Couenne

trunk

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Contents

1 Todo List

Member Couenne::InitHeuristic::solution (double &objectiveValue, double *newSolution)

Find a quicker way to get to Couenne objects, store them or something

Member Couenne::NlpSolveHeuristic::solution (double &objectiveValue, double *newSolution)

Find a quicker way to get to Couenne objects, store them or something

2 Namespace Index

2.1 Namespace List

Here is a list of all namespaces with brief descriptions:

3 Class Index

3.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

- std::basic_iostream< char >
- std::basic_iostream< wchar_t >
- std::basic_istream< char >
- std::basic_istream< wchar_t >
- std::basic_istringstream< char >
- std::basic_istringstream< wchar_t >
- std::basic_ofstream< char >
- std::basic_ofstream< wchar_t >
- std::basic_ostream< char >
- std::basic_ostream< wchar_t >
- std::basic_ostringstream< char >
- std::basic_ostringstream< wchar_t >
- std::basic_string< char >
- std::basic_string< wchar_t >
- std::basic_stringstream< char >
- std::basic_stringstream< wchar_t >
- BitVector128 [external]
- CoinAbsFltEq [external]
- CoinArrayWithLength [external]
  - CoinArbitraryArrayWithLength [external]
  - CoinBigIndexArrayWithLength [external]
  - CoinDoubleArrayWithLength [external]
  - CoinFactorizationDoubleArrayWithLength [external]
  - CoinFactorizationLongDoubleArrayWithLength [external]
  - CoinIntArrayWithLength [external]
  - CoinUnsignedIntArrayWithLength [external]
  - CoinVoidStarArrayWithLength [external]
- CoinBaseModel [external]
  - CoinModel [external]
  - CoinStructuredModel [external]
- CoinBuild [external]
- CoinDenseVector< T > [external]
- CoinError [external]
- CoinExternalVectorFirstGreater_2< class, class, class > [external]
- CoinExternalVectorFirstGreater_3< class, class, class, class > [external]
- CoinExternalVectorFirstLess_2< class, class, class > [external]
- CoinExternalVectorFirstLess_3< class, class, class, class > [external]
- CoinFactorization [external]
- CoinFileIOBase [external]
  - CoinFileInput [external]
  - CoinFileOutput [external]
- CoinFirstAbsGreater_2< class, class > [external]
- CoinFirstAbsGreater_3< class, class, class > [external]
- CoinFirstAbsLess_2< class, class > [external]
- CoinFirstAbsLess_3< class, class, class > [external]
- CoinFirstGreater_2< class, class > [external]
- CoinFirstGreater_3< class, class, class > [external]
- CoinFirstLess_2< class, class > [external]
- CoinFirstLess_3< class, class, class > [external]
- CoinLpIO::CoinHashLink [external]
- CoinMpsIO::CoinHashLink [external]
- CoinIndexedVector [external]
  - CoinPartitionedVector [external]
- CoinLpIO [external]

- CoinMessageHandler [external]
- CoinMessages [external]
  - CoinMessage [external]
- CoinModelHash [external]
- CoinModelHash2 [external]
- CoinModelHashLink [external]
- CoinModelInfo2 [external]
- CoinModelLink [external]
- CoinModelLinkedList [external]
- CoinModelTriple [external]
- CoinMpsCardReader [external]
- CoinMpsIO [external]
- CoinOneMessage [external]
- CoinOtherFactorization [external]
  - CoinDenseFactorization [external]
  - CoinOslFactorization [external]
  - CoinSimpFactorization [external]
- CoinPackedMatrix [external]
- CoinPackedVectorBase [external]
  - CoinPackedVector [external]
  - CoinShallowPackedVector [external]
- CoinPair< S, T > [external]
- CoinParam [external]
- CoinPrePostsolveMatrix [external]
  - CoinPostsolveMatrix [external]
  - CoinPresolveMatrix [external]
- CoinPresolveAction [external]
  - do_tighten_action [external]
  - doubleton_action [external]
  - drop_empty_cols_action [external]
  - drop_empty_rows_action [external]
  - drop_zero_coefficients_action [external]
  - dupcol_action [external]
  - duprow_action [external]
  - forcing_constraint_action [external]
  - gubrow_action [external]
  - implied_free_action [external]
  - isolated_constraint_action [external]
  - make_fixed_action [external]
  - remove_dual_action [external]
  - remove_fixed_action [external]
  - slack_doubleton_action [external]
  - slack_singleton_action [external]
  - subst_constraint_action [external]
  - tripleton_action [external]
  - twoxtwo_action [external]
  - useless_constraint_action [external]
- CoinPresolveMonitor [external]
- CoinRational [external]
- CoinRelFltEq [external]
- CoinSearchTreeBase [external]
  - CoinSearchTree< class > [external]
- CoinSearchTreeCompareBest [external]
- CoinSearchTreeCompareBreadth [external]

4 Class Index

4.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

5 File Index

5.1 File List

Here is a list of all files with brief descriptions:

6 Namespace Documentation

6.1 Bonmin Namespace Reference

6.2 Coin Namespace Reference

6.3 Couenne Namespace Reference

general include file for different compilers

Classes

- class CouenneAggrProbing

  Cut Generator for aggressive BT; i.e., an aggressive probing.

- class CouenneBTPerfIndicator
- class CouenneFixPoint

  Cut Generator for FBBT fixpoint.
- class CouenneMultiVarProbe
- class CouenneSparseBndVec
- class CouenneTwoImplied

  Cut Generator for implied bounds derived from pairs of linear (in)equalities.
- class CouenneBranchingObject

  "Spatial" branching object.
- class CouenneChooseStrong
- class CouenneChooseVariable

  Choose a variable for branching.
- class CouenneComplBranchingObject

  "Spatial" branching object for complementarity constraints.
- class CouenneComplObject

  OsiObject for complementarity constraints $x_1 x_2 \geq, \leq, = 0$.
- class CouenneObject

  OsiObject for auxiliary variables $w=f(x)$.
- class CouenneOrbitBranchingObj

  "Spatial" branching object.
- class CouenneSOSBranchingObject
- class CouenneSOSObject
- class CouenneThreeWayBranchObj

  Spatial, three-way branching object.
- class CouenneVarObject

  OsiObject for variables in a MINLP.
- class CouenneVTObject

  OsiObject for violation transfer on variables in a MINLP.
- class CouenneCutGenerator

  Cut Generator for linear convexifications.
- class AuxRelation

  Base class definition for relations between auxiliaries.
- class SumLogAuxRel

  Identifies 5-ples of variables of the form.
- class MultiProdRel

  Identifies 5-ples of variables of the form.
- class BiProdDivRel

  Identifies 5-tuple of the form.
- class PowRel

  Identifies 5-tuple of the form.
- class CouenneCrossConv

  Cut Generator that uses relationships between auxiliaries.
- class CouenneScalar
- class CouenneSparseVector
- class CouenneExprMatrix
- class CouennePSDcon

  Class to represent positive semidefinite constraints //////////////////.
- class CouenneSdpCuts

These are cuts of the form.
- class CouenneDisjCuts

  Cut Generator for linear convexifications.
- class DomainPoint

  Define a point in the solution space and the bounds around it.
- class Domain

  Define a dynamic point+bounds, with a way to save and restore previous points+bounds through a LIFO structure.
- class exprAux

  Auxiliary variable.
- struct compExpr

  Structure for comparing expressions.
- class exprLowerBound

  These are bound expression classes.
- class exprUpperBound

  upper bound
- class exprClone

  expression clone (points to another expression)
- class exprConst

  constant-type operator
- class exprCopy
- class expression

  Expression base class.
- class exprIVar

  variable-type operator.
- class exprOp

  general n-ary operator-type expression: requires argument list.
- class exprStore

  storage class for previously evaluated expressions
- class exprUnary

  expression class for unary functions (sin, log, etc.)
- class exprVar

  variable-type operator
- class t_chg_bounds

  status of lower/upper bound of a variable, to be checked/modified in bound tightening
- class CouExpr
- class exprLBCos

  class to compute lower bound of a cosine based on the bounds of its arguments
- class exprUBCos

  class to compute lower bound of a cosine based on the bounds of its arguments
- class exprLBDiv

  class to compute lower bound of a fraction based on the bounds of both numerator and denominator
- class exprUBDiv

  class to compute upper bound of a fraction based on the bounds of both numerator and denominator
- class exprLBMul

  class to compute lower bound of a product based on the bounds of both factors
- class exprUBMul

  class to compute upper bound of a product based on the bounds of both factors

- class exprLBQuad

    class to compute lower bound of a fraction based on the bounds of both numerator and denominator
- class exprUBQuad

    class to compute upper bound of a fraction based on the bounds of both numerator and denominator
- class exprLBSin

    class to compute lower bound of a sine based on the bounds on its arguments
- class exprUBSin

    class to compute lower bound of a sine based on the bounds on its arguments
- class exprAbs

    class for $|f(x)|$
- class exprBinProd

    class for $\prod_{i=1}^{n} f_i(x)$ *with* $f_i(x)$ *all binary*
- class exprCeil

    class ceiling, $\lceil f(x) \rceil$
- class exprCos

    class cosine, $\cos f(x)$
- class exprDiv

    class for divisions, $\frac{f(x)}{g(x)}$
- class exprExp

    class for the exponential, $e^{f(x)}$
- class exprFloor

    class floor, $\lfloor f(x) \rfloor$
- class exprGroup

    class Group, with constant, linear and nonlinear terms: $a_0 + \sum_{i=1}^{n} a_i x_i$
- class exprIf
- class exprInv

    class inverse: $1/f(x)$
- class exprLog

    class logarithm, $\log f(x)$
- class exprMax

    class for maxima
- class exprMin

    class for minima
- class exprMultiLin

    another class for multiplications, $\prod_{i=1}^{n} f_i(x)$
- class exprNorm

    Class for p*-norms,* $||f(x)||_p = \left(\sum_{i=1}^{n} f_i(x)^p\right)^{\frac{1}{p}}$.
- class exprOddPow

    Power of an expression (binary operator), $f(x)^k$ *with* k *constant.*
- class exprOpp

    class opposite, $-f(x)$
- class exprPow

    Power of an expression (binary operator), $f(x)^k$ *with* k *constant.*
- class exprPWLinear
- class exprQuad

    class exprQuad, with constant, linear and quadratic terms
- class exprSin

class for $\sin f(x)$

- class exprSub

  class for subtraction, $f(x) - g(x)$

- class exprSum

  class sum, $\sum_{i=1}^{n} f_i(x)$

- class exprTrilinear

  class for multiplications

- class ExprHess

  expression matrices.

- class ExprJac

  Jacobian of the problem (computed through Couenne expression classes).

- class InitHeuristic

  A heuristic that stores the initial solution of the NLP.

- class NlpSolveHeuristic
- class CouenneFeasPump

  An implementation of the Feasibility pump that uses linearization and Ipopt to find the two sequences of points.

- class CouenneFPsolution

  Class containing a solution with infeasibility evaluation.

- class compareSol

  class for comparing solutions (used in tabu list)

- class CouenneFPpool

  Pool of solutions.

- class CouenneIterativeRounding

  An iterative rounding heuristic, tailored for nonconvex MINLPs.

- class CouenneInterface
- class CouenneMINLPInterface

  This is class provides an Osi interface for a Mixed Integer Linear Program expressed as a TMINLP (so that we can use it for example as the continuous solver in Cbc).

- class CouenneTNLP

  Class for handling NLPs using CouenneProblem.

- class CouenneUserInterface
- class CouenneInfo

  Bonmin class for passing info between components of branch-and-cuts.

- class SmartAsl
- class CouenneSetup
- class CouenneBab
- class CouenneOSInterface
- class GlobalCutOff
- class CouenneProblem

  Class for MINLP problems with symbolic information.

- class CouenneConstraint

  Class to represent nonlinear constraints.

- class CouenneObjective

  Objective function.

- class CouenneRecordBestSol
- class CouenneSolverInterface

  Solver interface class with a pointer to a Couenne cut generator.

- struct compNode

structure for comparing nodes in the dependence graph

- class DepNode

  vertex of a dependence graph.

- class DepGraph

  Dependence graph.

- class CouenneAmplInterface
- class quadElem
- class LinMap
- class QuadMap
- class funtriplet
- class simpletriplet
- class powertriplet
- class kpowertriplet
- class Qroot

  class that stores result of previous calls to rootQ into a map for faster access

- class CouenneSparseMatrix

  Class for sparse Matrixs (used in modifying distances in FP)

Typedefs

- typedef Ipopt::SmartPtr
  < Ipopt::Journalist > JnlstPtr
- typedef Ipopt::SmartPtr< const
  Ipopt::Journalist > ConstJnlstPtr
- typedef double CouNumber

  main number type in Couenne

- typedef CouNumber(∗ unary_function)(CouNumber)

  unary function, used in all exprUnary

Enumerations

- enum {
  TWO_LEFT, TWO_RIGHT, TWO_RAND, THREE_LEFT,
  THREE_CENTER, THREE_RIGHT, THREE_RAND, BRANCH_NONE }

  Define what kind of branching (two- or three-way) and where to start from: left, (center,) or right.

- enum { COUENNE_INFEASIBLE, COUENNE_TIGHTENED, COUENNE_FEASIBLE }
- enum nodeType {
  CONST = 0, VAR, UNARY, N_ARY,
  COPY, AUX, EMPTY }

  type of a node in an expression tree

- enum linearity_type {
  ZERO = 0, CONSTANT, LINEAR, QUADRATIC,
  NONLINEAR }

  linearity of an expression, as returned by the method Linearity()

- enum pos { PRE = 0, POST, INSIDE, NONE }

  position where the operator should be printed when printing the expression

- enum con_sign { COUENNE_EQ, COUENNE_LE, COUENNE_GE, COUENNE_RNG }

  sign of constraint

- enum conv_type { CURRENT_ONLY, UNIFORM_GRID, AROUND_CURPOINT } *position and number of convexification cuts added for a lower convex (upper concave) envelope*

- enum expr_type {
COU_EXPRESSION, COU_EXPRCONST, COU_EXPRVAR, COU_EXPRLBOUND,
COU_EXPRUBOUND, COU_EXPROP, COU_EXPRSUB, COU_EXPRSUM,
COU_EXPRGROUP, COU_EXPRQUAD, COU_EXPRMIN, COU_EXPRMUL,
COU_EXPRTRILINEAR, COU_EXPRPOW, COU_EXPRSIGNPOW, COU_EXPRMAX,
COU_EXPRDIV, COU_EXPRUNARY, COU_EXPRCOS, COU_EXPRABS,
COU_EXPREXP, COU_EXPRINV, COU_EXPRLOG, COU_EXPROPP,
COU_EXPRSIN, COU_EXPRFLOOR, COU_EXPRCEIL, MAX_COU_EXPR_CODE }

  code returned by the method expression::code()
- enum convexity {
UNSET, NONCONVEX, CONVEX, CONCAVE,
AFFINE, CONV_LINEAR, CONV_CONSTANT, CONV_ZERO }

  convexity type of an expression
- enum monotonicity {
MON_UNSET, NONMONOTONE, NDECREAS, NINCREAS,
INCLIN, DECLIN, MON_CONST, MON_ZERO }

  monotonicity type of an expression
- enum dig_type { ORIG_ONLY, STOP_AT_AUX, TAG_AND_RECURSIVE, COUNT }

  type of digging when filling the dependence list
- enum cou_trig { COU_SINE, COU_COSINE }

  specify which trigonometric function is dealt with in trigEnvelope
- enum what_to_compare {
SUM_NINF = 0, SUM_INF, OBJVAL, ALL_VARS,
INTEGER_VARS }

  what term to compare: the sum of infeasibilities, the sum of numbers of infeasible terms, or the objective function
- enum Solver { EIpopt = 0, EFilterSQP, EAll }

  Solvers for solving nonlinear programs.
- enum TrilinDecompType { rAI, treeDecomp, bi_tri, tri_bi }

Functions

- CouNumber minMaxDelta (funtriplet ∗ft, CouNumber lb, CouNumber ub)
- CouNumber maxHeight (funtriplet ∗ft, CouNumber lb, CouNumber ub)
- CouNumber project (CouNumber a, CouNumber b, CouNumber c, CouNumber x0, CouNumber y0, CouNumber lb, CouNumber ub, int sign, CouNumber ∗xp=NULL, CouNumber ∗yp=NULL)

  Compute projection of point (x0, y0) on the segment defined by line ax + by + c <>= 0 (sign provided by parameter sign) and bounds [lb, ub] on x.
- CouNumber projectSeg (CouNumber x0, CouNumber y0, CouNumber x1, CouNumber y1, CouNumber x2, CouNumber y2, int sign, CouNumber ∗xp=NULL, CouNumber ∗yp=NULL)

  Compute projection of point (x0, y0) on the segment defined by two points (x1,y1), (x2, y2) – sign provided by parameter sign.
- void sparse2dense (int ncols, t_chg_bounds ∗chg_bds, int ∗&changed, int &nchanged)

  translate sparse to dense vector (should be replaced)
- bool operator< (const CouenneScalar &first, const CouenneScalar &second)
- void CoinInvN (register const double ∗orig, register int n, register double ∗inverted)

  invert all contents
- void CoinCopyDisp (register const int ∗src, register int num, register int ∗dst, register int displacement)

  a CoinCopyN with a += on each element
- void draw_cuts (OsiCuts &, const CouenneCutGenerator ∗, int, expression ∗, expression ∗)

allow to draw function within intervals and cuts introduced
- bool updateBound (register int sign, register CouNumber ∗dst, register CouNumber src)

  updates maximum violation.
- int compareExpr (const void ∗e0, const void ∗e1)

  independent comparison
- bool isInteger (CouNumber x)

  is this number integer?
- expression ∗ getOriginal (expression ∗e)

  get original expression (can't make it an expression method as I need a non-const, what "this" would return)
- CouNumber zero_fun (CouNumber x)

  zero function (used by default by exprUnary)
- CouExpr operator+ (CouExpr &e1, CouExpr &e2)
- CouExpr & operator/ (CouExpr &e1, CouExpr &e2)
- CouExpr & operator% (CouExpr &e1, CouExpr &e2)
- CouExpr & operator- (CouExpr &e1, CouExpr &e2)
- CouExpr & operator∗ (CouExpr &e1, CouExpr &e2)
- CouExpr & operator^ (CouExpr &e1, CouExpr &e2)
- CouExpr & sin (CouExpr &e)
- CouExpr & cos (CouExpr &e)
- CouExpr & log (CouExpr &e)
- CouExpr & exp (CouExpr &e)
- CouExpr & operator+ (CouNumber &e1, CouExpr &e2)
- CouExpr & operator/ (CouNumber &e1, CouExpr &e2)
- CouExpr & operator% (CouNumber &e1, CouExpr &e2)
- CouExpr & operator- (CouNumber &e1, CouExpr &e2)
- CouExpr & operator∗ (CouNumber &e1, CouExpr &e2)
- CouExpr & operator^ (CouNumber &e1, CouExpr &e2)
- CouExpr & sin (CouNumber &e)
- CouExpr & cos (CouNumber &e)
- CouExpr & log (CouNumber &e)
- CouExpr & exp (CouNumber &e)
- CouExpr & operator+ (CouExpr &e1, CouNumber &e2)
- CouExpr & operator/ (CouExpr &e1, CouNumber &e2)
- CouExpr & operator% (CouExpr &e1, CouNumber &e2)
- CouExpr & operator- (CouExpr &e1, CouNumber &e2)
- CouExpr & operator∗ (CouExpr &e1, CouNumber &e2)
- CouExpr & operator^ (CouExpr &e1, CouNumber &e2)
- static CouNumber safeDiv (register CouNumber a, register CouNumber b, int sign)

  division that avoids NaN's and considers a sign when returning infinity
- CouNumber safeProd (register CouNumber a, register CouNumber b)

  product that avoids NaN's
- CouNumber trigNewton (CouNumber, CouNumber, CouNumber)

  common convexification method used by both cos and sin
- bool is_boundbox_regular (register CouNumber b1, register CouNumber b2)

  check if bounding box is suitable for a multiplication/division convexification constraint
- CouNumber inv (register CouNumber arg)

  the operator itself
- CouNumber oppInvSqr (register CouNumber x)

  derivative of inv (x)

- CouNumber inv_dblprime (register CouNumber x)

    inv_dblprime, second derivative of inv (x)
- CouNumber opp (register CouNumber arg)

    operator opp: returns the opposite of a number
- CouNumber safe_pow (CouNumber base, CouNumber exponent, bool signpower=false)

    compute power and check for integer-and-odd inverse exponent
- void addPowEnvelope (const CouenneCutGenerator *, OsiCuts &, int, int, CouNumber, CouNumber, CouNumber, CouNumber, CouNumber, int, bool=false)

    add upper/lower envelope to power in convex/concave areas
- CouNumber powNewton (CouNumber, CouNumber, unary_function, unary_function, unary_function)

    find proper tangent point to add deepest tangent cut
- CouNumber powNewton (CouNumber, CouNumber, funtriplet *)

    find proper tangent point to add deepest tangent cut
- CouNumber modulo (register CouNumber a, register CouNumber b)

    normalize angle within [0,b] (typically, pi or 2pi)
- CouNumber trigSelBranch (const CouenneObject *obj, const OsiBranchingInformation *info, expression *&var, double *&brpts, double *&brDist, int &way, enum cou_trig type)

    generalized procedure for both sine and cosine
- bool trigImpliedBound (enum cou_trig, int, int, CouNumber *, CouNumber *, t_chg_bounds *)

    generalized implied bound procedure for sine/cosine
- bool operator< (const CouenneFPsolution &one, const CouenneFPsolution &two)

    compare, base version
- const Ipopt::EJournalCategory J_BRANCHING (Ipopt::J_USER1)
- const Ipopt::EJournalCategory J_BOUNDTIGHTENING (Ipopt::J_USER2)
- const Ipopt::EJournalCategory J_CONVEXIFYING (Ipopt::J_USER3)
- const Ipopt::EJournalCategory J_PROBLEM (Ipopt::J_USER4)
- const Ipopt::EJournalCategory J_NLPHEURISTIC (Ipopt::J_USER5)
- const Ipopt::EJournalCategory J_DISJCUTS (Ipopt::J_USER6)
- const Ipopt::EJournalCategory J_REFORMULATE (Ipopt::J_USER7)
- const Ipopt::EJournalCategory J_COUENNE (Ipopt::J_USER8)
- CouNumber rootQ (int k)

    Find roots of polynomial $Q^k(x) = $\sum_{i=1}^{2k} ix^{i-1}$.

Variables

- const CouNumber default_alpha = 0.25
- const CouNumber default_clamp = 0.2
- const CouNumber max_pseudocost = 1000.
- const double large_bound = 1e9

    if $|$branching point$|$ $>$ this, change it
- const CouNumber closeToBounds = .05
- const double Couenne_large_bound = 9.999e12

    used to declare LP unbounded
- const double maxNlpInf_0 = 1e-5

    A heuristic to call an NlpSolver if all CouenneObjects are close to be satisfied (for other integer objects, rounding is performed, if SOS's are not satisfied it does not run).
- static enum
  Couenne::what_to_compare comparedTerm_
- const CouNumber feas_tolerance_default = 1e-5

6.3.1 Detailed Description

general include file for different compilers

6.3.2 Typedef Documentation

6.3.2.1 typedef Ipopt::SmartPtr< Ipopt::Journalist > **Couenne::JnlstPtr**

Definition at line 34 of file CouenneExprVar.hpp.

6.3.2.2 typedef Ipopt::SmartPtr< const Ipopt::Journalist > **Couenne::ConstJnlstPtr**

Definition at line 35 of file CouenneExprVar.hpp.

6.3.2.3 typedef double **Couenne::CouNumber**

main number type in Couenne

Definition at line 100 of file CouenneTypes.hpp.

6.3.2.4 typedef **CouNumber**(* Couenne::unary_function)(**CouNumber**)

unary function, used in all exprUnary

Definition at line 103 of file CouenneTypes.hpp.

6.3.3 Enumeration Type Documentation

6.3.3.1 anonymous enum

Define what kind of branching (two- or three-way) and where to start from: left, (center,) or right.

The last is to help diversify branching through randomization, which may help when the same variable is branched upon in several points of the BB tree.

Enumerator:

TWO_LEFT

TWO_RIGHT

TWO_RAND

THREE_LEFT

THREE_CENTER

THREE_RIGHT

THREE_RAND

BRANCH_NONE

Definition at line 40 of file CouenneObject.hpp.

6.3.3.2 anonymous enum

Enumerator:

COUENNE_INFEASIBLE

COUENNE_TIGHTENED

COUENNE_FEASIBLE

Definition at line 30 of file CouenneDisjCuts.hpp.

6.3.3.3 enum Couenne::nodeType

type of a node in an expression tree

Enumerator:

CONST

VAR

UNARY

N_ARY

COPY

AUX

EMPTY

Definition at line 20 of file CouenneTypes.hpp.

6.3.3.4 enum Couenne::linearity_type

linearity of an expression, as returned by the method Linearity()

Enumerator:

ZERO

CONSTANT

LINEAR

QUADRATIC

NONLINEAR

Definition at line 23 of file CouenneTypes.hpp.

6.3.3.5 enum Couenne::pos

position where the operator should be printed when printing the expression

For instance, it is INSIDE for exprSum, exprMul, exprDiv, while it is PRE for exprLog, exprSin, exprExp...

Enumerator:

PRE

POST

INSIDE

NONE

Definition at line 30 of file CouenneTypes.hpp.

6.3.3.6 enum Couenne::con_sign

sign of constraint

Enumerator:

COUENNE_EQ

COUENNE_LE

COUENNE_GE

COUENNE_RNG

Definition at line 33 of file CouenneTypes.hpp.

6.3.3.7 enum Couenne::conv_type

position and number of convexification cuts added for a lower convex (upper concave) envelope

Enumerator:

CURRENT_ONLY

UNIFORM_GRID

AROUND_CURPOINT

Definition at line 37 of file CouenneTypes.hpp.

6.3.3.8 enum Couenne::expr_type

code returned by the method expression::code()

Enumerator:

COU_EXPRESSION

COU_EXPRCONST

COU_EXPRVAR

COU_EXPRLBOUND

COU_EXPRUBOUND

COU_EXPROP

COU_EXPRSUB

COU_EXPRSUM

COU_EXPRGROUP

COU_EXPRQUAD

COU_EXPRMIN

COU_EXPRMUL

COU_EXPRTRILINEAR

COU_EXPRPOW

COU_EXPRSIGNPOW

COU_EXPRMAX

COU_EXPRDIV

COU_EXPRUNARY

COU_EXPRCOS
COU_EXPRABS
COU_EXPREXP
COU_EXPRINV
COU_EXPRLOG
COU_EXPROPP
COU_EXPRSIN
COU_EXPRFLOOR
COU_EXPRCEIL
MAX_COU_EXPR_CODE

Definition at line 40 of file CouenneTypes.hpp.

6.3.3.9 enum Couenne::convexity

convexity type of an expression

Enumerator:

UNSET
NONCONVEX
CONVEX
CONCAVE
AFFINE
CONV_LINEAR
CONV_CONSTANT
CONV_ZERO

Definition at line 56 of file CouenneTypes.hpp.

6.3.3.10 enum Couenne::monotonicity

monotonicity type of an expression

Enumerator:

MON_UNSET
NONMONOTONE
NDECREAS
NINCREAS
INCLIN
DECLIN
MON_CONST
MON_ZERO

Definition at line 59 of file CouenneTypes.hpp.

6.3.3.11 enum Couenne::dig_type

type of digging when filling the dependence list

Enumerator:

ORIG_ONLY

STOP_AT_AUX

TAG_AND_RECURSIVE

COUNT

Definition at line 62 of file CouenneTypes.hpp.

6.3.3.12 enum Couenne::cou_trig

specify which trigonometric function is dealt with in trigEnvelope

Enumerator:

COU_SINE

COU_COSINE

Definition at line 23 of file CouenneExprSin.hpp.

6.3.3.13 enum Couenne::what_to_compare

what term to compare: the sum of infeasibilities, the sum of numbers of infeasible terms, or the objective function

Enumerator:

SUM_NINF

SUM_INF

OBJVAL

ALL_VARS

INTEGER_VARS

Definition at line 29 of file CouenneFPpool.hpp.

6.3.3.14 enum Couenne::Solver

Solvers for solving nonlinear programs.

Enumerator:

EIpopt `Ipopt` interior point algorithm

EFilterSQP `filterSQP` Sequential Quadratic Programming algorithm

EAll Use all solvers.

Definition at line 47 of file CouenneMINLPInterface.hpp.

6.3.3.15 enum Couenne::TrilinDecompType

Enumerator:

rAI

treeDecomp

bi_tri

tri_bi

Definition at line 136 of file CouenneProblem.hpp.

6.3.4 Function Documentation

6.3.4.1 CouNumber Couenne::minMaxDelta (funtriplet ∗ *ft*, CouNumber *lb*, CouNumber *ub*)

6.3.4.2 CouNumber Couenne::maxHeight (funtriplet ∗ *ft*, CouNumber *lb*, CouNumber *ub*)

6.3.4.3 CouNumber Couenne::project (CouNumber *a*, CouNumber *b*, CouNumber *c*, CouNumber *x0*, CouNumber *y0*, CouNumber *lb*, CouNumber *ub*, int *sign*, CouNumber ∗ *xp* = `NULL`, CouNumber ∗ *yp* = `NULL`)

Compute projection of point (x0, y0) on the segment defined by line ax + by + c <>= 0 (sign provided by parameter sign) and bounds [lb, ub] on x.

Return distance from segment, 0 if satisfied

6.3.4.4 CouNumber Couenne::projectSeg (CouNumber *x0*, CouNumber *y0*, CouNumber *x1*, CouNumber *y1*, CouNumber *x2*, CouNumber *y2*, int *sign*, CouNumber ∗ *xp* = `NULL`, CouNumber ∗ *yp* = `NULL`)

Compute projection of point (x0, y0) on the segment defined by two points (x1,y1), (x2, y2) – sign provided by parameter sign.

Return distance from segment, 0 if on it.

6.3.4.5 void Couenne::sparse2dense (int *ncols*, t_chg_bounds ∗ *chg_bds*, int ∗& *changed*, int & *nchanged*)

translate sparse to dense vector (should be replaced)

6.3.4.6 bool Couenne::operator< (const CouenneScalar & *first*, const CouenneScalar & *second*) `[inline]`

Definition at line 62 of file CouenneMatrix.hpp.

6.3.4.7 void Couenne::CoinInvN (register const double ∗ *orig*, register int *n*, register double ∗ *inverted*) `[inline]`

invert all contents

Definition at line 194 of file CouenneDisjCuts.hpp.

6.3.4.8 void Couenne::CoinCopyDisp (register const int ∗ *src*, register int *num*, register int ∗ *dst*, register int *displacement*) `[inline]`

a CoinCopyN with a += on each element

Definition at line 203 of file CouenneDisjCuts.hpp.

6.3.4.9 void Couenne::draw_cuts (OsiCuts & , const CouenneCutGenerator ∗ , int , expression ∗ , expression ∗)

allow to draw function within intervals and cuts introduced

6.3.4.10 bool Couenne::updateBound (register int *sign*, register CouNumber * *dst*, register CouNumber *src*) [inline]

updates maximum violation.

Used with all impliedBound. Returns true if a bound has been modified, false otherwise

Definition at line 279 of file CouenneExpression.hpp.

6.3.4.11 int Couenne::compareExpr (const void * *e0*, const void * *e1*) [inline]

independent comparison

Definition at line 304 of file CouenneExpression.hpp.

6.3.4.12 bool Couenne::isInteger (CouNumber *x*) [inline]

is this number integer?

Definition at line 309 of file CouenneExpression.hpp.

6.3.4.13 expression* Couenne::getOriginal (expression * *e*) [inline]

get original expression (can't make it an expression method as I need a non-const, what "this" would return)

Definition at line 315 of file CouenneExpression.hpp.

6.3.4.14 CouNumber Couenne::zero_fun (CouNumber *x*) [inline]

zero function (used by default by exprUnary)

Definition at line 22 of file CouenneExprUnary.hpp.

6.3.4.15 CouExpr Couenne::operator+ (CouExpr & *e1*, CouExpr & *e2*)

6.3.4.16 CouExpr& Couenne::operator/ (CouExpr & *e1*, CouExpr & *e2*)

6.3.4.17 CouExpr& Couenne::operator% (CouExpr & *e1*, CouExpr & *e2*)

6.3.4.18 CouExpr& Couenne::operator- (CouExpr & *e1*, CouExpr & *e2*)

6.3.4.19 CouExpr& Couenne::operator* (CouExpr & *e1*, CouExpr & *e2*)

6.3.4.20 CouExpr& Couenne::operator^ (CouExpr & *e1*, CouExpr & *e2*)

6.3.4.21 CouExpr& Couenne::sin (CouExpr & *e*)

6.3.4.22 CouExpr& Couenne::cos (CouExpr & *e*)

6.3.4.23 CouExpr& Couenne::log (CouExpr & *e*)

6.3.4.24 CouExpr& Couenne::exp (CouExpr & *e*)

6.3.4.25 CouExpr& Couenne::operator+ (CouNumber & *e1*, CouExpr & *e2*)

6.3.4.26 CouExpr& Couenne::operator/ (CouNumber & *e1*, CouExpr & *e2*)

6.3.4.27 CouExpr& Couenne::operator% (CouNumber & *e1*, CouExpr & *e2*)

6.3.4.28 CouExpr& Couenne::operator- (CouNumber & *e1*, CouExpr & *e2*)

6.3.4.29 CouExpr& Couenne::operator* (CouNumber & *e1*, CouExpr & *e2*)

6.3.4.30 CouExpr& Couenne::operator^ (CouNumber & *e1*, CouExpr & *e2*)

6.3.4.31 CouExpr& Couenne::sin (CouNumber & *e*)

6.3.4.32 CouExpr& Couenne::cos (CouNumber & *e*)

6.3.4.33 CouExpr& Couenne::log (CouNumber & *e*)

6.3.4.34 CouExpr& Couenne::exp (CouNumber & *e*)

6.3.4.35 CouExpr& Couenne::operator+ (CouExpr & *e1*, CouNumber & *e2*)

6.3.4.36 CouExpr& Couenne::operator/ (CouExpr & *e1*, CouNumber & *e2*)

6.3.4.37 CouExpr& Couenne::operator% (CouExpr & *e1*, CouNumber & *e2*)

6.3.4.38 CouExpr& Couenne::operator- (CouExpr & *e1*, CouNumber & *e2*)

6.3.4.39 CouExpr& Couenne::operator* (CouExpr & *e1*, CouNumber & *e2*)

6.3.4.40 CouExpr& Couenne::operator^ (CouExpr & *e1*, CouNumber & *e2*)

6.3.4.41 static CouNumber Couenne::safeDiv (register CouNumber *a*, register CouNumber *b*, int *sign*) `[inline]`, `[static]`

division that avoids NaN's and considers a sign when returning infinity

Definition at line 19 of file CouenneExprBDiv.hpp.

6.3.4.42 CouNumber Couenne::safeProd (register CouNumber *a*, register CouNumber *b*) `[inline]`

product that avoids NaN's

Definition at line 25 of file CouenneExprBMul.hpp.

6.3.4.43 CouNumber Couenne::trigNewton (CouNumber , CouNumber , CouNumber)

common convexification method used by both cos and sin

6.3.4.44 bool Couenne::is_boundbox_regular (register CouNumber *b1*, register CouNumber *b2*) `[inline]`

check if bounding box is suitable for a multiplication/division convexification constraint

Definition at line 124 of file CouenneExprDiv.hpp.

6.3.4.45 CouNumber Couenne::inv (register CouNumber *arg*) `[inline]`

the operator itself

Definition at line 19 of file CouenneExprInv.hpp.

6.3.4.46 CouNumber Couenne::oppInvSqr (register CouNumber *x*) `[inline]`

derivative of inv (x)

Definition at line 24 of file CouenneExprInv.hpp.

6.3.4.47 CouNumber Couenne::inv_dblprime (register CouNumber *x*) [inline]

inv_dblprime, second derivative of inv (x)

Definition at line 29 of file CouenneExprInv.hpp.

6.3.4.48 CouNumber Couenne::opp (register CouNumber *arg*) [inline]

operator opp: returns the opposite of a number

Definition at line 21 of file CouenneExprOpp.hpp.

6.3.4.49 CouNumber Couenne::safe_pow (CouNumber *base*, CouNumber *exponent*, bool *signpower* = false) [inline]

compute power and check for integer-and-odd inverse exponent

Definition at line 129 of file CouenneExprPow.hpp.

6.3.4.50 void Couenne::addPowEnvelope (const CouenneCutGenerator *, OsiCuts &, int, int, CouNumber, CouNumber, CouNumber, CouNumber, CouNumber, int, bool = false)

add upper/lower envelope to power in convex/concave areas

6.3.4.51 CouNumber Couenne::powNewton (CouNumber, CouNumber, unary_function, unary_function, unary_function)

find proper tangent point to add deepest tangent cut

6.3.4.52 CouNumber Couenne::powNewton (CouNumber, CouNumber, funtriplet *)

find proper tangent point to add deepest tangent cut

6.3.4.53 CouNumber Couenne::modulo (register CouNumber *a*, register CouNumber *b*) [inline]

normalize angle within [0,b] (typically, pi or 2pi)

Definition at line 27 of file CouenneExprSin.hpp.

6.3.4.54 CouNumber Couenne::trigSelBranch (const CouenneObject * *obj*, const OsiBranchingInformation * *info*, expression *& *var*, double *& *brpts*, double *& *brDist*, int & *way*, enum cou_trig *type*)

generalized procedure for both sine and cosine

6.3.4.55 bool Couenne::trigImpliedBound (enum *cou_trig*, int, int, CouNumber *, CouNumber *, t_chg_bounds *)

generalized implied bound procedure for sine/cosine

6.3.4.56 bool Couenne::operator< (const CouenneFPsolution & *one*, const CouenneFPsolution & *two*) [inline]

compare, base version

Definition at line 76 of file CouenneFPpool.hpp.

6.3.4.57 const Ipopt::EJournalCategory Couenne::J_BRANCHING (Ipopt::J_USER1)

6.3.4.58 const Ipopt::EJournalCategory Couenne::J_BOUNDTIGHTENING (Ipopt::J_USER2)

6.3.4.59 const Ipopt::EJournalCategory Couenne::J_CONVEXIFYING (Ipopt::J_USER3)

6.3.4.60 const Ipopt::EJournalCategory Couenne::J_PROBLEM (Ipopt::J_USER4)

6.3.4.61 const Ipopt::EJournalCategory Couenne::J_NLPHEURISTIC (Ipopt::J_USER5)

6.3.4.62 const Ipopt::EJournalCategory Couenne::J_DISJCUTS (Ipopt::J_USER6)

6.3.4.63 const Ipopt::EJournalCategory Couenne::J_REFORMULATE (Ipopt::J_USER7)

6.3.4.64 const Ipopt::EJournalCategory Couenne::J_COUENNE (Ipopt::J_USER8)

6.3.4.65 CouNumber Couenne::rootQ (int *k*)

Find roots of polynomial \$Q^k(x) = $\sum_{i=1}^{2k} ix^{i-1}$.

Used in convexification of powers with odd exponent

6.3.5 Variable Documentation

6.3.5.1 const CouNumber Couenne::default_alpha = 0.25

Definition at line 23 of file CouenneObject.hpp.

6.3.5.2 const CouNumber Couenne::default_clamp = 0.2

Definition at line 24 of file CouenneObject.hpp.

6.3.5.3 const CouNumber Couenne::max_pseudocost = 1000.

Definition at line 25 of file CouenneObject.hpp.

6.3.5.4 const double Couenne::large_bound = 1e9

if $|$branching point$| >$ this, change it

Definition at line 28 of file CouenneObject.hpp.

6.3.5.5 const CouNumber Couenne::closeToBounds = .05

Definition at line 33 of file CouenneObject.hpp.

6.3.5.6 const double Couenne::Couenne_large_bound = 9.999e12

used to declare LP unbounded

Definition at line 50 of file CouennePrecisions.hpp.

6.3.5.7 const double Couenne::maxNlpInf_0 = 1e-5

A heuristic to call an NlpSolver if all CouenneObjects are close to be satisfied (for other integer objects, rounding is performed, if SOS's are not satisfied it does not run).

Definition at line 26 of file BonNlpHeuristic.hpp.

6.3.5.8 enum Couenne::what_to_compare Couenne::comparedTerm_ [static]

6.3.5.9 const CouNumber Couenne::feas_tolerance_default = 1e-5

Definition at line 159 of file CouenneProblem.hpp.

6.4 Ipopt Namespace Reference

6.5 Osi Namespace Reference

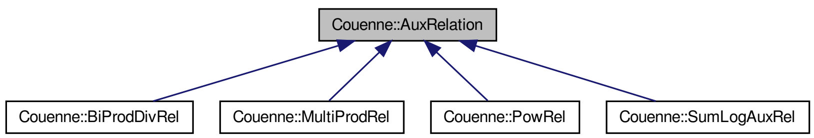
7 Class Documentation

7.1 Couenne::AuxRelation Class Reference

Base class definition for relations between auxiliaries.

`#include <CouenneCrossConv.hpp>`

Inheritance diagram for Couenne::AuxRelation:



Public Member Functions

- virtual int findRelations ()=0
- virtual void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

7.1.1 Detailed Description

Base class definition for relations between auxiliaries.

Definition at line 32 of file CouenneCrossConv.hpp.

7.1.2 Member Function Documentation

7.1.2.1 virtual int Couenne::AuxRelation::findRelations ( ) [pure virtual]

Implemented in Couenne::PowRel, Couenne::BiProdDivRel, Couenne::MultiProdRel, and Couenne::SumLogAuxRel.

7.1.2.2 virtual void Couenne::AuxRelation::generateCuts (const OsiSolverInterface & , OsiCuts & , const CglTreeInfo = CglTreeInfo()) const [virtual]

Reimplemented in Couenne::PowRel, Couenne::BiProdDivRel, Couenne::MultiProdRel, and Couenne::SumLogAuxRel.

The documentation for this class was generated from the following file:

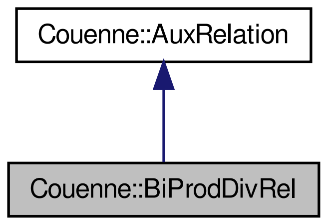
- /home/ted/COIN/trunk/Couenne/src/cut/crossconv/CouenneCrossConv.hpp

7.2 Couenne::BiProdDivRel Class Reference

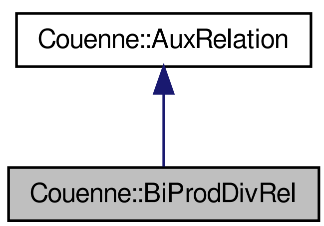
Identifies 5-tuple of the form.

`#include <CouenneCrossConv.hpp>`

Inheritance diagram for Couenne::BiProdDivRel:



Collaboration diagram for Couenne::BiProdDivRel:



Public Member Functions

- virtual int findRelations ()
- virtual void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

7.2.1 Detailed Description

Identifies 5-tuple of the form.

x_j := x_i / x_k x_p := x_i / x_q

x_l := x_j / x_p OR x_l := x_j x_k x_m := x_q / x_k x_m := x_p x_q

and generates, ONLY once, a cut

x_l = x_m (in both cases).

Definition at line 105 of file CouenneCrossConv.hpp.

7.2.2 Member Function Documentation

7.2.2.1 virtual int Couenne::BiProdDivRel::findRelations ( ) [virtual]

Implements Couenne::AuxRelation.

7.2.2.2 virtual void Couenne::BiProdDivRel::generateCuts (const OsiSolverInterface & , OsiCuts & , const CglTreeInfo = CglTreeInfo()) const [virtual]

Reimplemented from Couenne::AuxRelation.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/cut/crossconv/CouenneCrossConv.hpp

7.3 Couenne::CouenneExprMatrix::compare_pair_ind Struct Reference

`#include <CouenneMatrix.hpp>`

Public Member Functions

- bool operator() (register const std::pair< int, CouenneSparseVector ∗ > &a, register const std::pair< int, CouenneSparseVector ∗ > &b) const

7.3.1 Detailed Description

Definition at line 108 of file CouenneMatrix.hpp.

7.3.2 Member Function Documentation

7.3.2.1 bool Couenne::CouenneExprMatrix::compare_pair_ind::operator() (register const std::pair< int, CouenneSparseVector ∗ > & a, register const std::pair< int, CouenneSparseVector ∗ > & b) const [inline]

Definition at line 109 of file CouenneMatrix.hpp.

The documentation for this struct was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouenneMatrix.hpp

7.4 Couenne::CouenneSparseVector::compare_scalars Struct Reference

`#include <CouenneMatrix.hpp>`

Public Member Functions

- bool operator() (register CouenneScalar ∗const &a, register CouenneScalar ∗const &b)

7.4.1 Detailed Description

Definition at line 70 of file CouenneMatrix.hpp.

7.4.2 Member Function Documentation

7.4.2.1 bool Couenne::CouenneSparseVector::compare_scalars::operator() (register **CouenneScalar** ∗const & *a*, register **CouenneScalar** ∗const & *b*) `[inline]`

Definition at line 71 of file CouenneMatrix.hpp.

The documentation for this struct was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouenneMatrix.hpp

7.5 Couenne::compareSol Class Reference

class for comparing solutions (used in tabu list)

`#include <CouenneFPpool.hpp>`

Public Member Functions

- bool operator() (const CouenneFPsolution &one, const CouenneFPsolution &two) const

7.5.1 Detailed Description

class for comparing solutions (used in tabu list)

Definition at line 82 of file CouenneFPpool.hpp.

7.5.2 Member Function Documentation

7.5.2.1 bool Couenne::compareSol::operator() (const **CouenneFPsolution** & *one*, const **CouenneFPsolution** & *two*) const

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/heuristics/CouenneFPpool.hpp

7.6 Couenne::compExpr Struct Reference

Structure for comparing expressions.

`#include <CouenneExprAux.hpp>`

Public Member Functions

- bool operator() (exprAux ∗e0, exprAux ∗e1) const

7.6.1 Detailed Description

Structure for comparing expressions.

Used in compare() method for same-class expressions

Definition at line 210 of file CouenneExprAux.hpp.

7.6.2 Member Function Documentation

7.6.2.1 bool Couenne::compExpr::operator() (**exprAux** ∗ *e0,* **exprAux** ∗ *e1*) const [inline]

Definition at line 211 of file CouenneExprAux.hpp.

The documentation for this struct was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprAux.hpp

7.7 Couenne::compNode Struct Reference

structure for comparing nodes in the dependence graph

`#include <CouenneDepGraph.hpp>`

Public Member Functions

- bool operator() (const DepNode ∗n0, const DepNode ∗n1) const

  structure for comparing nodes

7.7.1 Detailed Description

structure for comparing nodes in the dependence graph

Definition at line 25 of file CouenneDepGraph.hpp.

7.7.2 Member Function Documentation

7.7.2.1 bool Couenne::compNode::operator() (const **DepNode** ∗ *n0,* const **DepNode** ∗ *n1*) const [inline]

structure for comparing nodes

Definition at line 108 of file CouenneDepGraph.hpp.

The documentation for this struct was generated from the following file:

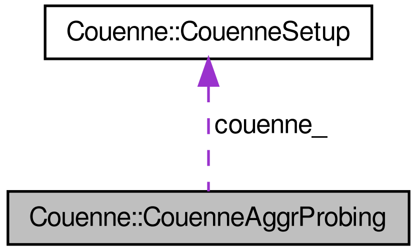
- /home/ted/COIN/trunk/Couenne/src/problem/depGraph/CouenneDepGraph.hpp

7.8 Couenne::CouenneAggrProbing Class Reference

Cut Generator for aggressive BT; i.e., an aggressive probing.

`#include <CouenneAggrProbing.hpp>`

Collaboration diagram for Couenne::CouenneAggrProbing:



Public Member Functions

- CouenneAggrProbing (CouenneSetup ∗couenne, const Ipopt::SmartPtr< Ipopt::OptionsList > options)

  Constructor.
- CouenneAggrProbing (const CouenneAggrProbing &rhs)

  Copy constructor.
- ∼CouenneAggrProbing ()

  Destructor.
- CouenneAggrProbing ∗ clone () const

  Clone method (necessary for the abstract CglCutGenerator class)
- void generateCuts (const OsiSolverInterface &solver, OsiCuts &cuts, const CglTreeInfo=CglTreeInfo()) const

  The main CglCutGenerator; not implemented yet.
- double probeVariable (int index, bool probeLower)

  Probe one variable (try to tigthen the lower or the upper bound, depending on the value of the second argument), so that we can generate the corresponding column cut.
- double probeVariable2 (int index, bool lower)

  Alternative probing algorithm.
- void setMaxTime (double value)

  Set/get maximum time to probe one variable.
- double getMaxTime () const
- void setMaxFailedSteps (int value)

  Set/get maximum number of failed steps.
- int getMaxFailedSteps () const
- void setMaxNodes (int value)

  Set/get maximum number of nodes to probe one variable.
- int getMaxNodes () const
- void setRestoreCutoff (bool value)

  Set/get restoreCutoff parameter (should we restore the initial cutoff value after each probing run?)
- bool getRestoreCutoff () const

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

  Add list of options to be read from file.

Protected Attributes

- CouenneSetup * couenne_

  Pointer to the CouenneProblem representation.
- int numCols_

  Number of columns (want to have this handy)
- double maxTime_

  Maximum time to probe one variable.
- int maxFailedSteps_

  Maximum number of failed iterations.
- int maxNodes_

  Maximum number of nodes in probing.
- bool restoreCutoff_

  Restore initial cutoff (value and solution)?
- double initCutoff_

  Initial cutoff.

7.8.1 Detailed Description

Cut Generator for aggressive BT; i.e., an aggressive probing.

This probing strategy is very expensive and was initially developed to be run in parallel; hence, the user can choose to probe just a particular variable, without adding this cut generator to the list of cut generators normally employed by Couenne. However, it can also be used in the standard way; in that case, it chooses automatically the variables to probe (in a very naive way, for the moment). TODO: Implement some way to automatically choose the variables TODO: Implement the generateCuts method, for use in Branch-and-Bound

Definition at line 37 of file CouenneAggrProbing.hpp.

7.8.2 Constructor & Destructor Documentation

7.8.2.1 Couenne::CouenneAggrProbing::CouenneAggrProbing (CouenneSetup * *couenne,* const Ipopt::SmartPtr< Ipopt::OptionsList > *options*)

Constructor.

7.8.2.2 Couenne::CouenneAggrProbing::CouenneAggrProbing (const CouenneAggrProbing & *rhs*)

Copy constructor.

7.8.2.3 Couenne::CouenneAggrProbing::∼CouenneAggrProbing ( )

Destructor.

7.8.3 Member Function Documentation

7.8.3.1 CouenneAggrProbing* Couenne::CouenneAggrProbing::clone ( ) const [inline]

Clone method (necessary for the abstract CglCutGenerator class)

Definition at line 52 of file CouenneAggrProbing.hpp.

7.8.3.2 void Couenne::CouenneAggrProbing::generateCuts (const OsiSolverInterface & *solver,* OsiCuts & *cuts,* const CglTreeInfo = CglTreeInfo ()) const [inline]

The main CglCutGenerator; not implemented yet.

Definition at line 56 of file CouenneAggrProbing.hpp.

7.8.3.3 double Couenne::CouenneAggrProbing::probeVariable (int *index,* bool *probeLower*)

Probe one variable (try to tigthen the lower or the upper bound, depending on the value of the second argument), so that we can generate the corresponding column cut.

This runs the main algorithm. It returns the new bound (equal to the initial one if we could not tigthen)

7.8.3.4 double Couenne::CouenneAggrProbing::probeVariable2 (int *index,* bool *lower*)

Alternative probing algorithm.

This one does not work yet! Do not use, will probably segfault.

7.8.3.5 static void Couenne::CouenneAggrProbing::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.8.3.6 void Couenne::CouenneAggrProbing::setMaxTime (double *value*)

Set/get maximum time to probe one variable.

7.8.3.7 double Couenne::CouenneAggrProbing::getMaxTime ( ) const

7.8.3.8 void Couenne::CouenneAggrProbing::setMaxFailedSteps (int *value*)

Set/get maximum number of failed steps.

7.8.3.9 int Couenne::CouenneAggrProbing::getMaxFailedSteps ( ) const

7.8.3.10 void Couenne::CouenneAggrProbing::setMaxNodes (int *value*)

Set/get maximum number of nodes to probe one variable.

7.8.3.11 int Couenne::CouenneAggrProbing::getMaxNodes ( ) const

7.8.3.12 void Couenne::CouenneAggrProbing::setRestoreCutoff (bool *value*)

Set/get restoreCutoff parameter (should we restore the initial cutoff value after each probing run?)

7.8.3.13 bool Couenne::CouenneAggrProbing::getRestoreCutoff ( ) const

7.8.4 Member Data Documentation

7.8.4.1 CouenneSetup* Couenne::CouenneAggrProbing::couenne_ [protected]

Pointer to the CouenneProblem representation.

Definition at line 98 of file CouenneAggrProbing.hpp.

7.8.4.2 int Couenne::CouenneAggrProbing::numCols_ [protected]

Number of columns (want to have this handy)

Definition at line 101 of file CouenneAggrProbing.hpp.

7.8.4.3 double Couenne::CouenneAggrProbing::maxTime_ [protected]

Maximum time to probe one variable.

Definition at line 104 of file CouenneAggrProbing.hpp.

7.8.4.4 int Couenne::CouenneAggrProbing::maxFailedSteps_ [protected]

Maximum number of failed iterations.

Definition at line 107 of file CouenneAggrProbing.hpp.

7.8.4.5 int Couenne::CouenneAggrProbing::maxNodes_ [protected]

Maximum number of nodes in probing.

Definition at line 110 of file CouenneAggrProbing.hpp.

7.8.4.6 bool Couenne::CouenneAggrProbing::restoreCutoff_ [protected]

Restore initial cutoff (value and solution)?

Definition at line 113 of file CouenneAggrProbing.hpp.

7.8.4.7 double Couenne::CouenneAggrProbing::initCutoff_ [protected]

Initial cutoff.

Definition at line 116 of file CouenneAggrProbing.hpp.

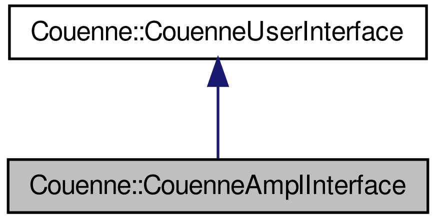
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneAggrProbing.hpp

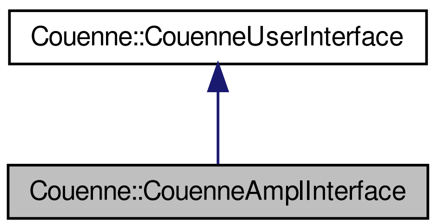
7.9 Couenne::CouenneAmplInterface Class Reference

```
#include <CouenneAmplInterface.hpp>
```

Inheritance diagram for Couenne::CouenneAmplInterface:



Collaboration diagram for Couenne::CouenneAmplInterface:



Public Member Functions

- CouenneAmplInterface (Ipopt::SmartPtr< Ipopt::OptionsList > options_, Ipopt::SmartPtr< Ipopt::Journalist > jnlst_)
- ∼CouenneAmplInterface ()
- CouenneProblem ∗ getCouenneProblem ()

  Should return the problem to solve in algebraic form.
- Ipopt::SmartPtr< Bonmin::TMINLP > getTMINLP ()

  Should return the problem to solve as TMINLP.
- bool writeSolution (Bonmin::Bab &bab)

  Called after B&B finished.
- void setRegisteredOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions_)

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

Additional Inherited Members

7.9.1 Detailed Description

Definition at line 26 of file CouenneAmplInterface.hpp.

7.9.2 Constructor & Destructor Documentation

7.9.2.1 Couenne::CouenneAmplInterface::CouenneAmplInterface (Ipopt::SmartPtr< Ipopt::OptionsList > *options_*, Ipopt::SmartPtr< Ipopt::Journalist > *jnlst_*) [inline]

Definition at line 41 of file CouenneAmplInterface.hpp.

7.9.2.2 Couenne::CouenneAmplInterface::∼CouenneAmplInterface ( )

7.9.3 Member Function Documentation

7.9.3.1 static void Couenne::CouenneAmplInterface::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

7.9.3.2 CouenneProblem∗ Couenne::CouenneAmplInterface::getCouenneProblem ( ) [virtual]

Should return the problem to solve in algebraic form.

NOTE: Couenne is (currently) going to modify this problem!

Implements Couenne::CouenneUserInterface.

7.9.3.3 Ipopt::SmartPtr<Bonmin::TMINLP> Couenne::CouenneAmplInterface::getTMINLP ( ) [virtual]

Should return the problem to solve as TMINLP.

Implements Couenne::CouenneUserInterface.

7.9.3.4 bool Couenne::CouenneAmplInterface::writeSolution (Bonmin::Bab & *bab*) [virtual]

Called after B&B finished.

Should write solution information.

Reimplemented from Couenne::CouenneUserInterface.

7.9.3.5 void Couenne::CouenneAmplInterface::setRegisteredOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions_*) [inline]

Definition at line 53 of file CouenneAmplInterface.hpp.

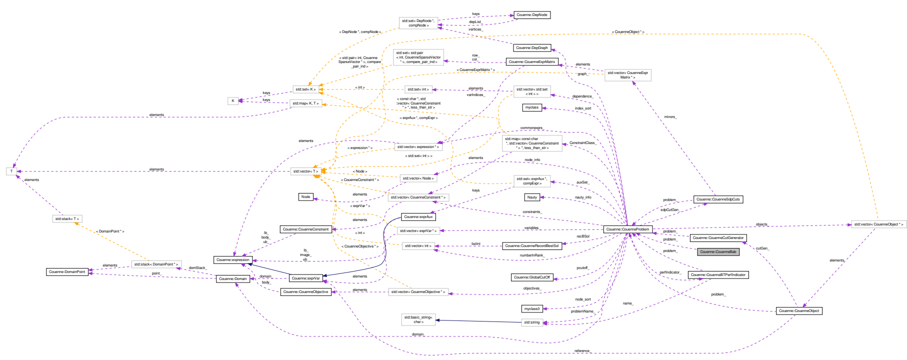
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/readnl/CouenneAmplInterface.hpp

7.10 Couenne::CouenneBab Class Reference

```
#include <CouenneBab.hpp>
```

Collaboration diagram for Couenne::CouenneBab:



Public Member Functions

- CouenneBab ()

    Constructor.
- virtual ∼CouenneBab ()

    Destructor.
- void setProblem (CouenneProblem ∗p)
- virtual void branchAndBound (Bonmin::BabSetupBase &s)

    Carry out branch and bound.
- const double ∗ bestSolution () const

    Get the best solution known to the problem (is optimal if MipStatus is FeasibleOptimal).
- double bestObj () const

    Return objective value of the bestSolution.
- double bestBound ()

    return the best known lower bound on the objective value

Protected Attributes

- CouenneProblem ∗ problem_

7.10.1 Detailed Description

Definition at line 21 of file CouenneBab.hpp.

7.10.2 Constructor & Destructor Documentation

7.10.2.1 Couenne::CouenneBab::CouenneBab ( )

Constructor.

7.10.2.2 virtual Couenne::CouenneBab::∼CouenneBab ( ) [virtual]

Destructor.

7.10.3 Member Function Documentation

7.10.3.1 void Couenne::CouenneBab::setProblem (CouenneProblem * p)

7.10.3.2 virtual void Couenne::CouenneBab::branchAndBound (Bonmin::BabSetupBase & s) [virtual]

Carry out branch and bound.

7.10.3.3 const double* Couenne::CouenneBab::bestSolution ( ) const

Get the best solution known to the problem (is optimal if MipStatus is FeasibleOptimal).

If no solution is known returns NULL.

7.10.3.4 double Couenne::CouenneBab::bestObj ( ) const

Return objective value of the bestSolution.

7.10.3.5 double Couenne::CouenneBab::bestBound ( ) [inline]

return the best known lower bound on the objective value

Definition at line 42 of file CouenneBab.hpp.

7.10.4 Member Data Documentation

7.10.4.1 CouenneProblem* Couenne::CouenneBab::problem_ [protected]

Definition at line 46 of file CouenneBab.hpp.

The documentation for this class was generated from the following file:

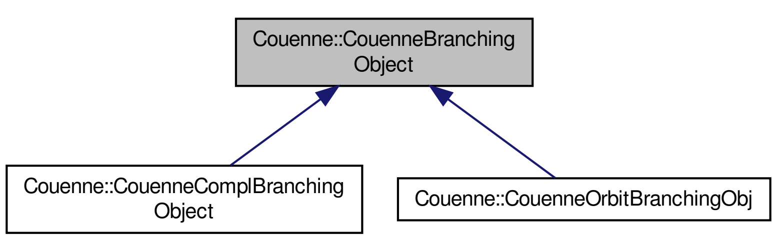
- /home/ted/COIN/trunk/Couenne/src/main/CouenneBab.hpp

7.11 Couenne::CouenneBranchingObject Class Reference

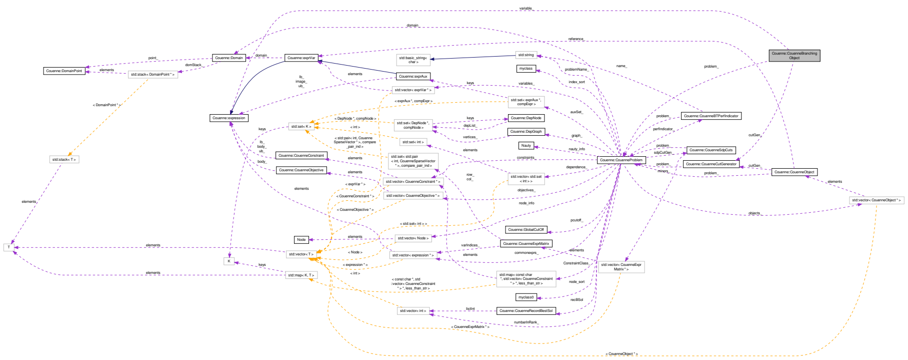
"Spatial" branching object.

`#include <CouenneBranchingObject.hpp>`

Inheritance diagram for Couenne::CouenneBranchingObject:



Collaboration diagram for Couenne::CouenneBranchingObject:



Public Member Functions

- CouenneBranchingObject (OsiSolverInterface ∗solver, const OsiObject ∗originalObject, JnlstPtr jnlst, CouenneCutGenerator ∗c, CouenneProblem ∗p, expression ∗var, int way, CouNumber brpoint, bool doFBBT, bool doConvCuts)

    Constructor.
- CouenneBranchingObject (const CouenneBranchingObject &src)

    Copy constructor.
- virtual OsiBranchingObject ∗ clone () const

    cloning method
- virtual double branch (OsiSolverInterface ∗solver=NULL)

    Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.
- virtual bool boundBranch () const

    does this branching object only change variable bounds?
- void setSimulate (bool s)

    set simulate_ field below
- expression ∗ variable ()

    return branching variable
- void branchCore (OsiSolverInterface ∗, int, int, bool, double, t_chg_bounds ∗&)

    Perform branching step.

Static Public Attributes

- static int nOrbBr
- static int maxDepthOrbBranch
- static int nSGcomputations

Protected Attributes

- CouenneCutGenerator ∗ cutGen_

    Pointer to CouenneCutGenerator (if any); if not NULL, allows to do extra cut generation during branching.
- CouenneProblem ∗ problem_

Pointer to CouenneProblem (necessary to allow FBBT)
- expression ∗ variable_

  The index of the variable this branching object refers to.
- JnlstPtr jnlst_

  SmartPointer to the Journalist.
- bool doFBBT_

  shall we do Feasibility based Bound Tightening (FBBT) at branching?
- bool doConvCuts_

  shall we add convexification cuts at branching?
- double downEstimate_

  down branch estimate (done at selectBranch with reduced costs)
- double upEstimate_

  up branch estimate
- bool simulate_

  are we currently in strong branching?

7.11.1 Detailed Description

"Spatial" branching object.

Branching can also be performed on continuous variables.

Definition at line 37 of file CouenneBranchingObject.hpp.

7.11.2 Constructor & Destructor Documentation

7.11.2.1 Couenne::CouenneBranchingObject::CouenneBranchingObject (OsiSolverInterface ∗ *solver,* const OsiObject ∗ *originalObject,* JnlstPtr *jnlst,* CouenneCutGenerator ∗ *c,* CouenneProblem ∗ *p,* expression ∗ *var,* int *way,* CouNumber *brpoint,* bool *doFBBT,* bool *doConvCuts*)

Constructor.

7.11.2.2 Couenne::CouenneBranchingObject::CouenneBranchingObject (const CouenneBranchingObject & *src*) [inline]

Copy constructor.

Definition at line 54 of file CouenneBranchingObject.hpp.

7.11.3 Member Function Documentation

7.11.3.1 virtual OsiBranchingObject∗ Couenne::CouenneBranchingObject::clone ( ) const [inline], [virtual]

cloning method

Reimplemented in Couenne::CouenneOrbitBranchingObj, and Couenne::CouenneComplBranchingObject.

Definition at line 68 of file CouenneBranchingObject.hpp.

7.11.3.2 virtual double Couenne::CouenneBranchingObject::branch (OsiSolverInterface * *solver* = NULL) [virtual]

Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Returns change in guessed objective on next branch

Reimplemented in Couenne::CouenneOrbitBranchingObj, and Couenne::CouenneComplBranchingObject.

7.11.3.3 virtual bool Couenne::CouenneBranchingObject::boundBranch ( ) const [inline], [virtual]

does this branching object only change variable bounds?

Reimplemented in Couenne::CouenneOrbitBranchingObj.

Definition at line 79 of file CouenneBranchingObject.hpp.

7.11.3.4 void Couenne::CouenneBranchingObject::setSimulate (bool *s*) [inline]

set simulate_ field below

Reimplemented in Couenne::CouenneOrbitBranchingObj.

Definition at line 83 of file CouenneBranchingObject.hpp.

7.11.3.5 expression* Couenne::CouenneBranchingObject::variable ( ) [inline]

return branching variable

Definition at line 87 of file CouenneBranchingObject.hpp.

7.11.3.6 void Couenne::CouenneBranchingObject::branchCore (OsiSolverInterface *, int , int , bool , double , t_chg_bounds *&)

Perform branching step.

7.11.4 Member Data Documentation

7.11.4.1 int Couenne::CouenneBranchingObject::nOrbBr [static]

Definition at line 94 of file CouenneBranchingObject.hpp.

7.11.4.2 int Couenne::CouenneBranchingObject::maxDepthOrbBranch [static]

Definition at line 95 of file CouenneBranchingObject.hpp.

7.11.4.3 int Couenne::CouenneBranchingObject::nSGcomputations [static]

Definition at line 96 of file CouenneBranchingObject.hpp.

7.11.4.4 CouenneCutGenerator* Couenne::CouenneBranchingObject::cutGen_ [protected]

Pointer to CouenneCutGenerator (if any); if not NULL, allows to do extra cut generation during branching.

Definition at line 102 of file CouenneBranchingObject.hpp.

7.11.4.5 CouenneProblem* Couenne::CouenneBranchingObject::problem_ [protected]

Pointer to CouenneProblem (necessary to allow FBBT)

Definition at line 105 of file CouenneBranchingObject.hpp.

7.11.4.6 expression* Couenne::CouenneBranchingObject::variable_ [protected]

The index of the variable this branching object refers to.

If the corresponding CouenneObject was created on w=f(x,y), it is either x or y, chosen previously with a call to getFixVar() expression *reference_;

Definition at line 111 of file CouenneBranchingObject.hpp.

7.11.4.7 JnlstPtr Couenne::CouenneBranchingObject::jnlst_ [protected]

SmartPointer to the Journalist.

Definition at line 114 of file CouenneBranchingObject.hpp.

7.11.4.8 bool Couenne::CouenneBranchingObject::doFBBT_ [protected]

shall we do Feasibility based Bound Tightening (FBBT) at branching?

Definition at line 117 of file CouenneBranchingObject.hpp.

7.11.4.9 bool Couenne::CouenneBranchingObject::doConvCuts_ [protected]

shall we add convexification cuts at branching?

Definition at line 120 of file CouenneBranchingObject.hpp.

7.11.4.10 double Couenne::CouenneBranchingObject::downEstimate_ [protected]

down branch estimate (done at selectBranch with reduced costs)

Definition at line 123 of file CouenneBranchingObject.hpp.

7.11.4.11 double Couenne::CouenneBranchingObject::upEstimate_ [protected]

up branch estimate

Definition at line 126 of file CouenneBranchingObject.hpp.

7.11.4.12 bool Couenne::CouenneBranchingObject::simulate_ [protected]

are we currently in strong branching?

Definition at line 129 of file CouenneBranchingObject.hpp.

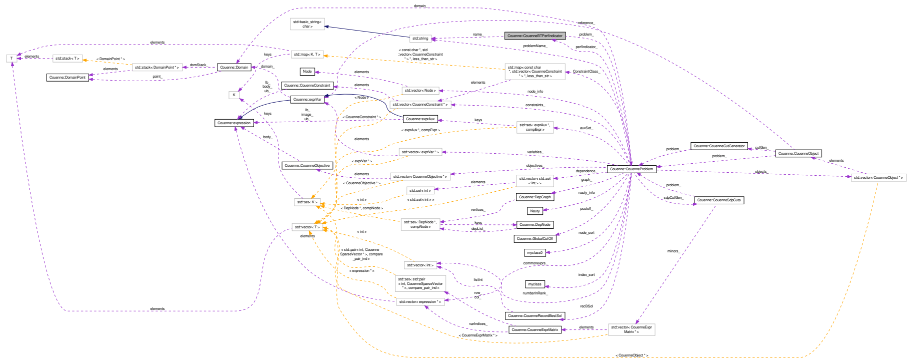
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/branch/CouenneBranchingObject.hpp

7.12 Couenne::CouenneBTPerfIndicator Class Reference

```
#include <CouenneBTPerfIndicator.hpp>
```

Collaboration diagram for Couenne::CouenneBTPerfIndicator:



Public Member Functions

- CouenneBTPerfIndicator (CouenneProblem ∗p, const std::string &name)

    Should stats be printed at the end? Copied from problem_ -> JnIst () -> ProduceOutput (ERROR, BOUNDTIGHTENING)
- ∼CouenneBTPerfIndicator ()
- CouenneBTPerfIndicator (const CouenneBTPerfIndicator &rhs)
- CouenneBTPerfIndicator & operator= (const CouenneBTPerfIndicator &rhs)
- void setOldBounds (const CouNumber ∗lb, const CouNumber ∗ub) const
- void addToTimer (double time) const

    add to timer
- void update (const CouNumber ∗lb, const CouNumber ∗ub, int depth) const

Protected Attributes

- std::string name_
- double nFixed_

    Whose performance is this?
- double boundRatio_

    number of fixed variables
- double shrunkInf_

    average bound width shrinkage
- double shrunkDoubleInf_

    average # bounds that went from infinite to finite (counts twice if [-inf,inf] to [a,b]
- double nProvedInfeas_

    average # bounds that went from doubly infinite to infinite
- double weightSum_

    average # proofs of infeasibility
- double ∗ oldLB_

    total weight (used to give an average indicator at the end of Couenne)
- double ∗ oldUB_

    old lower bounds (initial, i.e. before BT)
- double totalTime_

    old upper bounds

- int nRuns_

  CPU time spent on this.
- CouenneProblem ∗ problem_

  number of runs
- bool stats_

  Couenne problem info.

7.12.1 Detailed Description

Definition at line 23 of file CouenneBTPerfIndicator.hpp.

7.12.2 Constructor & Destructor Documentation

7.12.2.1 Couenne::CouenneBTPerfIndicator::CouenneBTPerfIndicator (CouenneProblem ∗ *p*, const std::string & *name*)

Should stats be printed at the end? Copied from problem_ -> Jnlst () -> ProduceOutput (ERROR, BOUNDTIGHTENI-NG)

7.12.2.2 Couenne::CouenneBTPerfIndicator::∼CouenneBTPerfIndicator ( )

7.12.2.3 Couenne::CouenneBTPerfIndicator::CouenneBTPerfIndicator (const CouenneBTPerfIndicator & *rhs*)

7.12.3 Member Function Documentation

7.12.3.1 CouenneBTPerfIndicator& Couenne::CouenneBTPerfIndicator::operator= (const CouenneBTPerfIndicator & *rhs*)

7.12.3.2 void Couenne::CouenneBTPerfIndicator::setOldBounds (const CouNumber ∗ *lb*, const CouNumber ∗ *ub*) const

7.12.3.3 void Couenne::CouenneBTPerfIndicator::addToTimer (double *time*) const

add to timer

7.12.3.4 void Couenne::CouenneBTPerfIndicator::update (const CouNumber ∗ *lb*, const CouNumber ∗ *ub*, int *depth*) const

7.12.4 Member Data Documentation

7.12.4.1 std::string Couenne::CouenneBTPerfIndicator::name_ [protected]

Definition at line 27 of file CouenneBTPerfIndicator.hpp.

7.12.4.2 double Couenne::CouenneBTPerfIndicator::nFixed_ [mutable], [protected]

Whose performance is this?

Definition at line 29 of file CouenneBTPerfIndicator.hpp.

7.12.4.3 double Couenne::CouenneBTPerfIndicator::boundRatio_ [mutable], [protected]

number of fixed variables

Definition at line 30 of file CouenneBTPerfIndicator.hpp.

7.12.4.4 double Couenne::CouenneBTPerfIndicator::shrunkInf_ [mutable], [protected]

average bound width shrinkage

Definition at line 31 of file CouenneBTPerfIndicator.hpp.

7.12.4.5 double Couenne::CouenneBTPerfIndicator::shrunkDoubleInf_ [mutable], [protected]

average # bounds that went from infinite to finite (counts twice if [-inf,inf] to [a,b]

Definition at line 32 of file CouenneBTPerfIndicator.hpp.

7.12.4.6 double Couenne::CouenneBTPerfIndicator::nProvedInfeas_ [mutable], [protected]

average # bounds that went from doubly infinite to infinite

Definition at line 33 of file CouenneBTPerfIndicator.hpp.

7.12.4.7 double Couenne::CouenneBTPerfIndicator::weightSum_ [mutable], [protected]

average # proofs of infeasibility

Definition at line 35 of file CouenneBTPerfIndicator.hpp.

7.12.4.8 double* Couenne::CouenneBTPerfIndicator::oldLB_ [mutable], [protected]

total weight (used to give an average indicator at the end of Couenne)

Definition at line 37 of file CouenneBTPerfIndicator.hpp.

7.12.4.9 double* Couenne::CouenneBTPerfIndicator::oldUB_ [mutable], [protected]

old lower bounds (initial, i.e. before BT)

Definition at line 38 of file CouenneBTPerfIndicator.hpp.

7.12.4.10 double Couenne::CouenneBTPerfIndicator::totalTime_ [mutable], [protected]

old upper bounds

Definition at line 40 of file CouenneBTPerfIndicator.hpp.

7.12.4.11 int Couenne::CouenneBTPerfIndicator::nRuns_ [mutable], [protected]

CPU time spent on this.

Definition at line 42 of file CouenneBTPerfIndicator.hpp.

7.12.4.12 CouenneProblem* Couenne::CouenneBTPerfIndicator::problem_ [protected]

number of runs

Definition at line 44 of file CouenneBTPerfIndicator.hpp.

7.12.4.13 bool Couenne::CouenneBTPerfIndicator::stats_ [protected]

Couenne problem info.

Definition at line 46 of file CouenneBTPerfIndicator.hpp.

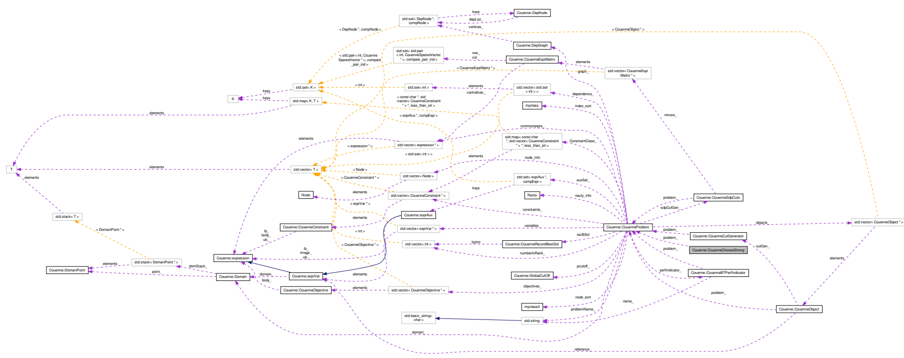
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneBTPerfIndicator.hpp

7.13 Couenne::CouenneChooseStrong Class Reference

```
#include <CouenneChooseStrong.hpp>
```

Collaboration diagram for Couenne::CouenneChooseStrong:



Public Member Functions

- CouenneChooseStrong (Bonmin::BabSetupBase &b, CouenneProblem ∗problem, JnlstPtr jnlst)

    Constructor from solver (so we can set up arrays etc)
- CouenneChooseStrong (const CouenneChooseStrong &)

    Copy constructor.
- CouenneChooseStrong & operator= (const CouenneChooseStrong &rhs)

    Assignment operator.
- virtual OsiChooseVariable ∗ clone () const

    Clone.
- virtual ∼CouenneChooseStrong ()

    Destructor.
- virtual int setupList (OsiBranchingInformation ∗info, bool initialize)

    Sets up strong list and clears all if initialize is true.
- int gutsOfSetupList (OsiBranchingInformation ∗info, bool initialize)
- virtual int doStrongBranching (OsiSolverInterface ∗OsiSolver, OsiBranchingInformation ∗info, int numberToDo, int returnCriterion)

    This is a utility function which does strong branching on a list of objects and stores the results in OsiHotInfo.objects.
- virtual bool feasibleSolution (const OsiBranchingInformation ∗info, const double ∗solution, int numberObjects, const OsiObject ∗∗objects)

    Returns true if solution looks feasible against given objects.
- virtual int chooseVariable (OsiSolverInterface ∗solver, OsiBranchingInformation ∗info, bool fixVariables)

    choose object to branch based on earlier setup

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

    Add list of options to be read from file.

Protected Member Functions

- int simulateBranch (OsiObject ∗Object, OsiBranchingInformation ∗info, OsiBranchingObject ∗branch, OsiSolverInterface ∗solver, Bonmin::HotInfo ∗result, int direction)

  does one side of the branching

Protected Attributes

- CouenneProblem ∗ problem_

  Pointer to the associated MINLP problem.
- bool pseudoUpdateLP_

  should we update the pseudocost multiplier with the distance between the LP point and the solution of the resulting branches' LPs? If so, this only happens in strong branching
- bool estimateProduct_

  Normally, a convex combination of the min/max lower bounds' estimates is taken to select a branching variable, as in the original definition of strong branching.
- JnlstPtr jnlst_

  pointer to journalist for detailed information
- double branchtime_

  total time spent in strong branching

7.13.1 Detailed Description

Definition at line 23 of file CouenneChooseStrong.hpp.

7.13.2 Constructor & Destructor Documentation

7.13.2.1 Couenne::CouenneChooseStrong::CouenneChooseStrong (Bonmin::BabSetupBase & *b*, CouenneProblem ∗ *problem*, JnlstPtr *jnlst*)

Constructor from solver (so we can set up arrays etc)

7.13.2.2 Couenne::CouenneChooseStrong::CouenneChooseStrong (const CouenneChooseStrong &)

Copy constructor.

7.13.2.3 virtual Couenne::CouenneChooseStrong::∼CouenneChooseStrong ( ) [virtual]

Destructor.

7.13.3 Member Function Documentation

7.13.3.1 CouenneChooseStrong& Couenne::CouenneChooseStrong::operator= (const CouenneChooseStrong & *rhs*)

Assignment operator.

7.13.3.2 virtual OsiChooseVariable∗ Couenne::CouenneChooseStrong::clone ( ) const [virtual]

Clone.

7.13.3.3 virtual int Couenne::CouenneChooseStrong::setupList (OsiBranchingInformation * *info*, bool *initialize*) [virtual]

Sets up strong list and clears all if initialize is true.

Returns number of infeasibilities.

7.13.3.4 int Couenne::CouenneChooseStrong::gutsOfSetupList (OsiBranchingInformation * *info*, bool *initialize*)

7.13.3.5 virtual int Couenne::CouenneChooseStrong::doStrongBranching (OsiSolverInterface * *OsiSolver*, OsiBranchingInformation * *info*, int *numberToDo*, int *returnCriterion*) [virtual]

This is a utility function which does strong branching on a list of objects and stores the results in OsiHotInfo.objects.

On entry the object sequence is stored in the OsiHotInfo object and maybe more. It returns - -1 - one branch was infeasible both ways 0 - all inspected - nothing can be fixed 1 - all inspected - some can be fixed (returnCriterion==0) 2 - may be returning early - one can be fixed (last one done) (returnCriterion==1) 3 - returning because max time

7.13.3.6 virtual bool Couenne::CouenneChooseStrong::feasibleSolution (const OsiBranchingInformation * *info*, const double * *solution*, int *numberObjects*, const OsiObject ** *objects*) [virtual]

Returns true if solution looks feasible against given objects.

7.13.3.7 virtual int Couenne::CouenneChooseStrong::chooseVariable (OsiSolverInterface * *solver*, OsiBranchingInformation * *info*, bool *fixVariables*) [virtual]

choose object to branch based on earlier setup

7.13.3.8 static void Couenne::CouenneChooseStrong::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.13.3.9 int Couenne::CouenneChooseStrong::simulateBranch (OsiObject * *Object*, OsiBranchingInformation * *info*, OsiBranchingObject * *branch*, OsiSolverInterface * *solver*, Bonmin::HotInfo * *result*, int *direction*) [protected]

does one side of the branching

7.13.4 Member Data Documentation

7.13.4.1 CouenneProblem* Couenne::CouenneChooseStrong::problem_ [protected]

Pointer to the associated MINLP problem.

Definition at line 119 of file CouenneChooseStrong.hpp.

7.13.4.2 bool Couenne::CouenneChooseStrong::pseudoUpdateLP_ [protected]

should we update the pseudocost multiplier with the distance between the LP point and the solution of the resulting branches' LPs? If so, this only happens in strong branching

Definition at line 124 of file CouenneChooseStrong.hpp.

7.13.4.3 bool Couenne::CouenneChooseStrong::estimateProduct_ [protected]

Normally, a convex combination of the min/max lower bounds' estimates is taken to select a branching variable, as in the original definition of strong branching.

If this option is set to true, their product is taken instead:

(1e-6+min) ∗ max

where the 1e-6 is used to ensure that even those with one subproblem with no improvement are compared.

Definition at line 135 of file CouenneChooseStrong.hpp.

7.13.4.4 JnlstPtr Couenne::CouenneChooseStrong::jnlst_ [protected]

pointer to journalist for detailed information

Definition at line 138 of file CouenneChooseStrong.hpp.

7.13.4.5 double Couenne::CouenneChooseStrong::branchtime_ [protected]

total time spent in strong branching

Definition at line 141 of file CouenneChooseStrong.hpp.

The documentation for this class was generated from the following file:

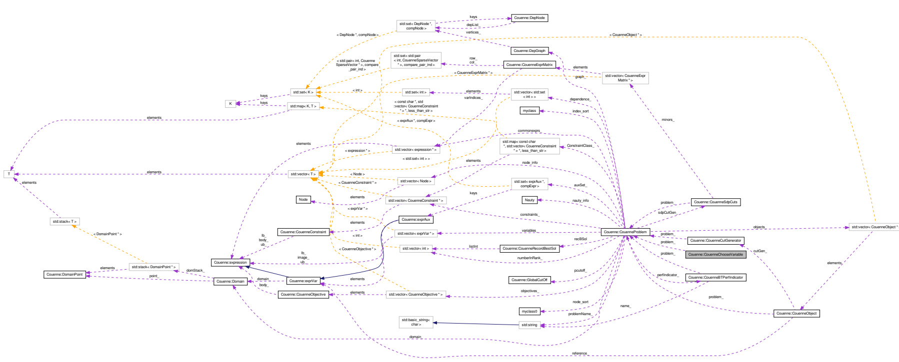
- /home/ted/COIN/trunk/Couenne/src/branch/CouenneChooseStrong.hpp

7.14 Couenne::CouenneChooseVariable Class Reference

Choose a variable for branching.

`#include <CouenneChooseVariable.hpp>`

Collaboration diagram for Couenne::CouenneChooseVariable:



Public Member Functions

- CouenneChooseVariable ()

  Default Constructor.
- CouenneChooseVariable (const OsiSolverInterface ∗, CouenneProblem ∗, JnlstPtr jnlst)

  Constructor from solver (so we can set up arrays etc)
- CouenneChooseVariable (const CouenneChooseVariable &)

  Copy constructor.
- CouenneChooseVariable & operator= (const CouenneChooseVariable &)

  Assignment operator.
- virtual OsiChooseVariable ∗ clone () const

  Clone.

- virtual ∼CouenneChooseVariable ()

  Destructor.
- virtual int setupList (OsiBranchingInformation ∗, bool)

  Sets up strong list and clears all if initialize is true.
- virtual bool feasibleSolution (const OsiBranchingInformation ∗info, const double ∗solution, int numberObjects, const OsiObject ∗∗objects)

  Returns true if solution looks feasible against given objects.

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

  Add list of options to be read from file.

Protected Attributes

- CouenneProblem ∗ problem_

  Pointer to the associated MINLP problem.
- JnlstPtr jnlst_

  journalist for detailed debug information

7.14.1 Detailed Description

Choose a variable for branching.

Definition at line 27 of file CouenneChooseVariable.hpp.

7.14.2 Constructor & Destructor Documentation

7.14.2.1 Couenne::CouenneChooseVariable::CouenneChooseVariable ( )

Default Constructor.

7.14.2.2 Couenne::CouenneChooseVariable::CouenneChooseVariable (const OsiSolverInterface ∗ , CouenneProblem ∗ , JnlstPtr *jnlst*)

Constructor from solver (so we can set up arrays etc)

7.14.2.3 Couenne::CouenneChooseVariable::CouenneChooseVariable (const CouenneChooseVariable &)

Copy constructor.

7.14.2.4 virtual Couenne::CouenneChooseVariable::∼CouenneChooseVariable ( ) [inline], [virtual]

Destructor.

Definition at line 48 of file CouenneChooseVariable.hpp.

7.14.3 Member Function Documentation

7.14.3.1 CouenneChooseVariable& Couenne::CouenneChooseVariable::operator= (const CouenneChooseVariable &)

Assignment operator.

7.14.3.2 virtual OsiChooseVariable* Couenne::CouenneChooseVariable::clone ( ) const [inline], [virtual]

Clone.

Definition at line 44 of file CouenneChooseVariable.hpp.

7.14.3.3 virtual int Couenne::CouenneChooseVariable::setupList (OsiBranchingInformation * , bool) [virtual]

Sets up strong list and clears all if initialize is true.

Returns number of infeasibilities. If returns -1 then has worked out node is infeasible!

7.14.3.4 virtual bool Couenne::CouenneChooseVariable::feasibleSolution (const OsiBranchingInformation * *info*, const double * *solution*, int *numberObjects*, const OsiObject ** *objects*) [virtual]

Returns true if solution looks feasible against given objects.

7.14.3.5 static void Couenne::CouenneChooseVariable::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.14.4 Member Data Documentation

7.14.4.1 CouenneProblem* Couenne::CouenneChooseVariable::problem_ [protected]

Pointer to the associated MINLP problem.

Definition at line 72 of file CouenneChooseVariable.hpp.

7.14.4.2 JnlstPtr Couenne::CouenneChooseVariable::jnlst_ [protected]

journalist for detailed debug information

Definition at line 75 of file CouenneChooseVariable.hpp.

The documentation for this class was generated from the following file:

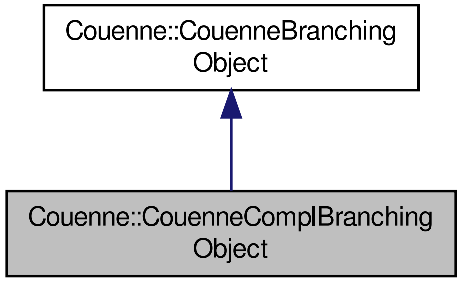
- /home/ted/COIN/trunk/Couenne/src/branch/CouenneChooseVariable.hpp

7.15 Couenne::CouenneComplBranchingObject Class Reference

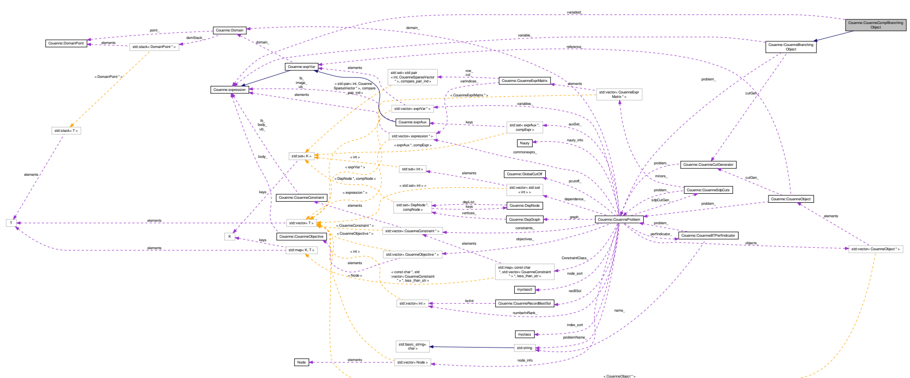
"Spatial" branching object for complementarity constraints.

`#include <CouenneComplBranchingObject.hpp>`

Inheritance diagram for Couenne::CouenneComplBranchingObject:



Collaboration diagram for Couenne::CouenneComplBranchingObject:



Public Member Functions

- CouenneComplBranchingObject (OsiSolverInterface ∗solver, const OsiObject ∗originalObject, JnlstPtr jnlst, CouenneCutGenerator ∗c, CouenneProblem ∗p, expression ∗var, expression ∗var2, int way, CouNumber brpoint, bool doFBBT, bool doConvCuts, int sign)

    Constructor.
- CouenneComplBranchingObject (const CouenneComplBranchingObject &src)

    Copy constructor.
- virtual OsiBranchingObject ∗ clone () const

    cloning method
- virtual double branch (OsiSolverInterface ∗solver=NULL)

    Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Protected Attributes

- expression * variable2_

    use CouenneBranchingObject::variable_ as the first variable to set to 0, and this one as the second
- int sign_

    *-1 if object is for xi * xj <= 0 +1 if object is for xi * xj <= 0 0 if object is for xi * xj = 0 (classical)*

Additional Inherited Members

7.15.1 Detailed Description

"Spatial" branching object for complementarity constraints.

Branching on such an object x_1 x_2 = 0 is performed by setting either x_1=0 or x_2=0

Definition at line 24 of file CouenneComplBranchingObject.hpp.

7.15.2 Constructor & Destructor Documentation

7.15.2.1 Couenne::CouenneComplBranchingObject::CouenneComplBranchingObject (OsiSolverInterface * *solver,* const OsiObject * *originalObject,* JnlstPtr *jnlst,* CouenneCutGenerator * *c,* CouenneProblem * *p,* expression * *var,* expression * *var2,* int *way,* CouNumber *brpoint,* bool *doFBBT,* bool *doConvCuts,* int *sign*)

Constructor.

7.15.2.2 Couenne::CouenneComplBranchingObject::CouenneComplBranchingObject (const CouenneComplBranchingObject & *src*) [inline]

Copy constructor.

Definition at line 43 of file CouenneComplBranchingObject.hpp.

7.15.3 Member Function Documentation

7.15.3.1 virtual OsiBranchingObject* Couenne::CouenneComplBranchingObject::clone ( ) const [inline], [virtual]

cloning method

Reimplemented from Couenne::CouenneBranchingObject.

Definition at line 49 of file CouenneComplBranchingObject.hpp.

7.15.3.2 virtual double Couenne::CouenneComplBranchingObject::branch (OsiSolverInterface * *solver* = NULL) [virtual]

Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Returns change in guessed objective on next branch

Reimplemented from Couenne::CouenneBranchingObject.

7.15.4 Member Data Documentation

7.15.4.1 expression* Couenne::CouenneComplBranchingObject::variable2_ [protected]

use CouenneBranchingObject::variable_ as the first variable to set to 0, and this one as the second

Definition at line 63 of file CouenneComplBranchingObject.hpp.

7.15.4.2 int Couenne::CouenneComplBranchingObject::sign_ [protected]

-1 if object is for xi $*$ xj <= 0 +1 if object is for xi $*$ xj <= 0 0 if object is for xi $*$ xj = 0 (classical)

Definition at line 68 of file CouenneComplBranchingObject.hpp.

The documentation for this class was generated from the following file:

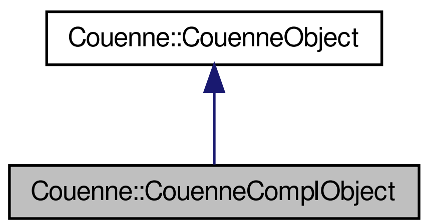
- /home/ted/COIN/trunk/Couenne/src/branch/CouenneComplBranchingObject.hpp

7.16 Couenne::CouenneComplObject Class Reference

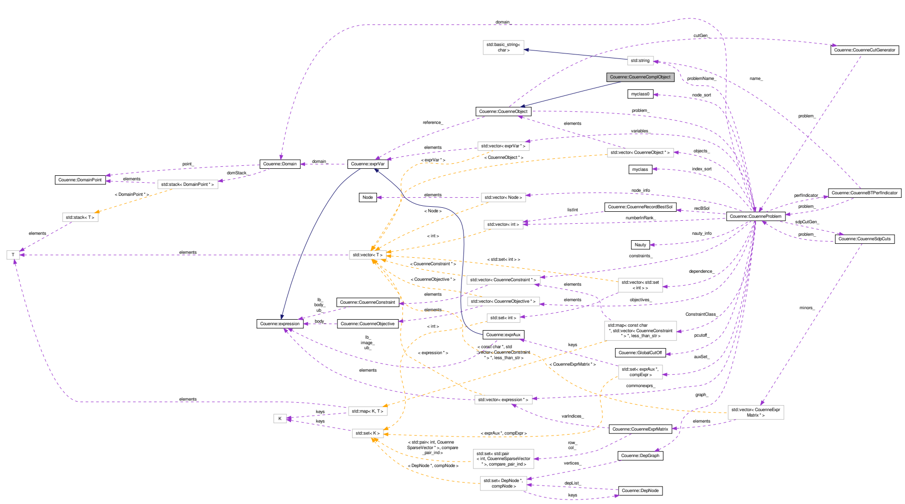
OsiObject for complementarity constraints $x_1 x_2 \geq, \leq, = 0$.

`#include <CouenneComplObject.hpp>`

Inheritance diagram for Couenne::CouenneComplObject:



Collaboration diagram for Couenne::CouenneComplObject:



Public Member Functions

- CouenneComplObject (CouenneCutGenerator ∗c, CouenneProblem ∗p, exprVar ∗ref, Bonmin::BabSetupBase ∗base, JnlstPtr jnlst, int sign)

  Constructor with information for branching point selection strategy.
- CouenneComplObject (exprVar ∗ref, Bonmin::BabSetupBase ∗base, JnlstPtr jnlst, int sign)

  Constructor with lesser information, used for infeasibility only.
- ∼CouenneComplObject ()

  Destructor.
- CouenneComplObject (const CouenneComplObject &src)

  Copy constructor.
- virtual CouenneObject ∗ clone () const

  Cloning method.
- virtual double infeasibility (const OsiBranchingInformation ∗info, int &way) const

  compute infeasibility of this variable, |w - f(x)| (where w is the auxiliary variable defined as w = f(x)
- virtual double checkInfeasibility (const OsiBranchingInformation ∗info) const

  compute infeasibility of this variable, |w - f(x)|, where w is the auxiliary variable defined as w = f(x)
- virtual OsiBranchingObject ∗ createBranch (OsiSolverInterface ∗, const OsiBranchingInformation ∗, int way) const

  create CouenneBranchingObject or CouenneThreeWayBranchObj based on this object

Additional Inherited Members

7.16.1 Detailed Description

OsiObject for complementarity constraints $x_1 x_2 \geq, \leq, = 0$.

Associated with two variables x_1 and x_2, branches with either $x_1 = 0$ or $x_2 = 0$

Definition at line 22 of file CouenneComplObject.hpp.

7.16.2 Constructor & Destructor Documentation

7.16.2.1 Couenne::CouenneComplObject::CouenneComplObject (CouenneCutGenerator ∗ *c*, CouenneProblem ∗ *p*, exprVar ∗ *ref*, Bonmin::BabSetupBase ∗ *base*, JnlstPtr *jnlst*, int *sign*)

Constructor with information for branching point selection strategy.

7.16.2.2 Couenne::CouenneComplObject::CouenneComplObject (exprVar ∗ *ref*, Bonmin::BabSetupBase ∗ *base*, JnlstPtr *jnlst*, int *sign*)

Constructor with lesser information, used for infeasibility only.

7.16.2.3 Couenne::CouenneComplObject::∼CouenneComplObject ( ) [inline]

Destructor.

Definition at line 37 of file CouenneComplObject.hpp.

7.16.2.4 Couenne::CouenneComplObject::CouenneComplObject (const CouenneComplObject & *src*)

Copy constructor.

7.16.3 Member Function Documentation

7.16.3.1 virtual CouenneObject∗ Couenne::CouenneComplObject::clone ( ) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::CouenneObject.

Definition at line 43 of file CouenneComplObject.hpp.

7.16.3.2 virtual double Couenne::CouenneComplObject::infeasibility (const OsiBranchingInformation ∗ *info*, int & *way*) const [virtual]

compute infeasibility of this variable, |w - f(x)| (where w is the auxiliary variable defined as w = f(x)

Reimplemented from Couenne::CouenneObject.

7.16.3.3 virtual double Couenne::CouenneComplObject::checkInfeasibility (const OsiBranchingInformation ∗ *info*) const [virtual]

compute infeasibility of this variable, |w - f(x)|, where w is the auxiliary variable defined as w = f(x)

Reimplemented from Couenne::CouenneObject.

7.16.3.4 virtual OsiBranchingObject∗ Couenne::CouenneComplObject::createBranch (OsiSolverInterface ∗ , const OsiBranchingInformation ∗ , int *way*) const [virtual]

create CouenneBranchingObject or CouenneThreeWayBranchObj based on this object

Reimplemented from Couenne::CouenneObject.

The documentation for this class was generated from the following file:

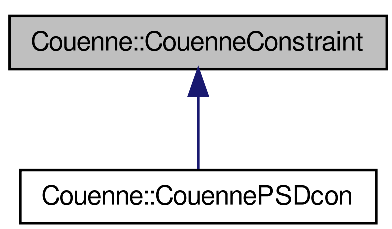
- /home/ted/COIN/trunk/Couenne/src/branch/CouenneComplObject.hpp

7.17 Couenne::CouenneConstraint Class Reference

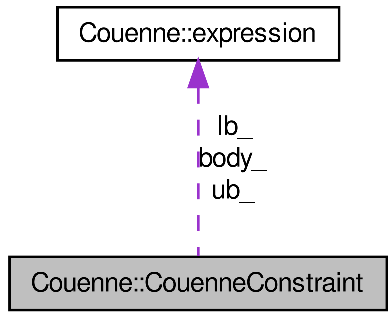
Class to represent nonlinear constraints.

`#include <CouenneProblemElem.hpp>`

Inheritance diagram for Couenne::CouenneConstraint:



Collaboration diagram for Couenne::CouenneConstraint:



Public Member Functions

- CouenneConstraint (expression ∗body=NULL, expression ∗lb=NULL, expression ∗ub=NULL)

    Constructor.
- virtual ∼CouenneConstraint ()

    Destructor.
- CouenneConstraint (const CouenneConstraint &c, Domain ∗d=NULL)

    Copy constructor.
- virtual CouenneConstraint ∗ clone (Domain ∗d=NULL) const

    Cloning method.
- virtual expression ∗ Lb () const

    Expression of lower bound.
- virtual expression ∗ Ub () const

    Expression of upper bound.
- virtual expression ∗ Body () const

    Expression of body of constraint.
- virtual expression ∗ Body (expression ∗newBody)

    Set body of constraint.
- virtual exprAux ∗ standardize (CouenneProblem ∗)

    decompose body of constraint through auxiliary variables
- virtual void print (std::ostream &=std::cout)

    print constraint

Protected Attributes

- expression ∗ body_

    Body of constraint.
- expression ∗ lb_

    Lower bound (expression)

- expression * ub_

  Upper bound (expression)

7.17.1 Detailed Description

Class to represent nonlinear constraints.

It consists of an expression as the body and two range expressions as lower- and upper bounds.

A general constraint is defined as lb_ <= body_ <= ub_, where all three components are expressions, depending on variables, auxiliaries and bounds. If the constraint is 2 <= exp (x1+x2) <= 4, then:

body_ = exp (x1+x2), that is,

new exprExp (new exprSum (new exprVar (1), new exprVar (2))

while lb_ = new exprConst (2.) and ub_ = new exprConst (4.).

Definition at line 39 of file CouenneProblemElem.hpp.

7.17.2 Constructor & Destructor Documentation

7.17.2.1 Couenne::CouenneConstraint::CouenneConstraint (expression * *body* = NULL, expression * *lb* = NULL, expression * *ub* = NULL) [inline]

Constructor.

Definition at line 50 of file CouenneProblemElem.hpp.

7.17.2.2 virtual Couenne::CouenneConstraint::~CouenneConstraint ( ) [inline], [virtual]

Destructor.

Definition at line 67 of file CouenneProblemElem.hpp.

7.17.2.3 Couenne::CouenneConstraint::CouenneConstraint (const CouenneConstraint & *c*, Domain * *d* = NULL) [inline]

Copy constructor.

Definition at line 74 of file CouenneProblemElem.hpp.

7.17.3 Member Function Documentation

7.17.3.1 virtual CouenneConstraint* Couenne::CouenneConstraint::clone (Domain * *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented in Couenne::CouennePSDcon.

Definition at line 80 of file CouenneProblemElem.hpp.

7.17.3.2 virtual expression* Couenne::CouenneConstraint::Lb ( ) const [inline], [virtual]

Expression of lower bound.

Definition at line 84 of file CouenneProblemElem.hpp.

7.17.3.3 virtual expression* Couenne::CouenneConstraint::Ub ( ) const [inline], [virtual]

Expression of upper bound.

Definition at line 85 of file CouenneProblemElem.hpp.

7.17.3.4 virtual expression* Couenne::CouenneConstraint::Body ( ) const [inline], [virtual]

Expression of body of constraint.

Definition at line 86 of file CouenneProblemElem.hpp.

7.17.3.5 virtual expression* Couenne::CouenneConstraint::Body (expression * *newBody*) [inline], [virtual]

Set body of constraint.

Definition at line 89 of file CouenneProblemElem.hpp.

7.17.3.6 virtual exprAux* Couenne::CouenneConstraint::standardize (CouenneProblem *) [virtual]

decompose body of constraint through auxiliary variables

Reimplemented in Couenne::CouennePSDcon.

7.17.3.7 virtual void Couenne::CouenneConstraint::print (std::ostream & = std::cout) [virtual]

print constraint

Reimplemented in Couenne::CouennePSDcon.

7.17.4 Member Data Documentation

7.17.4.1 expression* Couenne::CouenneConstraint::body_ [protected]

Body of constraint.

Definition at line 43 of file CouenneProblemElem.hpp.

7.17.4.2 expression* Couenne::CouenneConstraint::lb_ [protected]

Lower bound (expression)

Definition at line 44 of file CouenneProblemElem.hpp.

7.17.4.3 expression* Couenne::CouenneConstraint::ub_ [protected]

Upper bound (expression)

Definition at line 45 of file CouenneProblemElem.hpp.

The documentation for this class was generated from the following file:

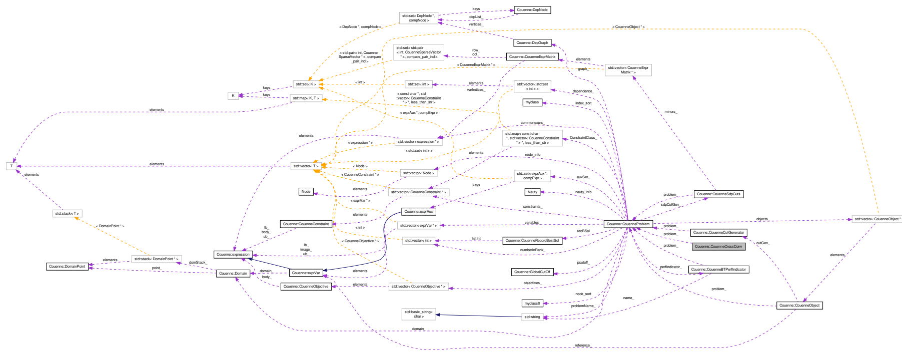
- /home/ted/COIN/trunk/Couenne/src/problem/CouenneProblemElem.hpp

7.18 Couenne::CouenneCrossConv Class Reference

Cut Generator that uses relationships between auxiliaries.

`#include <CouenneCrossConv.hpp>`

Collaboration diagram for Couenne::CouenneCrossConv:



Public Member Functions

- CouenneCrossConv (CouenneProblem ∗, JnlstPtr, const Ipopt::SmartPtr< Ipopt::OptionsList >)

  constructor
- CouenneCrossConv (const CouenneCrossConv &)

  copy constructor
- virtual ∼CouenneCrossConv ()

  destructor
- virtual CouenneCrossConv ∗ clone () const

  clone method (necessary for the abstract CglCutGenerator class)
- virtual void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

  the main CglCutGenerator
- virtual void setup ()

  Set up data structure to detect redundancies.

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

  Add list of options to be read from file.

Protected Attributes

- JnlstPtr jnlst_

  Journalist.
- CouenneProblem ∗ problem_

  pointer to the CouenneProblem representation

7.18.1 Detailed Description

Cut Generator that uses relationships between auxiliaries.

Definition at line 139 of file CouenneCrossConv.hpp.

7.18.2 Constructor & Destructor Documentation

7.18.2.1 Couenne::CouenneCrossConv::CouenneCrossConv (CouenneProblem *, JnlstPtr, const Ipopt::SmartPtr< Ipopt::OptionsList >)

constructor

7.18.2.2 Couenne::CouenneCrossConv::CouenneCrossConv (const CouenneCrossConv &)

copy constructor

7.18.2.3 virtual Couenne::CouenneCrossConv::∼CouenneCrossConv ( ) [virtual]

destructor

7.18.3 Member Function Documentation

7.18.3.1 virtual CouenneCrossConv* Couenne::CouenneCrossConv::clone ( ) const [inline], [virtual]

clone method (necessary for the abstract CglCutGenerator class)

Definition at line 155 of file CouenneCrossConv.hpp.

7.18.3.2 virtual void Couenne::CouenneCrossConv::generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo = CglTreeInfo()) const [virtual]

the main CglCutGenerator

7.18.3.3 static void Couenne::CouenneCrossConv::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.18.3.4 virtual void Couenne::CouenneCrossConv::setup ( ) [virtual]

Set up data structure to detect redundancies.

7.18.4 Member Data Documentation

7.18.4.1 JnlstPtr Couenne::CouenneCrossConv::jnlst_ [protected]

Journalist.

Definition at line 176 of file CouenneCrossConv.hpp.

7.18.4.2 CouenneProblem* Couenne::CouenneCrossConv::problem_ [protected]

pointer to the CouenneProblem representation

Definition at line 179 of file CouenneCrossConv.hpp.

The documentation for this class was generated from the following file:

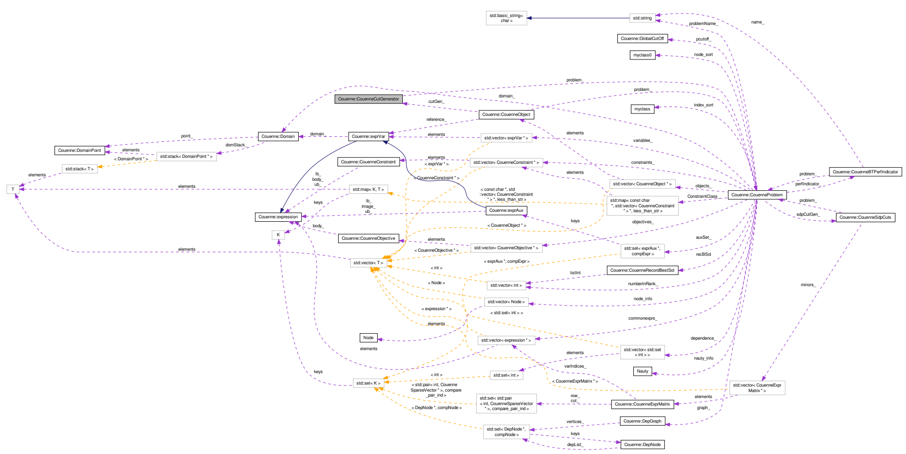
- /home/ted/COIN/trunk/Couenne/src/cut/crossconv/CouenneCrossConv.hpp

7.19 Couenne::CouenneCutGenerator Class Reference

Cut Generator for linear convexifications.

`#include <CouenneCutGenerator.hpp>`

Collaboration diagram for Couenne::CouenneCutGenerator:



Public Member Functions

- CouenneCutGenerator (Bonmin::OsiTMINLPInterface ∗=NULL, Bonmin::BabSetupBase ∗base=NULL, CouenneProblem ∗=NULL, struct ASL ∗=NULL)

    constructor
- CouenneCutGenerator (const CouenneCutGenerator &)

    copy constructor
- ∼CouenneCutGenerator ()

    destructor
- CouenneCutGenerator ∗ clone () const

    clone method (necessary for the abstract CglCutGenerator class)
- CouenneProblem ∗ Problem () const

    return pointer to symbolic problem
- void setProblem (CouenneProblem ∗p)

    return pointer to symbolic problem
- int getnvars () const

    total number of variables (original + auxiliary)
- bool isFirst () const

    has generateCuts been called yet?
- bool addViolated () const

    should we add the violated cuts only (true), or all of them (false)?
- enum conv_type ConvType () const

    get convexification type (see CouenneTypes.h)
- int nSamples () const

    get number of convexification samples
- void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

the main CglCutGenerator

- int createCut (OsiCuts &, CouNumber, CouNumber, int, CouNumber, int=-1, CouNumber=0., int=-1, CouNumber=0., bool=false) const

  create cut and check violation. Insert and return status

- int createCut (OsiCuts &, CouNumber, int, int, CouNumber, int=-1, CouNumber=0., int=-1, CouNumber=0., bool=false) const

  create cut and check violation. Other version with only one bound

- void addEnvelope (OsiCuts &, int, unary_function, unary_function, int, int, CouNumber, CouNumber, CouNumber, t_chg_bounds ∗=NULL, bool=false) const

  Add general linear envelope to convex function, given its variables' indices, the (univariate) function and its first derivative.

- void addEnvelope (OsiCuts &, int, funtriplet ∗, int, int, CouNumber, CouNumber, CouNumber, t_chg_bounds ∗=NULL, bool=false) const

  Add general linear envelope to convex function, given its variables' indices, the (univariate) function and its first derivative.

- int addSegment (OsiCuts &, int, int, CouNumber, CouNumber, CouNumber, CouNumber, int) const

  Add half-plane through (x1,y1) and (x2,y2) – resp.

- int addTangent (OsiCuts &, int, int, CouNumber, CouNumber, CouNumber, int) const

  add tangent at given poing (x,w) with given slope

- void setBabPtr (Bonmin::Bab ∗p)

  Method to set the Bab pointer.

- void getStats (int &nrc, int &ntc, double &st)

  Get statistics.

- bool & infeasNode () const

  Allow to get and set the infeasNode_ flag (used only in generateCuts())

- void genRowCuts (const OsiSolverInterface &, OsiCuts &cs, int, int ∗, t_chg_bounds ∗=NULL) const

  generate OsiRowCuts for current convexification

- void genColCuts (const OsiSolverInterface &, OsiCuts &, int, int ∗) const

  generate OsiColCuts for improved (implied and propagated) bounds

- void printLineInfo () const

  print node, depth, LB/UB/LP info

- ConstJnlstPtr Jnlst () const

  Provide Journalist.

- void setJnlst (JnlstPtr jnlst__)
- double & rootTime ()

  Time spent at root node.

- bool check_lp () const

  return check_lp flag (used in CouenneSolverInterface)

- bool enableLpImpliedBounds () const

  *returns value of enable_lp_implied_bounds_*

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

  Add list of options to be read from file.

Protected Attributes

- bool firstcall_

  True if no convexification cuts have been generated yet for this problem.
- bool addviolated_

  True if we should add the violated cuts only, false if all of them should be added.
- enum conv_type convtype_

  what kind of sampling should be performed?
- int nSamples_

  how many cuts should be added for each function?
- CouenneProblem ∗ problem_

  pointer to symbolic repr. of constraint, variables, and bounds
- int nrootcuts_

  number of cuts generated at the first call
- int ntotalcuts_

  total number of cuts generated
- double septime_

  separation time (includes generation of problem)
- double objValue_

  Record obj value at final point of CouenneConv.
- Bonmin::OsiTMINLPInterface ∗ nlp_

  nonlinear solver interface as used within Bonmin (used at first Couenne pass of each b&b node
- Bonmin::Bab ∗ BabPtr_

  pointer to the Bab object (used to retrieve the current primal bound through bestObj())
- bool infeasNode_

  signal infeasibility of current node (found through bound tightening)
- JnlstPtr jnlst_

  SmartPointer to the Journalist.
- double rootTime_

  Time spent at the root node.
- bool check_lp_

  Check all generated LPs through an independent call to OsiClpSolverInterface::initialSolve()
- bool enable_lp_implied_bounds_

  Take advantage of OsiClpSolverInterface::tightenBounds (), known to have caused some problems some time ago.
- int lastPrintLine

  Running count of printed info lines.

7.19.1 Detailed Description

Cut Generator for linear convexifications.

Definition at line 49 of file CouenneCutGenerator.hpp.

7.19.2 Constructor & Destructor Documentation

7.19.2.1 Couenne::CouenneCutGenerator::CouenneCutGenerator (Bonmin::OsiTMINLPInterface ∗ = NULL, Bonmin::BabSetupBase ∗ *base* = NULL, CouenneProblem ∗ = NULL, struct ASL ∗ = NULL)

constructor

7.19.2.2 Couenne::CouenneCutGenerator::CouenneCutGenerator (const CouenneCutGenerator &)

copy constructor

7.19.2.3 Couenne::CouenneCutGenerator::∼CouenneCutGenerator ( )

destructor

7.19.3 Member Function Documentation

7.19.3.1 CouenneCutGenerator* Couenne::CouenneCutGenerator::clone ( ) const [inline]

clone method (necessary for the abstract CglCutGenerator class)

Definition at line 125 of file CouenneCutGenerator.hpp.

7.19.3.2 CouenneProblem* Couenne::CouenneCutGenerator::Problem ( ) const [inline]

return pointer to symbolic problem

Definition at line 129 of file CouenneCutGenerator.hpp.

7.19.3.3 void Couenne::CouenneCutGenerator::setProblem (CouenneProblem * *p*) [inline]

return pointer to symbolic problem

Definition at line 133 of file CouenneCutGenerator.hpp.

7.19.3.4 int Couenne::CouenneCutGenerator::getnvars ( ) const

total number of variables (original + auxiliary)

7.19.3.5 bool Couenne::CouenneCutGenerator::isFirst ( ) const [inline]

has generateCuts been called yet?

Definition at line 140 of file CouenneCutGenerator.hpp.

7.19.3.6 bool Couenne::CouenneCutGenerator::addViolated ( ) const [inline]

should we add the violated cuts only (true), or all of them (false)?

Definition at line 144 of file CouenneCutGenerator.hpp.

7.19.3.7 enum conv_type Couenne::CouenneCutGenerator::ConvType ( ) const [inline]

get convexification type (see CouenneTypes.h)

Definition at line 148 of file CouenneCutGenerator.hpp.

7.19.3.8 int Couenne::CouenneCutGenerator::nSamples ( ) const [inline]

get number of convexification samples

Definition at line 152 of file CouenneCutGenerator.hpp.

7.19.3.9 void Couenne::CouenneCutGenerator::generateCuts (const OsiSolverInterface & , OsiCuts & , const CglTreeInfo = CglTreeInfo()) const

the main CglCutGenerator

7.19.3.10 int Couenne::CouenneCutGenerator::createCut (OsiCuts & , CouNumber , CouNumber , int , CouNumber , int = -1, CouNumber = 0., int = -1, CouNumber = 0., bool = false) const

create cut and check violation. Insert and return status

7.19.3.11 int Couenne::CouenneCutGenerator::createCut (OsiCuts & , CouNumber , int , int , CouNumber , int = -1, CouNumber = 0., int = -1, CouNumber = 0., bool = false) const

create cut and check violation. Other version with only one bound

7.19.3.12 void Couenne::CouenneCutGenerator::addEnvelope (OsiCuts & , int , unary_function , unary_function , int , int , CouNumber , CouNumber , CouNumber , t_chg_bounds * = NULL, bool = false) const

Add general linear envelope to convex function, given its variables' indices, the (univariate) function and its first derivative.

7.19.3.13 void Couenne::CouenneCutGenerator::addEnvelope (OsiCuts & , int , funtriplet * , int , int , CouNumber , CouNumber , CouNumber , t_chg_bounds * = NULL, bool = false) const

Add general linear envelope to convex function, given its variables' indices, the (univariate) function and its first derivative.

7.19.3.14 int Couenne::CouenneCutGenerator::addSegment (OsiCuts & , int , int , CouNumber , CouNumber , CouNumber , CouNumber , int) const

Add half-plane through (x1,y1) and (x2,y2) – resp.

4th, 5th, 6th, and 7th argument

7.19.3.15 int Couenne::CouenneCutGenerator::addTangent (OsiCuts & , int , int , CouNumber , CouNumber , CouNumber , int) const

add tangent at given poing (x,w) with given slope

7.19.3.16 void Couenne::CouenneCutGenerator::setBabPtr (Bonmin::Bab * *p*) [inline]

Method to set the Bab pointer.

Definition at line 218 of file CouenneCutGenerator.hpp.

7.19.3.17 void Couenne::CouenneCutGenerator::getStats (int & *nrc*, int & *ntc*, double & *st*) [inline]

Get statistics.

Definition at line 222 of file CouenneCutGenerator.hpp.

7.19.3.18 bool& Couenne::CouenneCutGenerator::infeasNode ( ) const [inline]

Allow to get and set the infeasNode_ flag (used only in generateCuts())

Definition at line 229 of file CouenneCutGenerator.hpp.

7.19.3.19 void Couenne::CouenneCutGenerator::genRowCuts (const OsiSolverInterface & , OsiCuts & *cs*, int , int * , t_chg_bounds * = NULL) const

generate OsiRowCuts for current convexification

7.19.3.20 void Couenne::CouenneCutGenerator::genColCuts (const OsiSolverInterface & , OsiCuts & , int , int *) const

generate OsiColCuts for improved (implied and propagated) bounds

7.19.3.21 static void Couenne::CouenneCutGenerator::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.19.3.22 void Couenne::CouenneCutGenerator::printLineInfo ( ) const

print node, depth, LB/UB/LP info

7.19.3.23 ConstJnlstPtr Couenne::CouenneCutGenerator::Jnlst ( ) const [inline]

Provide Journalist.

Definition at line 246 of file CouenneCutGenerator.hpp.

7.19.3.24 void Couenne::CouenneCutGenerator::setJnlst (JnlstPtr *jnlst__*) [inline]

Definition at line 249 of file CouenneCutGenerator.hpp.

7.19.3.25 double& Couenne::CouenneCutGenerator::rootTime ( ) [inline]

Time spent at root node.

Definition at line 253 of file CouenneCutGenerator.hpp.

7.19.3.26 bool Couenne::CouenneCutGenerator::check_lp ( ) const [inline]

return check_lp flag (used in CouenneSolverInterface)

Definition at line 257 of file CouenneCutGenerator.hpp.

7.19.3.27 bool Couenne::CouenneCutGenerator::enableLpImpliedBounds ( ) const [inline]

returns value of enable_lp_implied_bounds_

Definition at line 261 of file CouenneCutGenerator.hpp.

7.19.4 Member Data Documentation

7.19.4.1 bool Couenne::CouenneCutGenerator::firstcall_ [mutable], [protected]

True if no convexification cuts have been generated yet for this problem.

Definition at line 55 of file CouenneCutGenerator.hpp.

7.19.4.2 bool Couenne::CouenneCutGenerator::addviolated_ [mutable], [protected]

True if we should add the violated cuts only, false if all of them should be added.

Definition at line 59 of file CouenneCutGenerator.hpp.

7.19.4.3 enum conv_type Couenne::CouenneCutGenerator::convtype_ [protected]

what kind of sampling should be performed?

Definition at line 62 of file CouenneCutGenerator.hpp.

7.19.4.4 int Couenne::CouenneCutGenerator::nSamples_ [protected]

how many cuts should be added for each function?

Definition at line 65 of file CouenneCutGenerator.hpp.

7.19.4.5 CouenneProblem* Couenne::CouenneCutGenerator::problem_ [protected]

pointer to symbolic repr. of constraint, variables, and bounds

Definition at line 68 of file CouenneCutGenerator.hpp.

7.19.4.6 int Couenne::CouenneCutGenerator::nrootcuts_ [mutable], [protected]

number of cuts generated at the first call

Definition at line 71 of file CouenneCutGenerator.hpp.

7.19.4.7 int Couenne::CouenneCutGenerator::ntotalcuts_ [mutable], [protected]

total number of cuts generated

Definition at line 74 of file CouenneCutGenerator.hpp.

7.19.4.8 double Couenne::CouenneCutGenerator::septime_ [mutable], [protected]

separation time (includes generation of problem)

Definition at line 77 of file CouenneCutGenerator.hpp.

7.19.4.9 double Couenne::CouenneCutGenerator::objValue_ [mutable], [protected]

Record obj value at final point of CouenneConv.

Definition at line 80 of file CouenneCutGenerator.hpp.

7.19.4.10 Bonmin::OsiTMINLPInterface* Couenne::CouenneCutGenerator::nlp_ [protected]

nonlinear solver interface as used within Bonmin (used at first Couenne pass of each b&b node

Definition at line 84 of file CouenneCutGenerator.hpp.

7.19.4.11 Bonmin::Bab* Couenne::CouenneCutGenerator::BabPtr_ [protected]

pointer to the Bab object (used to retrieve the current primal bound through bestObj())

Definition at line 88 of file CouenneCutGenerator.hpp.

7.19.4.12 bool Couenne::CouenneCutGenerator::infeasNode_ [mutable], [protected]

signal infeasibility of current node (found through bound tightening)

Definition at line 91 of file CouenneCutGenerator.hpp.

7.19.4.13 JnlstPtr Couenne::CouenneCutGenerator::jnlst_ [protected]

SmartPointer to the Journalist.

Definition at line 94 of file CouenneCutGenerator.hpp.

7.19.4.14 double Couenne::CouenneCutGenerator::rootTime_ [mutable], [protected]

Time spent at the root node.

Definition at line 97 of file CouenneCutGenerator.hpp.

7.19.4.15 bool Couenne::CouenneCutGenerator::check_lp_ [protected]

Check all generated LPs through an independent call to OsiClpSolverInterface::initialSolve()

Definition at line 101 of file CouenneCutGenerator.hpp.

7.19.4.16 bool Couenne::CouenneCutGenerator::enable_lp_implied_bounds_ [protected]

Take advantage of OsiClpSolverInterface::tightenBounds (), known to have caused some problems some time ago.

Definition at line 105 of file CouenneCutGenerator.hpp.

7.19.4.17 int Couenne::CouenneCutGenerator::lastPrintLine [mutable], [protected]

Running count of printed info lines.

Definition at line 108 of file CouenneCutGenerator.hpp.

The documentation for this class was generated from the following file:

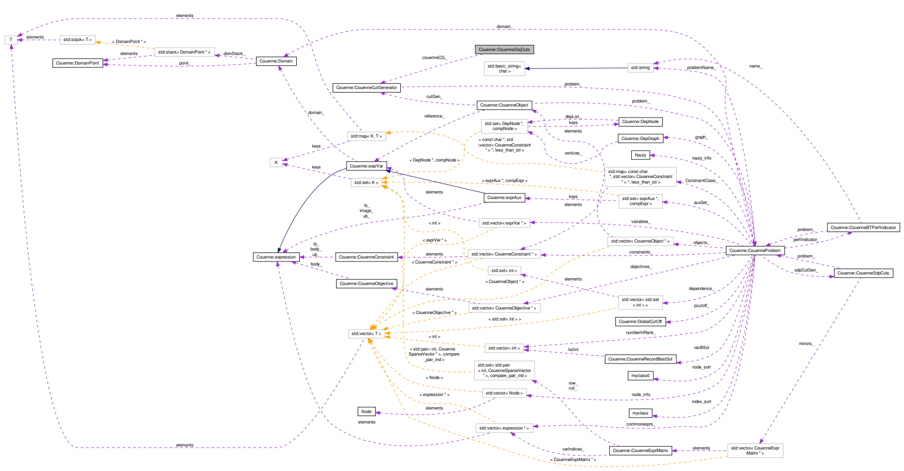
- /home/ted/COIN/trunk/Couenne/src/convex/CouenneCutGenerator.hpp

7.20 Couenne::CouenneDisjCuts Class Reference

Cut Generator for linear convexifications.

`#include <CouenneDisjCuts.hpp>`

Collaboration diagram for Couenne::CouenneDisjCuts:



Public Member Functions

- CouenneDisjCuts (Bonmin::OsiTMINLPInterface ∗minlp=NULL, Bonmin::BabSetupBase ∗base=NULL, Couenne-CutGenerator ∗cg=NULL, OsiChooseVariable ∗bcv=NULL, bool is_strong=false, JnlstPtr journalist=NULL, const

Ipopt::SmartPtr< Ipopt::OptionsList > options=NULL)

constructor

- CouenneDisjCuts (const CouenneDisjCuts &)

  copy constructor
- ∼CouenneDisjCuts ()

  destructor
- CouenneDisjCuts ∗ clone () const

  clone method (necessary for the abstract CglCutGenerator class)
- CouenneCutGenerator ∗ couenneCG () const

  return pointer to symbolic problem
- void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

  the main CglCutGenerator
- ConstJnlstPtr Jnlst () const

  Provide Journalist.
- int getDisjunctions (std::vector< std::pair< OsiCuts ∗, OsiCuts ∗ > > &disjunctions, OsiSolverInterface &si, OsiCuts &cs, const CglTreeInfo &info) const

  get all disjunctions
- int separateWithDisjunction (OsiCuts ∗cuts, OsiSolverInterface &si, OsiCuts &cs, const CglTreeInfo &info) const

  separate couenne cuts on both sides of single disjunction
- int generateDisjCuts (std::vector< std::pair< OsiCuts ∗, OsiCuts ∗ > > &disjs, OsiSolverInterface &si, OsiCuts &cs, const CglTreeInfo &info) const

  generate one disjunctive cut from one CGLP
- int checkDisjSide (OsiSolverInterface &si, OsiCuts ∗cuts) const

  check if (column!) cuts compatible with solver interface
- int getBoxUnion (OsiSolverInterface &si, OsiCuts ∗left, OsiCuts ∗right, **CoinPackedVector** &lower, **CoinPackedVector** &upper) const

  compute smallest box containing both left and right boxes.

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

  Add list of options to be read from file.

Protected Member Functions

- OsiCuts ∗ getSingleDisjunction (OsiSolverInterface &si) const

  create single osicolcut disjunction
- void mergeBoxes (int dir, **CoinPackedVector** &left, **CoinPackedVector** &right, **CoinPackedVector** merged) const

  utility to merge vectors into one
- void applyColCuts (OsiSolverInterface &si, OsiCuts ∗cuts) const

  our own applyColCuts
- void applyColCuts (OsiSolverInterface &si, OsiColCut ∗cut) const

  our own applyColCut, single cut
- void OsiSI2MatrVec (**CoinPackedMatrix** &M, **CoinPackedVector** &r, OsiSolverInterface &si) const
- int OsiCuts2MatrVec (OsiSolverInterface ∗cglp, OsiCuts ∗cuts, int displRow, int displRhs) const

  add CGLP columns to solver interface; return number of columns added (for later removal)

Protected Attributes

- CouenneCutGenerator ∗ couenneCG_

  pointer to symbolic repr. of constraint, variables, and bounds
- int nrootcuts_

  number of cuts generated at the first call
- int ntotalcuts_

  total number of cuts generated
- double septime_

  separation time (includes generation of problem)
- double objValue_

  Record obj value at final point of CouenneConv.
- Bonmin::OsiTMINLPInterface ∗ minlp_

  nonlinear solver interface as used within Bonmin (used at first Couenne pass of each b&b node)
- OsiChooseVariable ∗ branchingMethod_

  Branching scheme (if strong, we can use SB candidates)
- bool isBranchingStrong_

  Is branchMethod_ referred to a strong branching scheme?
- JnlstPtr jnlst_

  SmartPointer to the Journalist.
- int numDisjunctions_

  Number of disjunction to consider at each separation.
- double initDisjPercentage_

  Initial percentage of objects to use for generating cuts, in [0,1].
- int initDisjNumber_

  Initial number of objects to use for generating cuts.
- int depthLevelling_

  Depth of the BB tree where start decreasing number of objects.
- int depthStopSeparate_

  Depth of the BB tree where stop separation.
- bool activeRows_

  only include active rows in CGLP
- bool activeCols_

  only include active columns in CGLP
- bool addPreviousCut_

  add previous disj cut to current CGLP?
- double cpuTime_

  maximum CPU time

7.20.1 Detailed Description

Cut Generator for linear convexifications.

Definition at line 34 of file CouenneDisjCuts.hpp.

7.20.2 Constructor & Destructor Documentation

7.20.2.1 Couenne::CouenneDisjCuts::CouenneDisjCuts (Bonmin::OsiTMINLPInterface * *minlp* = NULL, Bonmin::BabSetupBase * *base* = NULL, CouenneCutGenerator * *cg* = NULL, OsiChooseVariable * *bcv* = NULL, bool *is_strong* = false, JnlstPtr *journalist* = NULL, const Ipopt::SmartPtr< Ipopt::OptionsList > *options* = NULL)

constructor

7.20.2.2 Couenne::CouenneDisjCuts::CouenneDisjCuts (const CouenneDisjCuts &)

copy constructor

7.20.2.3 Couenne::CouenneDisjCuts::∼CouenneDisjCuts ( )

destructor

7.20.3 Member Function Documentation

7.20.3.1 CouenneDisjCuts* Couenne::CouenneDisjCuts::clone ( ) const [inline]

clone method (necessary for the abstract CglCutGenerator class)

Definition at line 111 of file CouenneDisjCuts.hpp.

7.20.3.2 CouenneCutGenerator* Couenne::CouenneDisjCuts::couenneCG ( ) const [inline]

return pointer to symbolic problem

Definition at line 115 of file CouenneDisjCuts.hpp.

7.20.3.3 void Couenne::CouenneDisjCuts::generateCuts (const OsiSolverInterface & , OsiCuts & , const CglTreeInfo = CglTreeInfo()) const

the main CglCutGenerator

7.20.3.4 static void Couenne::CouenneDisjCuts::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.20.3.5 ConstJnlstPtr Couenne::CouenneDisjCuts::Jnlst ( ) const [inline]

Provide Journalist.

Definition at line 131 of file CouenneDisjCuts.hpp.

7.20.3.6 int Couenne::CouenneDisjCuts::getDisjunctions (std::vector< std::pair< OsiCuts *, OsiCuts * > > & *disjunctions*, OsiSolverInterface & *si*, OsiCuts & *cs*, const CglTreeInfo & *info*) const

get all disjunctions

7.20.3.7 int Couenne::CouenneDisjCuts::separateWithDisjunction (OsiCuts * *cuts*, OsiSolverInterface & *si*, OsiCuts & *cs*, const CglTreeInfo & *info*) const

separate couenne cuts on both sides of single disjunction

7.20.3.8 int Couenne::CouenneDisjCuts::generateDisjCuts (std::vector< std::pair< OsiCuts *, OsiCuts * > > & *disjs*, OsiSolverInterface & *si*, OsiCuts & *cs*, const CglTreeInfo & *info*) const

generate one disjunctive cut from one CGLP

7.20.3.9 int Couenne::CouenneDisjCuts::checkDisjSide (OsiSolverInterface & *si*, OsiCuts * *cuts*) const

check if (column!) cuts compatible with solver interface

7.20.3.10 int Couenne::CouenneDisjCuts::getBoxUnion (OsiSolverInterface & *si*, OsiCuts * *left*, OsiCuts * *right*, CoinPackedVector & *lower*, CoinPackedVector & *upper*) const

compute smallest box containing both left and right boxes.

7.20.3.11 OsiCuts* Couenne::CouenneDisjCuts::getSingleDisjunction (OsiSolverInterface & *si*) const [protected]

create single osicolcut disjunction

7.20.3.12 void Couenne::CouenneDisjCuts::mergeBoxes (int *dir*, CoinPackedVector & *left*, CoinPackedVector & *right*, CoinPackedVector *merged*) const [protected]

utility to merge vectors into one

7.20.3.13 void Couenne::CouenneDisjCuts::applyColCuts (OsiSolverInterface & *si*, OsiCuts * *cuts*) const [protected]

our own applyColCuts

7.20.3.14 void Couenne::CouenneDisjCuts::applyColCuts (OsiSolverInterface & *si*, OsiColCut * *cut*) const [protected]

our own applyColCut, single cut

7.20.3.15 void Couenne::CouenneDisjCuts::OsiSI2MatrVec (CoinPackedMatrix & *M*, CoinPackedVector & *r*, OsiSolverInterface & *si*) const [protected]

7.20.3.16 int Couenne::CouenneDisjCuts::OsiCuts2MatrVec (OsiSolverInterface * *cglp*, OsiCuts * *cuts*, int *displRow*, int *displRhs*) const [protected]

add CGLP columns to solver interface; return number of columns added (for later removal)

7.20.4 Member Data Documentation

7.20.4.1 CouenneCutGenerator* Couenne::CouenneDisjCuts::couenneCG_ [protected]

pointer to symbolic repr. of constraint, variables, and bounds

Definition at line 39 of file CouenneDisjCuts.hpp.

7.20.4.2 int Couenne::CouenneDisjCuts::nrootcuts_ [mutable], [protected]

number of cuts generated at the first call

Definition at line 42 of file CouenneDisjCuts.hpp.

7.20.4.3 int Couenne::CouenneDisjCuts::ntotalcuts_ [mutable], [protected]

total number of cuts generated

Definition at line 45 of file CouenneDisjCuts.hpp.

7.20.4.4 double Couenne::CouenneDisjCuts::septime_ [mutable], [protected]

separation time (includes generation of problem)

Definition at line 48 of file CouenneDisjCuts.hpp.

7.20.4.5 double Couenne::CouenneDisjCuts::objValue_ [mutable], [protected]

Record obj value at final point of CouenneConv.

Definition at line 51 of file CouenneDisjCuts.hpp.

7.20.4.6 Bonmin::OsiTMINLPInterface* Couenne::CouenneDisjCuts::minlp_ [protected]

nonlinear solver interface as used within Bonmin (used at first Couenne pass of each b&b node)

Definition at line 55 of file CouenneDisjCuts.hpp.

7.20.4.7 OsiChooseVariable* Couenne::CouenneDisjCuts::branchingMethod_ [protected]

Branching scheme (if strong, we can use SB candidates)

Definition at line 58 of file CouenneDisjCuts.hpp.

7.20.4.8 bool Couenne::CouenneDisjCuts::isBranchingStrong_ [protected]

Is branchMethod_ referred to a strong branching scheme?

Definition at line 61 of file CouenneDisjCuts.hpp.

7.20.4.9 JnlstPtr Couenne::CouenneDisjCuts::jnlst_ [protected]

SmartPointer to the Journalist.

Definition at line 64 of file CouenneDisjCuts.hpp.

7.20.4.10 int Couenne::CouenneDisjCuts::numDisjunctions_ [mutable], [protected]

Number of disjunction to consider at each separation.

Definition at line 67 of file CouenneDisjCuts.hpp.

7.20.4.11 double Couenne::CouenneDisjCuts::initDisjPercentage_ [protected]

Initial percentage of objects to use for generating cuts, in [0,1].

Definition at line 70 of file CouenneDisjCuts.hpp.

7.20.4.12 int Couenne::CouenneDisjCuts::initDisjNumber_ [protected]

Initial number of objects to use for generating cuts.

Definition at line 73 of file CouenneDisjCuts.hpp.

7.20.4.13 int Couenne::CouenneDisjCuts::depthLevelling_ [protected]

Depth of the BB tree where start decreasing number of objects.

Definition at line 76 of file CouenneDisjCuts.hpp.

7.20.4.14 int Couenne::CouenneDisjCuts::depthStopSeparate_ [protected]

Depth of the BB tree where stop separation.

Definition at line 79 of file CouenneDisjCuts.hpp.

7.20.4.15 bool Couenne::CouenneDisjCuts::activeRows_ [protected]

only include active rows in CGLP

Definition at line 82 of file CouenneDisjCuts.hpp.

7.20.4.16 bool Couenne::CouenneDisjCuts::activeCols_ [protected]

only include active columns in CGLP

Definition at line 85 of file CouenneDisjCuts.hpp.

7.20.4.17 bool Couenne::CouenneDisjCuts::addPreviousCut_ [protected]

add previous disj cut to current CGLP?

Definition at line 88 of file CouenneDisjCuts.hpp.

7.20.4.18 double Couenne::CouenneDisjCuts::cpuTime_ [protected]

maximum CPU time

Definition at line 91 of file CouenneDisjCuts.hpp.

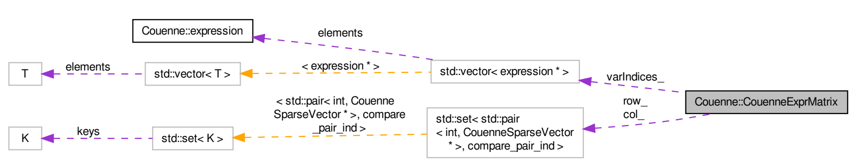
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/disjunctive/CouenneDisjCuts.hpp

7.21 Couenne::CouenneExprMatrix Class Reference

```
#include <CouenneMatrix.hpp>
```

Collaboration diagram for Couenne::CouenneExprMatrix:



Classes

- struct compare_pair_ind

Public Member Functions

- CouenneExprMatrix ()

- ∼CouenneExprMatrix ()
- CouenneExprMatrix (const CouenneExprMatrix &rhs)
- CouenneExprMatrix & operator= (const CouenneExprMatrix &rhs)
- CouenneExprMatrix ∗ clone ()
- const std::set< std::pair< int,
  CouenneSparseVector ∗ >
  , compare_pair_ind > & getRows () const
- const std::set< std::pair< int,
  CouenneSparseVector ∗ >
  , compare_pair_ind > & getCols () const
- std::vector< expression ∗ > & varIndices ()
- void add_element (int row, int column, expression ∗elem)
- void print () const
- long unsigned int size ()
- CouenneSparseVector & operator∗ (const CouenneSparseVector &factor) const

  matrix ∗ vector
- CouenneExprMatrix & operator∗ (const CouenneExprMatrix &post) const

  matrix ∗ matrix

Protected Attributes

- std::set< std::pair< int,
  CouenneSparseVector ∗ >
  , compare_pair_ind > row_

  row major
- std::set< std::pair< int,
  CouenneSparseVector ∗ >
  , compare_pair_ind > col_

  col major
- std::vector< expression ∗ > varIndices_

  if used in sdp cuts, contains indices of x_i used in X_ij = x_i ∗ x_j

7.21.1 Detailed Description

Definition at line 104 of file CouenneMatrix.hpp.

7.21.2 Constructor & Destructor Documentation

7.21.2.1 Couenne::CouenneExprMatrix::CouenneExprMatrix ( ) [inline]

Definition at line 123 of file CouenneMatrix.hpp.

7.21.2.2 Couenne::CouenneExprMatrix::∼CouenneExprMatrix ( )

7.21.2.3 Couenne::CouenneExprMatrix::CouenneExprMatrix (const CouenneExprMatrix & *rhs*)

7.21.3 Member Function Documentation

7.21.3.1 CouenneExprMatrix& Couenne::CouenneExprMatrix::operator= (const CouenneExprMatrix & *rhs*)

7.21.3.2 CouenneExprMatrix* Couenne::CouenneExprMatrix::clone ( ) [inline]

Definition at line 129 of file CouenneMatrix.hpp.

7.21.3.3 const std::set<std::pair <int, CouenneSparseVector *>, compare_pair_ind>& Couenne::CouenneExprMatrix::getRows ( ) const [inline]

Definition at line 131 of file CouenneMatrix.hpp.

7.21.3.4 const std::set<std::pair <int, CouenneSparseVector *>, compare_pair_ind>& Couenne::CouenneExprMatrix::getCols ( ) const [inline]

Definition at line 132 of file CouenneMatrix.hpp.

7.21.3.5 std::vector<expression *>& Couenne::CouenneExprMatrix::varIndices ( ) [inline]

Definition at line 134 of file CouenneMatrix.hpp.

7.21.3.6 void Couenne::CouenneExprMatrix::add_element (int *row*, int *column*, expression * *elem*)

7.21.3.7 void Couenne::CouenneExprMatrix::print ( ) const

7.21.3.8 long unsigned int Couenne::CouenneExprMatrix::size ( )

7.21.3.9 CouenneSparseVector& Couenne::CouenneExprMatrix::operator* (const CouenneSparseVector & *factor*) const

matrix * vector

7.21.3.10 CouenneExprMatrix& Couenne::CouenneExprMatrix::operator* (const CouenneExprMatrix & *post*) const

matrix * matrix

7.21.4 Member Data Documentation

7.21.4.1 std::set<std::pair <int, CouenneSparseVector *>, compare_pair_ind> Couenne::CouenneExprMatrix::row_ [protected]

row major

Definition at line 116 of file CouenneMatrix.hpp.

7.21.4.2 std::set<std::pair <int, CouenneSparseVector *>, compare_pair_ind> Couenne::CouenneExprMatrix::col_ [protected]

col major

Definition at line 117 of file CouenneMatrix.hpp.

7.21.4.3 std::vector<expression *> Couenne::CouenneExprMatrix::varIndices_ [protected]

if used in sdp cuts, contains indices of x_i used in X_ij = x_i * x_j

Definition at line 119 of file CouenneMatrix.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouenneMatrix.hpp

7.22 Couenne::CouenneFeasPump Class Reference

An implementation of the Feasibility pump that uses linearization and Ipopt to find the two sequences of points.

`#include <CouenneFeasPump.hpp>`

Public Types

- enum fpCompDistIntType { FP_DIST_INT, FP_DIST_ALL, FP_DIST_POST }
- enum fpCutPlane { FP_CUT_NONE, FP_CUT_INTEGRATED, FP_CUT_EXTERNAL, FP_CUT_POST }
- enum fpTabuMgtPolicy { FP_TABU_NONE, FP_TABU_POOL, FP_TABU_PERTURB, FP_TABU_CUT }

Public Member Functions

- CouenneFeasPump (CouenneProblem ∗couenne=NULL, CouenneCutGenerator ∗cg=NULL, Ipopt::SmartPtr< Ipopt::OptionsList > options=NULL)

  Constructor with (optional) MINLP pointer.
- CouenneFeasPump (const CouenneFeasPump &other)

  Copy constructor.
- virtual ∼CouenneFeasPump ()

  Destructor.
- virtual CbcHeuristic ∗ clone () const

  Clone.
- CouenneFeasPump & operator= (const CouenneFeasPump &rhs)

  Assignment operator.
- virtual void resetModel (CbcModel ∗model)

  Does nothing, but necessary as CbcHeuristic declares it pure virtual.
- virtual int solution (double &objectiveValue, double ∗newSolution)

  Run heuristic, return 1 if a better solution than the one passed is found and 0 otherwise.
- void setNumberSolvePerLevel (int value)

  set number of nlp's solved for each given level of the tree
- virtual CouNumber solveMILP (const CouNumber ∗nSol, CouNumber ∗&iSol, int niter, int ∗nsuciter)

  find integer (possibly NLP-infeasible) point isol closest (according to the l-1 norm of the hessian) to the current NLP-feasible (but fractional) solution nsol
- virtual CouNumber solveNLP (const CouNumber ∗nSol, CouNumber ∗&iSol)

  obtain solution to NLP
- expression ∗ updateNLPObj (const double ∗)

  set new expression as the NLP objective function using argument as point to minimize distance from.
- bool fixIntVariables (const double ∗sol)

  admits a (possibly fractional) solution and fixes the integer components in the nonlinear problem for later re-solve.
- double findSolution (const double ∗nSol, double ∗&sol, int niter, int ∗nsuciter)

  find feasible solution (called by solveMILP ())
- void init_MILP ()

  initialize all solvers at the first call, where the initial MILP is built
- void initIpoptApp ()

  Common code for initializing non-smartptr ipopt application.
- CouenneProblem ∗ Problem () const

  return pointer to problem

- enum fpCompDistIntType compDistInt () const

  return type of MILP solved
- double multDistNLP () const

  Return Weights in computing distance, in both MILP and NLP (must sum up to 1 for MILP and for NLP):
- double multHessNLP () const

  weight of Hessian in NLP
- double multObjFNLP () const

  weight of objective in NLP
- double multDistMILP () const

  weight of distance in MILP
- double multHessMILP () const

  weight of Hessian in MILP
- double multObjFMILP () const

  weight of objective in MILP
- CouenneTNLP ∗ nlp () const

  return NLP
- int & nCalls ()

  return number of calls (can be changed)
- int milpPhase (double ∗nSol, double ∗iSol)

  MILP phase of the FP.
- int nlpPhase (double ∗iSol, double ∗nSol)

  NLP phase of the FP.

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions >)

  initialize options to be read later

7.22.1 Detailed Description

An implementation of the Feasibility pump that uses linearization and Ipopt to find the two sequences of points.

Definition at line 57 of file CouenneFeasPump.hpp.

7.22.2 Member Enumeration Documentation

7.22.2.1 enum Couenne::CouenneFeasPump::fpCompDistIntType

Enumerator:

FP_DIST_INT

FP_DIST_ALL

FP_DIST_POST

Definition at line 61 of file CouenneFeasPump.hpp.

7.22.2.2 enum Couenne::CouenneFeasPump::fpCutPlane

Enumerator:

FP_CUT_NONE

FP_CUT_INTEGRATED

FP_CUT_EXTERNAL

FP_CUT_POST

Definition at line 62 of file CouenneFeasPump.hpp.

7.22.2.3 enum Couenne::CouenneFeasPump::fpTabuMgtPolicy

Enumerator:

FP_TABU_NONE

FP_TABU_POOL

FP_TABU_PERTURB

FP_TABU_CUT

Definition at line 63 of file CouenneFeasPump.hpp.

7.22.3 Constructor & Destructor Documentation

7.22.3.1 Couenne::CouenneFeasPump::CouenneFeasPump (CouenneProblem * *couenne* = NULL, CouenneCutGenerator * *cg* = NULL, Ipopt::SmartPtr< Ipopt::OptionsList > *options* = NULL)

Constructor with (optional) MINLP pointer.

7.22.3.2 Couenne::CouenneFeasPump::CouenneFeasPump (const CouenneFeasPump & *other*)

Copy constructor.

7.22.3.3 virtual Couenne::CouenneFeasPump::~CouenneFeasPump ( ) [virtual]

Destructor.

7.22.4 Member Function Documentation

7.22.4.1 virtual CbcHeuristic* Couenne::CouenneFeasPump::clone ( ) const [virtual]

Clone.

7.22.4.2 CouenneFeasPump& Couenne::CouenneFeasPump::operator= (const CouenneFeasPump & *rhs*)

Assignment operator.

7.22.4.3 virtual void Couenne::CouenneFeasPump::resetModel (CbcModel * *model*) [inline], [virtual]

Does nothing, but necessary as CbcHeuristic declares it pure virtual.

Definition at line 83 of file CouenneFeasPump.hpp.

7.22.4.4 virtual int Couenne::CouenneFeasPump::solution (double & *objectiveValue,* double $*$ *newSolution*) [virtual]

Run heuristic, return 1 if a better solution than the one passed is found and 0 otherwise.

objectiveValue Best known solution in input and value of solution found in output

newSolution Solution found by heuristic.

7.22.4.5 void Couenne::CouenneFeasPump::setNumberSolvePerLevel (int *value*) [inline]

set number of nlp's solved for each given level of the tree

Definition at line 95 of file CouenneFeasPump.hpp.

7.22.4.6 virtual CouNumber Couenne::CouenneFeasPump::solveMILP (const CouNumber $*$ *nSol,* CouNumber $*$& *iSol,* int *niter,* int $*$ *nsuciter*) [virtual]

find integer (possibly NLP-infeasible) point isol closest (according to the l-1 norm of the hessian) to the current NLP-feasible (but fractional) solution nsol

7.22.4.7 virtual CouNumber Couenne::CouenneFeasPump::solveNLP (const CouNumber $*$ *nSol,* CouNumber $*$& *iSol*) [virtual]

obtain solution to NLP

7.22.4.8 expression$*$ Couenne::CouenneFeasPump::updateNLPObj (const double $*$)

set new expression as the NLP objective function using argument as point to minimize distance from.

Return new objective function

7.22.4.9 bool Couenne::CouenneFeasPump::fixIntVariables (const double $*$ *sol*)

admits a (possibly fractional) solution and fixes the integer components in the nonlinear problem for later re-solve.

Returns false if restriction infeasible, true otherwise

7.22.4.10 static void Couenne::CouenneFeasPump::registerOptions (Ipopt::SmartPtr$<$ Bonmin::RegisteredOptions $>$) [static]

initialize options to be read later

7.22.4.11 double Couenne::CouenneFeasPump::findSolution (const double $*$ *nSol,* double $*$& *sol,* int *niter,* int $*$ *nsuciter*)

find feasible solution (called by solveMILP ())

7.22.4.12 void Couenne::CouenneFeasPump::init_MILP ( )

initialize all solvers at the first call, where the initial MILP is built

7.22.4.13 void Couenne::CouenneFeasPump::initIpoptApp ( )

Common code for initializing non-smartptr ipopt application.

7.22.4.14 CouenneProblem$*$ Couenne::CouenneFeasPump::Problem ( ) const [inline]

return pointer to problem

Definition at line 135 of file CouenneFeasPump.hpp.

7.22.4.15 enum fpCompDistIntType Couenne::CouenneFeasPump::compDistInt ( ) const [inline]

return type of MILP solved

Definition at line 139 of file CouenneFeasPump.hpp.

7.22.4.16 double Couenne::CouenneFeasPump::multDistNLP ( ) const [inline]

Return Weights in computing distance, in both MILP and NLP (must sum up to 1 for MILP and for NLP):

weight of distance in NLP

Definition at line 145 of file CouenneFeasPump.hpp.

7.22.4.17 double Couenne::CouenneFeasPump::multHessNLP ( ) const [inline]

weight of Hessian in NLP

Definition at line 146 of file CouenneFeasPump.hpp.

7.22.4.18 double Couenne::CouenneFeasPump::multObjFNLP ( ) const [inline]

weight of objective in NLP

Definition at line 147 of file CouenneFeasPump.hpp.

7.22.4.19 double Couenne::CouenneFeasPump::multDistMILP ( ) const [inline]

weight of distance in MILP

Definition at line 149 of file CouenneFeasPump.hpp.

7.22.4.20 double Couenne::CouenneFeasPump::multHessMILP ( ) const [inline]

weight of Hessian in MILP

Definition at line 150 of file CouenneFeasPump.hpp.

7.22.4.21 double Couenne::CouenneFeasPump::multObjFMILP ( ) const [inline]

weight of objective in MILP

Definition at line 151 of file CouenneFeasPump.hpp.

7.22.4.22 CouenneTNLP* Couenne::CouenneFeasPump::nlp ( ) const [inline]

return NLP

Definition at line 154 of file CouenneFeasPump.hpp.

7.22.4.23 int& Couenne::CouenneFeasPump::nCalls ( ) [inline]

return number of calls (can be changed)

Definition at line 158 of file CouenneFeasPump.hpp.

7.22.4.24 int Couenne::CouenneFeasPump::milpPhase (double * *nSol*, double * *iSol*)

MILP phase of the FP.

7.22.4.25 int Couenne::CouenneFeasPump::nlpPhase (double ∗ *iSol,* double ∗ *nSol*)

NLP phase of the FP.

The documentation for this class was generated from the following file:

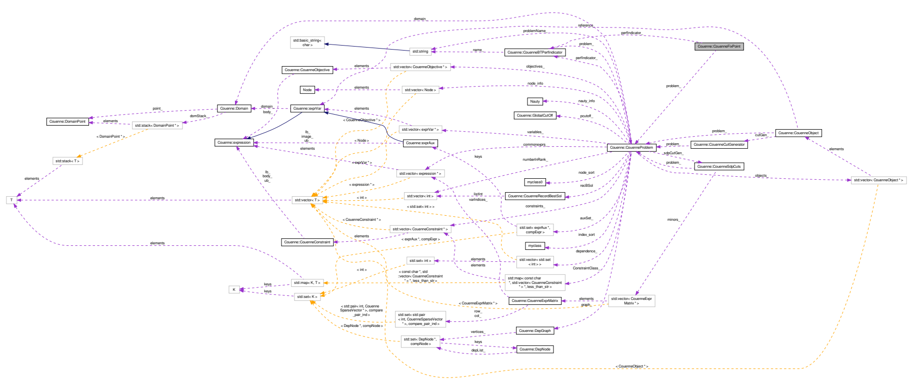
- /home/ted/COIN/trunk/Couenne/src/heuristics/CouenneFeasPump.hpp

7.23 Couenne::CouenneFixPoint Class Reference

Cut Generator for FBBT fixpoint.

`#include <CouenneFixPoint.hpp>`

Collaboration diagram for Couenne::CouenneFixPoint:



Public Member Functions

- CouenneFixPoint (CouenneProblem ∗, const Ipopt::SmartPtr< Ipopt::OptionsList >)

    constructor
- CouenneFixPoint (const CouenneFixPoint &)

    copy constructor
- ∼CouenneFixPoint ()

    destructor
- CouenneFixPoint ∗ clone () const

    clone method (necessary for the abstract CglCutGenerator class)
- void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

    the main CglCutGenerator

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

    Add list of options to be read from file.

Protected Member Functions

- void createRow (int, int, int, OsiSolverInterface ∗, const int ∗, const double ∗, const double, const int, bool, int, int) const

  Create a single cut.

Protected Attributes

- bool extendedModel_

  should we use an extended model or a more compact one?
- CouenneProblem ∗ problem_

  pointer to the CouenneProblem representation
- bool firstCall_

  Is this the first call?
- double CPUtime_

  CPU time.
- int nTightened_

  Number of bounds tightened.
- CouenneBTPerfIndicator perfIndicator_

  Performance indicator.

7.23.1 Detailed Description

Cut Generator for FBBT fixpoint.

Definition at line 30 of file CouenneFixPoint.hpp.

7.23.2 Constructor & Destructor Documentation

7.23.2.1 Couenne::CouenneFixPoint::CouenneFixPoint (CouenneProblem ∗ , const Ipopt::SmartPtr< Ipopt::OptionsList >)

constructor

7.23.2.2 Couenne::CouenneFixPoint::CouenneFixPoint (const CouenneFixPoint &)

copy constructor

7.23.2.3 Couenne::CouenneFixPoint::∼CouenneFixPoint ( )

destructor

7.23.3 Member Function Documentation

7.23.3.1 CouenneFixPoint∗ Couenne::CouenneFixPoint::clone ( ) const [inline]

clone method (necessary for the abstract CglCutGenerator class)

Definition at line 45 of file CouenneFixPoint.hpp.

7.23.3.2 void Couenne::CouenneFixPoint::generateCuts (const OsiSolverInterface & , OsiCuts & , const CglTreeInfo = CglTreeInfo()) const

the main CglCutGenerator

7.23.3.3 static void Couenne::CouenneFixPoint::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.23.3.4 void Couenne::CouenneFixPoint::createRow (int , int , int , OsiSolverInterface ∗ , const int ∗ , const double ∗ , const double , const int , bool , int , int) const [protected]

Create a single cut.

7.23.4 Member Data Documentation

7.23.4.1 bool Couenne::CouenneFixPoint::extendedModel_ [protected]

should we use an extended model or a more compact one?

Definition at line 63 of file CouenneFixPoint.hpp.

7.23.4.2 CouenneProblem∗ Couenne::CouenneFixPoint::problem_ [protected]

pointer to the CouenneProblem representation

Definition at line 66 of file CouenneFixPoint.hpp.

7.23.4.3 bool Couenne::CouenneFixPoint::firstCall_ [mutable], [protected]

Is this the first call?

Definition at line 69 of file CouenneFixPoint.hpp.

7.23.4.4 double Couenne::CouenneFixPoint::CPUtime_ [mutable], [protected]

CPU time.

Definition at line 72 of file CouenneFixPoint.hpp.

7.23.4.5 int Couenne::CouenneFixPoint::nTightened_ [mutable], [protected]

Number of bounds tightened.

Definition at line 75 of file CouenneFixPoint.hpp.

7.23.4.6 CouenneBTPerfIndicator Couenne::CouenneFixPoint::perfIndicator_ [protected]

Performance indicator.

Definition at line 89 of file CouenneFixPoint.hpp.

The documentation for this class was generated from the following file:

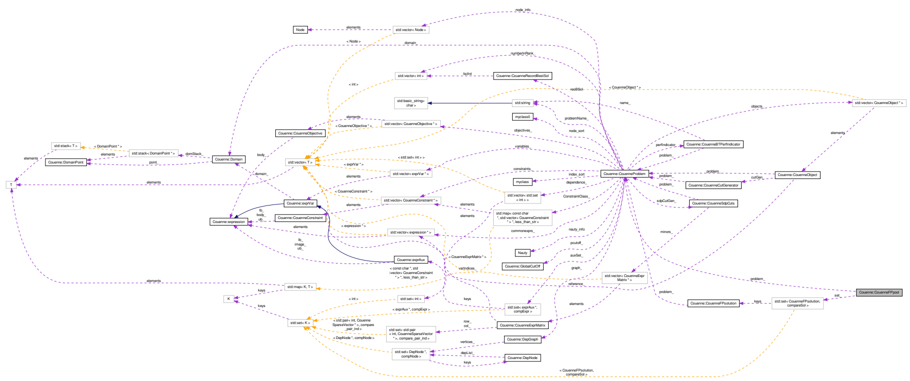
- /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneFixPoint.hpp

7.24 Couenne::CouenneFPpool Class Reference

Pool of solutions.

`#include <CouenneFPpool.hpp>`

Collaboration diagram for Couenne::CouenneFPpool:



Public Member Functions

- CouenneFPpool (CouenneProblem ∗p, enum what_to_compare c)

  simple constructor (empty pool)
- CouenneFPpool (const CouenneFPpool &src)

  copy constructor
- CouenneFPpool & operator= (const CouenneFPpool &src)

  assignment
- std::set< CouenneFPsolution, compareSol > & Set ()

  return the main object in this class
- CouenneProblem ∗ Problem ()

  return the problem pointer
- void findClosestAndReplace (double ∗&sol, const double ∗nSol, int nvars)

  finds, in pool, solution x closest to sol; removes it from the pool and overwrites it to sol

Protected Attributes

- std::set< CouenneFPsolution, compareSol > set_

  Pool.
- CouenneProblem ∗ problem_

  Problem pointer.

7.24.1 Detailed Description

Pool of solutions.

Definition at line 91 of file CouenneFPpool.hpp.

7.24.2 Constructor & Destructor Documentation

7.24.2.1 Couenne::CouenneFPpool::CouenneFPpool (CouenneProblem * *p*, enum what_to_compare *c*) [inline]

simple constructor (empty pool)

Definition at line 104 of file CouenneFPpool.hpp.

7.24.2.2 Couenne::CouenneFPpool::CouenneFPpool (const CouenneFPpool & *src*)

copy constructor

7.24.3 Member Function Documentation

7.24.3.1 CouenneFPpool& Couenne::CouenneFPpool::operator= (const CouenneFPpool & *src*)

assignment

7.24.3.2 std::set<CouenneFPsolution, compareSol>& Couenne::CouenneFPpool::Set ( ) [inline]

return the main object in this class

Definition at line 114 of file CouenneFPpool.hpp.

7.24.3.3 CouenneProblem* Couenne::CouenneFPpool::Problem ( ) [inline]

return the problem pointer

Definition at line 118 of file CouenneFPpool.hpp.

7.24.3.4 void Couenne::CouenneFPpool::findClosestAndReplace (double *& *sol*, const double * *nSol*, int *nvars*)

finds, in pool, solution x closest to sol; removes it from the pool and overwrites it to sol

7.24.4 Member Data Documentation

7.24.4.1 std::set<CouenneFPsolution, compareSol> Couenne::CouenneFPpool::set_ [protected]

Pool.

Definition at line 96 of file CouenneFPpool.hpp.

7.24.4.2 CouenneProblem* Couenne::CouenneFPpool::problem_ [protected]

Problem pointer.

Definition at line 99 of file CouenneFPpool.hpp.

The documentation for this class was generated from the following file:

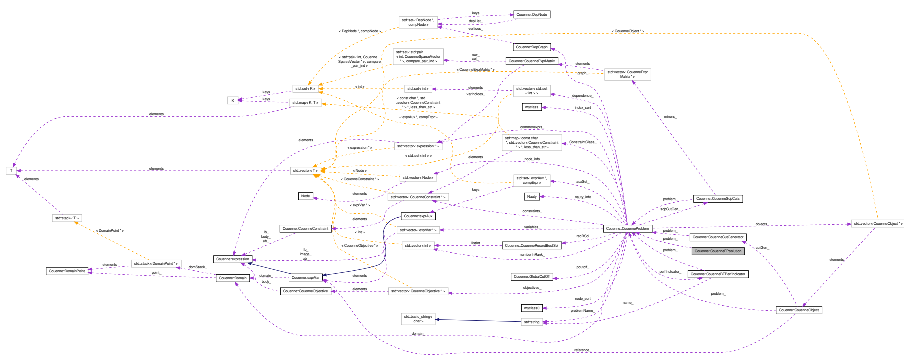
- /home/ted/COIN/trunk/Couenne/src/heuristics/CouenneFPpool.hpp

7.25 Couenne::CouenneFPsolution Class Reference

Class containing a solution with infeasibility evaluation.

`#include <CouenneFPpool.hpp>`

Collaboration diagram for Couenne::CouenneFPsolution:



Public Member Functions

- CouenneFPsolution (CouenneProblem *p, CouNumber *x, bool copied=false)

  CouenneProblem-aware constructor.
- CouenneFPsolution (const CouenneFPsolution &src)

  copy constructor
- CouenneFPsolution & operator= (const CouenneFPsolution &src)

  assignment
- ∼CouenneFPsolution ()

  destructor
- const int n () const

  returns size
- const double * x () const

  returns vector
- bool compare (const CouenneFPsolution &other, enum what_to_compare comparedTerm) const

  basic comparison procedure – what to compare depends on user's choice

Protected Attributes

- CouNumber * x_

  solution
- int n_

  number of variables (for independence from CouenneProblem)
- int nNLinf_

  number of NL infeasibilities
- int nIinf_

  number of integer infeasibilities
- CouNumber objVal_

  objective function value
- CouNumber maxNLinf_

  maximum NL infeasibility
- CouNumber maxIinf_

  maximum integer infeasibility

- bool copied_

  This is a temporary copy, not really a solution holder.
- CouenneProblem ∗ problem_

  holds pointer to problem to check integrality in comparison of integer variables

7.25.1 Detailed Description

Class containing a solution with infeasibility evaluation.

Definition at line 32 of file CouenneFPpool.hpp.

7.25.2 Constructor & Destructor Documentation

7.25.2.1 Couenne::CouenneFPsolution::CouenneFPsolution (CouenneProblem ∗ *p*, CouNumber ∗ *x*, bool *copied* = false)

CouenneProblem-aware constructor.

7.25.2.2 Couenne::CouenneFPsolution::CouenneFPsolution (const CouenneFPsolution & *src*)

copy constructor

7.25.2.3 Couenne::CouenneFPsolution::∼CouenneFPsolution ( )

destructor

7.25.3 Member Function Documentation

7.25.3.1 CouenneFPsolution& Couenne::CouenneFPsolution::operator= (const CouenneFPsolution & *src*)

assignment

7.25.3.2 const int Couenne::CouenneFPsolution::n ( ) const [inline]

returns size

Definition at line 65 of file CouenneFPpool.hpp.

7.25.3.3 const double∗ Couenne::CouenneFPsolution::x ( ) const [inline]

returns vector

Definition at line 68 of file CouenneFPpool.hpp.

7.25.3.4 bool Couenne::CouenneFPsolution::compare (const CouenneFPsolution & *other*, enum what_to_compare *comparedTerm*) const

basic comparison procedure – what to compare depends on user's choice

7.25.4 Member Data Documentation

7.25.4.1 CouNumber∗ Couenne::CouenneFPsolution::x_ [protected]

solution

Definition at line 36 of file CouenneFPpool.hpp.

7.25.4.2 int Couenne::CouenneFPsolution::n_ [protected]

number of variables (for independence from CouenneProblem)

Definition at line 37 of file CouenneFPpool.hpp.

7.25.4.3 int Couenne::CouenneFPsolution::nNLinf_ [protected]

number of NL infeasibilities

Definition at line 38 of file CouenneFPpool.hpp.

7.25.4.4 int Couenne::CouenneFPsolution::nIinf_ [protected]

number of integer infeasibilities

Definition at line 39 of file CouenneFPpool.hpp.

7.25.4.5 CouNumber Couenne::CouenneFPsolution::objVal_ [protected]

objective function value

Definition at line 40 of file CouenneFPpool.hpp.

7.25.4.6 CouNumber Couenne::CouenneFPsolution::maxNLinf_ [protected]

maximum NL infeasibility

Definition at line 41 of file CouenneFPpool.hpp.

7.25.4.7 CouNumber Couenne::CouenneFPsolution::maxIinf_ [protected]

maximum integer infeasibility

Definition at line 42 of file CouenneFPpool.hpp.

7.25.4.8 bool Couenne::CouenneFPsolution::copied_ [protected]

This is a temporary copy, not really a solution holder.

As a result, all the above members are meaningless for copied solutions

Definition at line 48 of file CouenneFPpool.hpp.

7.25.4.9 CouenneProblem* Couenne::CouenneFPsolution::problem_ [protected]

holds pointer to problem to check integrality in comparison of integer variables

Definition at line 50 of file CouenneFPpool.hpp.

The documentation for this class was generated from the following file:

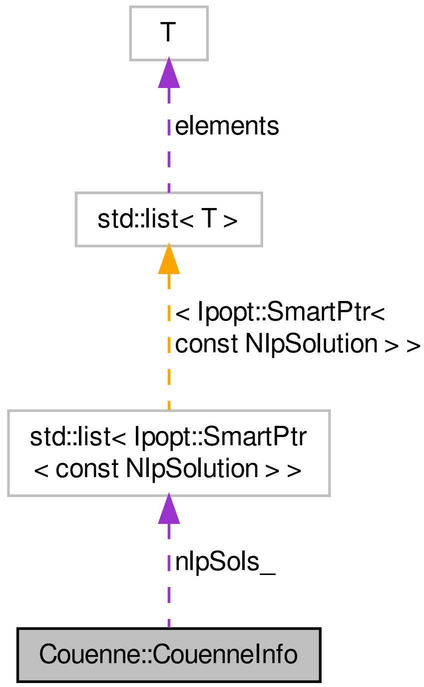
- /home/ted/COIN/trunk/Couenne/src/heuristics/CouenneFPpool.hpp

7.26 Couenne::CouenneInfo Class Reference

Bonmin class for passing info between components of branch-and-cuts.

`#include <BonCouenneInfo.hpp>`

Collaboration diagram for Couenne::CouenneInfo:



Classes

- class NlpSolution

    Class for storing an Nlp Solution.

Public Member Functions

- CouenneInfo (int type)

    Default constructor.
- CouenneInfo (const OsiBabSolver &other)

    Constructor from OsiBabSolver.
- CouenneInfo (const CouenneInfo &other)

    Copy constructor.
- virtual ∼CouenneInfo ()

    Destructor.
- virtual OsiAuxInfo ∗ clone () const

    Virtual copy constructor.
- const std::list
  < Ipopt::SmartPtr< const
  NlpSolution > > & NlpSolutions () const

List of all stored NLP solutions.

- void addSolution (Ipopt::SmartPtr< const NlpSolution > newSol)

  Add a new NLP solution.

Protected Attributes

- std::list< Ipopt::SmartPtr
  < const NlpSolution > > nlpSols_

7.26.1 Detailed Description

Bonmin class for passing info between components of branch-and-cuts.

Definition at line 22 of file BonCouenneInfo.hpp.

7.26.2 Constructor & Destructor Documentation

7.26.2.1 Couenne::CouenneInfo::CouenneInfo (int *type*)

Default constructor.

7.26.2.2 Couenne::CouenneInfo::CouenneInfo (const OsiBabSolver & *other*)

Constructor from OsiBabSolver.

7.26.2.3 Couenne::CouenneInfo::CouenneInfo (const **CouenneInfo** & *other*)

Copy constructor.

7.26.2.4 virtual Couenne::CouenneInfo::∼CouenneInfo ( ) [virtual]

Destructor.

7.26.3 Member Function Documentation

7.26.3.1 virtual OsiAuxInfo∗ Couenne::CouenneInfo::clone ( ) const [virtual]

Virtual copy constructor.

7.26.3.2 const std::list<Ipopt::SmartPtr<const **NlpSolution**> >& Couenne::CouenneInfo::NlpSolutions ( ) const [inline]

List of all stored NLP solutions.

Definition at line 81 of file BonCouenneInfo.hpp.

7.26.3.3 void Couenne::CouenneInfo::addSolution (Ipopt::SmartPtr< const **NlpSolution** > *newSol*) [inline]

Add a new NLP solution.

Definition at line 86 of file BonCouenneInfo.hpp.

7.26.4 Member Data Documentation

7.26.4.1 std::list<Ipopt::SmartPtr<const NlpSolution> > Couenne::CouenneInfo::nlpSols_ [protected]

Definition at line 92 of file BonCouenneInfo.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/main/BonCouenneInfo.hpp

7.27 Couenne::CouenneInterface Class Reference

`#include <BonCouenneInterface.hpp>`

Public Member Functions

- CouenneInterface ()

  Default constructor.
- CouenneInterface (const CouenneInterface &other)

  Copy constructor.
- virtual CouenneInterface * clone (bool CopyData)

  virutal copy constructor.
- virtual ~CouenneInterface ()

  Destructor.
- virtual std::string appName ()

Overloaded methods to build outer approximations

- bool have_nlp_solution_

  true if we got an integer feasible solution from initial solve
- virtual void extractLinearRelaxation (OsiSolverInterface &si, CouenneCutGenerator &couenneCg, bool getObj=1, bool solveNlp=1)

  Extract a linear relaxation of the MINLP.
- virtual void setAppDefaultOptions (Ipopt::SmartPtr< Ipopt::OptionsList > Options)

  To set some application specific defaults.
- bool haveNlpSolution ()

  *return value of have_nlp_solution_*

7.27.1 Detailed Description

Definition at line 33 of file BonCouenneInterface.hpp.

7.27.2 Constructor & Destructor Documentation

7.27.2.1 Couenne::CouenneInterface::CouenneInterface ( )

Default constructor.

7.27.2.2 Couenne::CouenneInterface::CouenneInterface (const CouenneInterface & *other*)

Copy constructor.

7.27.2.3 virtual Couenne::CouenneInterface::∼CouenneInterface ( ) [virtual]

Destructor.

7.27.3 Member Function Documentation

7.27.3.1 virtual CouenneInterface∗ Couenne::CouenneInterface::clone (bool *CopyData*) [virtual]

virutal copy constructor.

7.27.3.2 virtual std::string Couenne::CouenneInterface::appName ( ) [inline], [virtual]

Definition at line 49 of file BonCouenneInterface.hpp.

7.27.3.3 virtual void Couenne::CouenneInterface::extractLinearRelaxation (OsiSolverInterface & *si,* CouenneCutGenerator & *couenneCg,* bool *getObj* = 1, bool *solveNlp* = 1) [virtual]

Extract a linear relaxation of the MINLP.

Solve the continuous relaxation and takes first-order outer-approximation constraints at the optimum. The put everything in an OsiSolverInterface.

7.27.3.4 virtual void Couenne::CouenneInterface::setAppDefaultOptions (Ipopt::SmartPtr< Ipopt::OptionsList > *Options*) [virtual]

To set some application specific defaults.

7.27.3.5 bool Couenne::CouenneInterface::haveNlpSolution ( ) [inline]

return value of have_nlp_solution_

Definition at line 73 of file BonCouenneInterface.hpp.

7.27.4 Member Data Documentation

7.27.4.1 bool Couenne::CouenneInterface::have_nlp_solution_ [protected]

true if we got an integer feasible solution from initial solve

Definition at line 79 of file BonCouenneInterface.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/interfaces/BonCouenneInterface.hpp

7.28 Couenne::CouenneIterativeRounding Class Reference

An iterative rounding heuristic, tailored for nonconvex MINLPs.

```
#include <CouenneIterativeRounding.hpp>
```

Public Member Functions

- CouenneIterativeRounding ()

  Default constructor.
- CouenneIterativeRounding (Bonmin::OsiTMINLPInterface ∗nlp, OsiSolverInterface ∗cinlp, CouenneProblem ∗couenne, Ipopt::SmartPtr< Ipopt::OptionsList > options)

  Constructor with model and Couenne problems.
- CouenneIterativeRounding (const CouenneIterativeRounding &other)

  Copy constructor.
- virtual ∼CouenneIterativeRounding ()

  Destructor.
- virtual CbcHeuristic ∗ clone () const

  Clone.
- CouenneIterativeRounding & operator= (const CouenneIterativeRounding &rhs)

  Assignment operator.
- void setNlp (Bonmin::OsiTMINLPInterface ∗nlp, OsiSolverInterface ∗cinlp)

  Set the minlp solver.
- void setCouenneProblem (CouenneProblem ∗couenne)

  Set the couenne problem to use.
- void resetModel (CbcModel ∗model)

  Does nothing.
- int solution (double &objectiveValue, double ∗newSolution)

  Run heuristic, return 1 if a better solution than the one passed is found and 0 otherwise.
- void setMaxRoundingIter (int value)

  Set maximum number of iterations for each rounding phase.
- void setMaxFirPoints (int value)

  Set maximum number of points that we try to round in F-IR.
- void setMaxTime (double value)

  Set maximum CPU time for the heuristic at each node.
- void setMaxTimeFirstCall (double value)

  Set maximum CPU time for the heuristic at the root node only.
- void setOmega (double value)

  Set the value for omega, the multiplicative factor for the minimum log-barrier parameter mu used by F-IR whenever we need to generate a new NLP feasible point (in the interior of the feasible region)
- void setBaseLbRhs (int value)

  Set the base value for the rhs of the local branching constraint in the I-IR heuristic.
- void setAggressiveness (int value)

  Set aggressiveness of heuristic.

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions >)

  initialize options to be read later

7.28.1 Detailed Description

An iterative rounding heuristic, tailored for nonconvex MINLPs.

It solves a sequence of MILPs and NLPs for a given number of iterations, or until a better solution is found.

Definition at line 36 of file CouenneIterativeRounding.hpp.

7.28.2 Constructor & Destructor Documentation

7.28.2.1 Couenne::CouenneIterativeRounding::CouenneIterativeRounding ( )

Default constructor.

7.28.2.2 Couenne::CouenneIterativeRounding::CouenneIterativeRounding (Bonmin::OsiTMINLPInterface ∗ *nlp*, OsiSolverInterface ∗ *cinlp*, CouenneProblem ∗ *couenne*, Ipopt::SmartPtr< Ipopt::OptionsList > *options*)

Constructor with model and Couenne problems.

7.28.2.3 Couenne::CouenneIterativeRounding::CouenneIterativeRounding (const CouenneIterativeRounding & *other*)

Copy constructor.

7.28.2.4 virtual Couenne::CouenneIterativeRounding::∼CouenneIterativeRounding ( ) [virtual]

Destructor.

7.28.3 Member Function Documentation

7.28.3.1 virtual CbcHeuristic∗ Couenne::CouenneIterativeRounding::clone ( ) const [virtual]

Clone.

7.28.3.2 CouenneIterativeRounding& Couenne::CouenneIterativeRounding::operator= (const CouenneIterativeRounding & *rhs*)

Assignment operator.

7.28.3.3 void Couenne::CouenneIterativeRounding::setNlp (Bonmin::OsiTMINLPInterface ∗ *nlp*, OsiSolverInterface ∗ *cinlp*)

Set the minlp solver.

7.28.3.4 void Couenne::CouenneIterativeRounding::setCouenneProblem (CouenneProblem ∗ *couenne*) [inline]

Set the couenne problem to use.

Definition at line 62 of file CouenneIterativeRounding.hpp.

7.28.3.5 void Couenne::CouenneIterativeRounding::resetModel (CbcModel ∗ *model*) [inline]

Does nothing.

Definition at line 67 of file CouenneIterativeRounding.hpp.

7.28.3.6 int Couenne::CouenneIterativeRounding::solution (double & *objectiveValue*, double ∗ *newSolution*)

Run heuristic, return 1 if a better solution than the one passed is found and 0 otherwise.

objectiveValue Best known solution in input and value of solution found in output newSolution Solution found by heuristic.

7.28.3.7 void Couenne::CouenneIterativeRounding::setMaxRoundingIter (int *value*) [inline]

Set maximum number of iterations for each rounding phase.

Definition at line 79 of file CouenneIterativeRounding.hpp.

7.28.3.8 void Couenne::CouenneIterativeRounding::setMaxFirPoints (int *value*) [inline]

Set maximum number of points that we try to round in F-IR.

Definition at line 84 of file CouenneIterativeRounding.hpp.

7.28.3.9 void Couenne::CouenneIterativeRounding::setMaxTime (double *value*) [inline]

Set maximum CPU time for the heuristic at each node.

Definition at line 89 of file CouenneIterativeRounding.hpp.

7.28.3.10 void Couenne::CouenneIterativeRounding::setMaxTimeFirstCall (double *value*) [inline]

Set maximum CPU time for the heuristic at the root node only.

Definition at line 94 of file CouenneIterativeRounding.hpp.

7.28.3.11 void Couenne::CouenneIterativeRounding::setOmega (double *value*) [inline]

Set the value for omega, the multiplicative factor for the minimum log-barrier parameter mu used by F-IR whenever we need to generate a new NLP feasible point (in the interior of the feasible region)

Definition at line 102 of file CouenneIterativeRounding.hpp.

7.28.3.12 void Couenne::CouenneIterativeRounding::setBaseLbRhs (int *value*) [inline]

Set the base value for the rhs of the local branching constraint in the I-IR heuristic.

The actual rhs is then computed depending on current variable bounds

Definition at line 109 of file CouenneIterativeRounding.hpp.

7.28.3.13 void Couenne::CouenneIterativeRounding::setAggressiveness (int *value*)

Set aggressiveness of heuristic.

Three levels, that sets various parameters accordingly.

The levels are: 0: maxRoundingIter = 5, maxTimeFirstCall = 300, maxFirPoints = 5, maxTime = 60 1: maxRoundingIter = 10, maxTimeFirstCall = 300, maxFirPoints = 5, maxTime = 120 2: maxRoundingIter = 20, maxTimeFirstCall = 1000, maxFirPoints = 5, maxTime = 300

7.28.3.14 static void Couenne::CouenneIterativeRounding::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions >) [static]

initialize options to be read later

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/heuristics/CouenneIterativeRounding.hpp

7.29 Couenne::CouenneMINLPInterface Class Reference

This is class provides an Osi interface for a Mixed Integer Linear Program expressed as a TMINLP (so that we can use it for example as the continuous solver in Cbc).

`#include <CouenneMINLPInterface.hpp>`

Public Member Functions

- void setObj (int index, expression ∗newObj)

  REMOVE — backward compatibility sets objective[index] at newObj.
- void setInitSol (const CouNumber ∗sol)

  sets the initial solution for the NLP solver
- CouNumber solve (CouNumber ∗solution)

  solves and returns the optimal objective function and the solution
- CouenneProblem ∗ problem () const

  return pointer to Couenne problem
- Ipopt::OptionsList ∗ options () const

  return pointer to options

7.29.1 Detailed Description

This is class provides an Osi interface for a Mixed Integer Linear Program expressed as a TMINLP (so that we can use it for example as the continuous solver in Cbc).

Definition at line 59 of file CouenneMINLPInterface.hpp.

7.29.2 Member Function Documentation

7.29.2.1 void Couenne::CouenneMINLPInterface::setObj (int *index,* expression ∗ *newObj*) [inline]

REMOVE — backward compatibility sets objective[index] at newObj.

Definition at line 65 of file CouenneMINLPInterface.hpp.

7.29.2.2 void Couenne::CouenneMINLPInterface::setInitSol (const CouNumber ∗ *sol*)

sets the initial solution for the NLP solver

7.29.2.3 CouNumber Couenne::CouenneMINLPInterface::solve (CouNumber ∗ *solution*)

solves and returns the optimal objective function and the solution

7.29.2.4 CouenneProblem∗ Couenne::CouenneMINLPInterface::problem ( ) const [inline]

return pointer to Couenne problem

Definition at line 75 of file CouenneMINLPInterface.hpp.

7.29.2.5 Ipopt::OptionsList∗ Couenne::CouenneMINLPInterface::options ( ) const [inline]

return pointer to options

Definition at line 79 of file CouenneMINLPInterface.hpp.

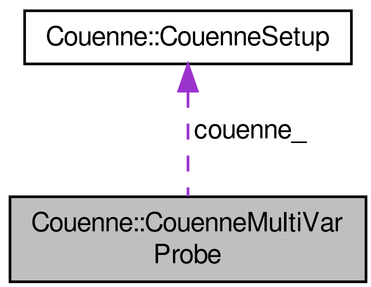
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/interfaces/CouenneMINLPInterface.hpp

7.30 Couenne::CouenneMultiVarProbe Class Reference

`#include <CouenneMultiVarProbe.hpp>`

Collaboration diagram for Couenne::CouenneMultiVarProbe:



Public Member Functions

- CouenneMultiVarProbe (CouenneSetup ∗couenne, const Ipopt::SmartPtr< Ipopt::OptionsList > options)

  Constructor.
- CouenneMultiVarProbe (const CouenneMultiVarProbe &rhs)

  Copy constructor.
- ∼CouenneMultiVarProbe ()

  Destructor.
- CouenneMultiVarProbe ∗ clone () const

  Clone method (necessary for the abstract CglCutGenerator class)
- void generateCuts (const OsiSolverInterface &solver, OsiCuts &cuts, const CglTreeInfo=CglTreeInfo()) const

  The main CglCutGenerator; not implemented yet.

Protected Attributes

- CouenneSetup ∗ couenne_

  Pointer to the CouenneProblem representation.
- int numCols_

  Number of columns (want to have this handy)
- double maxTime_

  Maximum time to probe one variable.

7.30.1 Detailed Description

Definition at line 25 of file CouenneMultiVarProbe.hpp.

7.30.2 Constructor & Destructor Documentation

7.30.2.1 Couenne::CouenneMultiVarProbe::CouenneMultiVarProbe (CouenneSetup * *couenne*, const Ipopt::SmartPtr< Ipopt::OptionsList > *options*)

Constructor.

7.30.2.2 Couenne::CouenneMultiVarProbe::CouenneMultiVarProbe (const CouenneMultiVarProbe & *rhs*)

Copy constructor.

7.30.2.3 Couenne::CouenneMultiVarProbe::∼CouenneMultiVarProbe ( )

Destructor.

7.30.3 Member Function Documentation

7.30.3.1 CouenneMultiVarProbe* Couenne::CouenneMultiVarProbe::clone ( ) const [inline]

Clone method (necessary for the abstract CglCutGenerator class)

Definition at line 40 of file CouenneMultiVarProbe.hpp.

7.30.3.2 void Couenne::CouenneMultiVarProbe::generateCuts (const OsiSolverInterface & *solver*, OsiCuts & *cuts*, const CglTreeInfo = CglTreeInfo()) const

The main CglCutGenerator; not implemented yet.

7.30.4 Member Data Documentation

7.30.4.1 CouenneSetup* Couenne::CouenneMultiVarProbe::couenne_ [protected]

Pointer to the CouenneProblem representation.

Definition at line 51 of file CouenneMultiVarProbe.hpp.

7.30.4.2 int Couenne::CouenneMultiVarProbe::numCols_ [protected]

Number of columns (want to have this handy)

Definition at line 54 of file CouenneMultiVarProbe.hpp.

7.30.4.3 double Couenne::CouenneMultiVarProbe::maxTime_ [protected]

Maximum time to probe one variable.

Definition at line 57 of file CouenneMultiVarProbe.hpp.

The documentation for this class was generated from the following file:

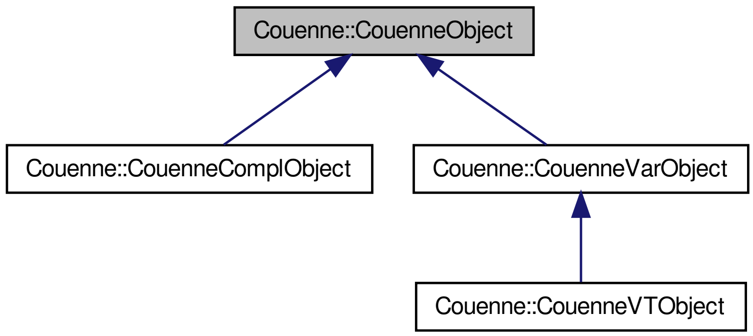
- /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneMultiVarProbe.hpp

7.31 Couenne::CouenneObject Class Reference

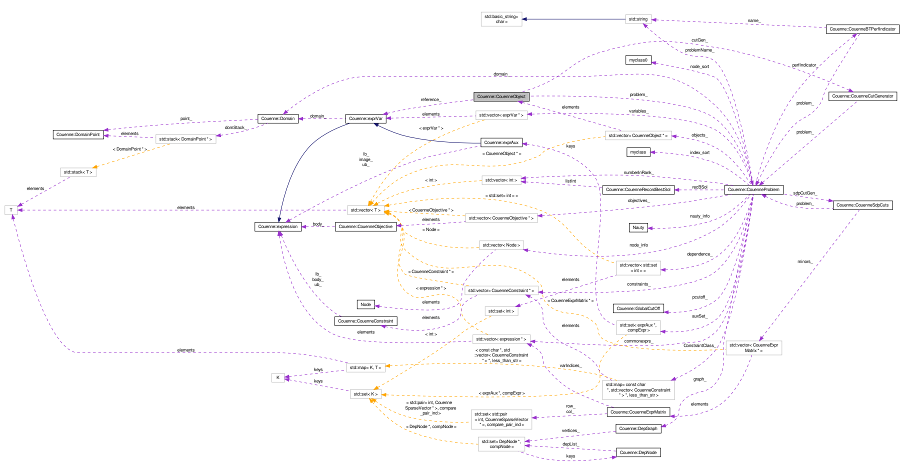
OsiObject for auxiliary variables $w=f(x)$.

`#include <CouenneObject.hpp>`

Inheritance diagram for Couenne::CouenneObject:



Collaboration diagram for Couenne::CouenneObject:



Public Types

- enum pseudocostMult {
INFEASIBILITY, INTERVAL_LP, INTERVAL_LP_REV, INTERVAL_BR,
INTERVAL_BR_REV, PROJECTDIST }

    type of up/down estimate to return for pseudocosts
- enum branch_obj { EXPR_OBJ, VAR_OBJ, VT_OBJ }

    type of object (for branching variable selection)

- enum brSelStrat {
  NO_STRATEGY, NO_BRANCH, MID_INTERVAL, MIN_AREA,
  BALANCED, LP_CENTRAL, LP_CLAMPED }

  strategy names

Public Member Functions

- CouenneObject ()

  empty constructor (for unused objects)
- CouenneObject (CouenneCutGenerator ∗cutgen, CouenneProblem ∗p, exprVar ∗ref, Bonmin::BabSetupBase ∗base, JnlstPtr jnlst)

  Constructor with information for branching point selection strategy.
- CouenneObject (exprVar ∗ref, Bonmin::BabSetupBase ∗base, JnlstPtr jnlst)

  Constructor with lesser information, used for infeasibility only.
- ∼CouenneObject ()

  Destructor.
- CouenneObject (const CouenneObject &src)

  Copy constructor.
- virtual CouenneObject ∗ clone () const

  Cloning method.
- void setParameters (Bonmin::BabSetupBase ∗base)

  set object parameters by reading from command line
- virtual double infeasibility (const OsiBranchingInformation ∗info, int &way) const

  compute infeasibility of this variable, |w - f(x)| (where w is the auxiliary variable defined as w = f(x)
- virtual double checkInfeasibility (const OsiBranchingInformation ∗info) const

  compute infeasibility of this variable, |w - f(x)|, where w is the auxiliary variable defined as w = f(x)
- virtual double feasibleRegion (OsiSolverInterface ∗, const OsiBranchingInformation ∗) const

  fix (one of the) arguments of reference auxiliary variable
- virtual OsiBranchingObject ∗ createBranch (OsiSolverInterface ∗, const OsiBranchingInformation ∗, int) const

  create CouenneBranchingObject or CouenneThreeWayBranchObj based on this object
- exprVar ∗ Reference () const

  return reference auxiliary variable
- enum brSelStrat Strategy () const

  return branching point selection strategy
- CouNumber getBrPoint (funtriplet ∗ft, CouNumber x0, CouNumber l, CouNumber u, const OsiBranchingInformation ∗info=NULL) const

  pick branching point based on current strategy
- CouNumber midInterval (CouNumber x, CouNumber l, CouNumber u, const OsiBranchingInformation ∗info=NULL) const

  returns a point "inside enough" a given interval, or x if it already is.
- virtual double downEstimate () const

  Return "down" estimate (for non-convex, distance old <–> new LP point)
- virtual double upEstimate () const

  Return "up" estimate (for non-convex, distance old <–> new LP point)
- void setEstimate (double est, int direction)

  set up/down estimate (0 for down, 1 for up).
- void setEstimates (const OsiBranchingInformation ∗info, CouNumber ∗infeasibility, CouNumber ∗brpt) const

set up/down estimates based on branching information

- virtual bool isCuttable () const

  are we on the bad or good side of the expression?

- virtual double intInfeasibility (double value, double lb, double ub) const

  integer infeasibility: min {value - floor(value), ceil(value) - value}

- CouNumber lp_clamp () const

  Defines safe interval percentage for using LP point as a branching point.

- virtual int columnNumber () const

  Returns the column index.

Protected Attributes

- CouenneCutGenerator * cutGen_

  pointer to cut generator (not necessary, can be NULL)

- CouenneProblem * problem_

  pointer to Couenne problem

- exprVar * reference_

  The (auxiliary) variable this branching object refers to.

- enum brSelStrat strategy_

  Branching point selection strategy.

- JnlstPtr jnlst_

  SmartPointer to the Journalist.

- CouNumber alpha_

  Combination parameter for the mid-point branching point selection strategy.

- CouNumber lp_clamp_

  Defines safe interval percentage for using LP point as a branching point.

- CouNumber feas_tolerance_

  feasibility tolerance (equal to that of CouenneProblem)

- bool doFBBT_

  shall we do Feasibility based Bound Tightening (FBBT) at branching?

- bool doConvCuts_

  shall we add convexification cuts at branching?

- double downEstimate_

  down estimate (to be used in pseudocost)

- double upEstimate_

  up estimate (to be used in pseudocost)

- enum pseudocostMult pseudoMultType_

  multiplier type for pseudocost

7.31.1 Detailed Description

OsiObject for auxiliary variables $w=f(x)$.

Associated with a multi-variate function $f(x)$ and a related infeasibility $|w-f(x)|$, creates branches to help restoring feasibility

Definition at line 57 of file CouenneObject.hpp.

7.31.2 Member Enumeration Documentation

7.31.2.1 enum Couenne::CouenneObject::pseudocostMult

type of up/down estimate to return for pseudocosts

Enumerator:

INFEASIBILITY
INTERVAL_LP
INTERVAL_LP_REV
INTERVAL_BR
INTERVAL_BR_REV
PROJECTDIST

Definition at line 62 of file CouenneObject.hpp.

7.31.2.2 enum Couenne::CouenneObject::branch_obj

type of object (for branching variable selection)

Enumerator:

EXPR_OBJ
VAR_OBJ
VT_OBJ

Definition at line 68 of file CouenneObject.hpp.

7.31.2.3 enum Couenne::CouenneObject::brSelStrat

strategy names

Enumerator:

NO_STRATEGY
NO_BRANCH
MID_INTERVAL
MIN_AREA
BALANCED
LP_CENTRAL
LP_CLAMPED

Definition at line 71 of file CouenneObject.hpp.

7.31.3 Constructor & Destructor Documentation

7.31.3.1 Couenne::CouenneObject::CouenneObject ( )

empty constructor (for unused objects)

7.31.3.2 Couenne::CouenneObject::CouenneObject (CouenneCutGenerator * *cutgen*, CouenneProblem * *p*, exprVar * *ref*, Bonmin::BabSetupBase * *base*, JnlstPtr *jnlst*)

Constructor with information for branching point selection strategy.

7.31.3.3 Couenne::CouenneObject::CouenneObject (exprVar * *ref*, Bonmin::BabSetupBase * *base*, JnlstPtr *jnlst*)

Constructor with lesser information, used for infeasibility only.

7.31.3.4 Couenne::CouenneObject::~CouenneObject ( ) [inline]

Destructor.

Definition at line 85 of file CouenneObject.hpp.

7.31.3.5 Couenne::CouenneObject::CouenneObject (const CouenneObject & *src*)

Copy constructor.

7.31.4 Member Function Documentation

7.31.4.1 virtual CouenneObject* Couenne::CouenneObject::clone ( ) const [inline], [virtual]

Cloning method.

Reimplemented in Couenne::CouenneComplObject, Couenne::CouenneVarObject, and Couenne::CouenneVTObject.

Definition at line 91 of file CouenneObject.hpp.

7.31.4.2 void Couenne::CouenneObject::setParameters (Bonmin::BabSetupBase * *base*)

set object parameters by reading from command line

7.31.4.3 virtual double Couenne::CouenneObject::infeasibility (const OsiBranchingInformation * *info*, int & *way*) const [virtual]

compute infeasibility of this variable, |w - f(x)| (where w is the auxiliary variable defined as w = f(x)

Reimplemented in Couenne::CouenneVarObject, Couenne::CouenneComplObject, and Couenne::CouenneVTObject.

7.31.4.4 virtual double Couenne::CouenneObject::checkInfeasibility (const OsiBranchingInformation * *info*) const [virtual]

compute infeasibility of this variable, |w - f(x)|, where w is the auxiliary variable defined as w = f(x)

Reimplemented in Couenne::CouenneVarObject, and Couenne::CouenneComplObject.

7.31.4.5 virtual double Couenne::CouenneObject::feasibleRegion (OsiSolverInterface *, const OsiBranchingInformation *) const [virtual]

fix (one of the) arguments of reference auxiliary variable

Reimplemented in Couenne::CouenneVarObject.

7.31.4.6 virtual OsiBranchingObject* Couenne::CouenneObject::createBranch (OsiSolverInterface *, const OsiBranchingInformation *, int) const [virtual]

create CouenneBranchingObject or CouenneThreeWayBranchObj based on this object

Reimplemented in Couenne::CouenneVarObject, and Couenne::CouenneComplObject.

7.31.4.7 exprVar∗ Couenne::CouenneObject::Reference ( ) const [inline]

return reference auxiliary variable

Definition at line 114 of file CouenneObject.hpp.

7.31.4.8 enum brSelStrat Couenne::CouenneObject::Strategy ( ) const [inline]

return branching point selection strategy

Definition at line 118 of file CouenneObject.hpp.

7.31.4.9 CouNumber Couenne::CouenneObject::getBrPoint (funtriplet ∗ *ft*, CouNumber *x0*, CouNumber *l*, CouNumber *u*, const OsiBranchingInformation ∗ *info* = NULL) const

pick branching point based on current strategy

7.31.4.10 CouNumber Couenne::CouenneObject::midInterval (CouNumber *x*, CouNumber *l*, CouNumber *u*, const OsiBranchingInformation ∗ *info* = NULL) const

returns a point "inside enough" a given interval, or x if it already is.

Modify alpha_ using gap provided by info

7.31.4.11 virtual double Couenne::CouenneObject::downEstimate ( ) const [inline], [virtual]

Return "down" estimate (for non-convex, distance old <−> new LP point)

Definition at line 129 of file CouenneObject.hpp.

7.31.4.12 virtual double Couenne::CouenneObject::upEstimate ( ) const [inline], [virtual]

Return "up" estimate (for non-convex, distance old <−> new LP point)

Definition at line 138 of file CouenneObject.hpp.

7.31.4.13 void Couenne::CouenneObject::setEstimate (double *est*, int *direction*) [inline]

set up/down estimate (0 for down, 1 for up).

This happens in CouenneChooseStrong, where a new LP point is available and we can measure distance from old LP point. This is the denominator we use in pseudocost

Definition at line 150 of file CouenneObject.hpp.

7.31.4.14 void Couenne::CouenneObject::setEstimates (const OsiBranchingInformation ∗ *info*, CouNumber ∗ *infeasibility*, CouNumber ∗ *brpt*) const

set up/down estimates based on branching information

7.31.4.15 virtual bool Couenne::CouenneObject::isCuttable ( ) const [inline], [virtual]

are we on the bad or good side of the expression?

Reimplemented in Couenne::CouenneVarObject.

Definition at line 159 of file CouenneObject.hpp.

7.31.4.16 virtual double Couenne::CouenneObject::intInfeasibility (double *value,* double *lb,* double *ub*) const [virtual]

integer infeasibility: min {value - floor(value), ceil(value) - value}

7.31.4.17 CouNumber Couenne::CouenneObject::lp_clamp ( ) const [inline]

Defines safe interval percentage for using LP point as a branching point.

Definition at line 170 of file CouenneObject.hpp.

7.31.4.18 virtual int Couenne::CouenneObject::columnNumber ( ) const [inline], [virtual]

Returns the column index.

Definition at line 174 of file CouenneObject.hpp.

7.31.5 Member Data Documentation

7.31.5.1 CouenneCutGenerator* Couenne::CouenneObject::cutGen_ [protected]

pointer to cut generator (not necessary, can be NULL)

Definition at line 180 of file CouenneObject.hpp.

7.31.5.2 CouenneProblem* Couenne::CouenneObject::problem_ [protected]

pointer to Couenne problem

Definition at line 183 of file CouenneObject.hpp.

7.31.5.3 exprVar* Couenne::CouenneObject::reference_ [protected]

The (auxiliary) variable this branching object refers to.

If the expression is w=f(x,y), this is w, as opposed to CouenneBranchingObject, where it would be either x or y.

Definition at line 188 of file CouenneObject.hpp.

7.31.5.4 enum brSelStrat Couenne::CouenneObject::strategy_ [protected]

Branching point selection strategy.

Definition at line 191 of file CouenneObject.hpp.

7.31.5.5 JnlstPtr Couenne::CouenneObject::jnlst_ [protected]

SmartPointer to the Journalist.

Definition at line 194 of file CouenneObject.hpp.

7.31.5.6 CouNumber Couenne::CouenneObject::alpha_ [protected]

Combination parameter for the mid-point branching point selection strategy.

Definition at line 198 of file CouenneObject.hpp.

7.31.5.7 CouNumber Couenne::CouenneObject::lp_clamp_ [protected]

Defines safe interval percentage for using LP point as a branching point.

Definition at line 201 of file CouenneObject.hpp.

7.31.5.8 CouNumber Couenne::CouenneObject::feas_tolerance_ [protected]

feasibility tolerance (equal to that of CouenneProblem)

Definition at line 204 of file CouenneObject.hpp.

7.31.5.9 bool Couenne::CouenneObject::doFBBT_ [protected]

shall we do Feasibility based Bound Tightening (FBBT) at branching?

Definition at line 207 of file CouenneObject.hpp.

7.31.5.10 bool Couenne::CouenneObject::doConvCuts_ [protected]

shall we add convexification cuts at branching?

Definition at line 210 of file CouenneObject.hpp.

7.31.5.11 double Couenne::CouenneObject::downEstimate_ [mutable], [protected]

down estimate (to be used in pseudocost)

Definition at line 213 of file CouenneObject.hpp.

7.31.5.12 double Couenne::CouenneObject::upEstimate_ [mutable], [protected]

up estimate (to be used in pseudocost)

Definition at line 216 of file CouenneObject.hpp.

7.31.5.13 enum pseudocostMult Couenne::CouenneObject::pseudoMultType_ [protected]

multiplier type for pseudocost

Definition at line 219 of file CouenneObject.hpp.

The documentation for this class was generated from the following file:

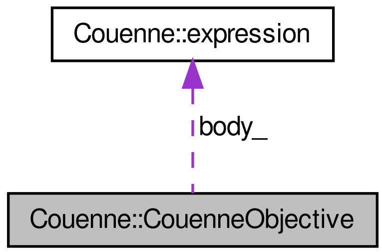
- /home/ted/COIN/trunk/Couenne/src/branch/CouenneObject.hpp

7.32 Couenne::CouenneObjective Class Reference

Objective function.

```
#include <CouenneProblemElem.hpp>
```

Collaboration diagram for Couenne::CouenneObjective:



Public Member Functions

- CouenneObjective (expression ∗body)

    constructor
- ∼CouenneObjective ()

    destructor
- CouenneObjective (const CouenneObjective &o, Domain ∗d=NULL)

    copy constructor
- CouenneObjective ∗ clone (Domain ∗d=NULL) const

    cloning method
- expression ∗ Body () const

    get body
- expression ∗ Body (expression ∗newBody)

    Set body.
- exprAux ∗ standardize (CouenneProblem ∗p)

    Get standard form of this objective function.
- void print (std::ostream &out=std::cout)

    Print to iostream.

Protected Attributes

- expression ∗ body_

    expression to optimize

7.32.1 Detailed Description

Objective function.

It consists of an expression only. We only assume minimization problems (proper sign changes are applied upon reading)

Definition at line 109 of file CouenneProblemElem.hpp.

7.32.2 Constructor & Destructor Documentation

7.32.2.1 Couenne::CouenneObjective::CouenneObjective (expression ∗ *body*) [inline]

constructor

Definition at line 119 of file CouenneProblemElem.hpp.

7.32.2.2 Couenne::CouenneObjective::∼CouenneObjective ( ) [inline]

destructor

Definition at line 123 of file CouenneProblemElem.hpp.

7.32.2.3 Couenne::CouenneObjective::CouenneObjective (const CouenneObjective & *o*, Domain ∗ *d* = NULL) [inline]

copy constructor

Definition at line 127 of file CouenneProblemElem.hpp.

7.32.3 Member Function Documentation

7.32.3.1 CouenneObjective∗ Couenne::CouenneObjective::clone (Domain ∗ *d* = NULL) const [inline]

cloning method

Definition at line 131 of file CouenneProblemElem.hpp.

7.32.3.2 expression∗ Couenne::CouenneObjective::Body ( ) const [inline]

get body

Definition at line 135 of file CouenneProblemElem.hpp.

7.32.3.3 expression∗ Couenne::CouenneObjective::Body (expression ∗ *newBody*) [inline]

Set body.

Definition at line 139 of file CouenneProblemElem.hpp.

7.32.3.4 exprAux∗ Couenne::CouenneObjective::standardize (CouenneProblem ∗ *p*) [inline]

Get standard form of this objective function.

Definition at line 143 of file CouenneProblemElem.hpp.

7.32.3.5 void Couenne::CouenneObjective::print (std::ostream & *out* = std::cout) [inline]

Print to iostream.

Definition at line 147 of file CouenneProblemElem.hpp.

7.32.4 Member Data Documentation

7.32.4.1 expression∗ Couenne::CouenneObjective::body_ [protected]

expression to optimize

Definition at line 114 of file CouenneProblemElem.hpp.

The documentation for this class was generated from the following file:

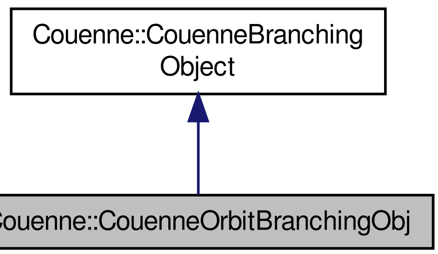
- /home/ted/COIN/trunk/Couenne/src/problem/CouenneProblemElem.hpp

7.33 Couenne::CouenneOrbitBranchingObj Class Reference

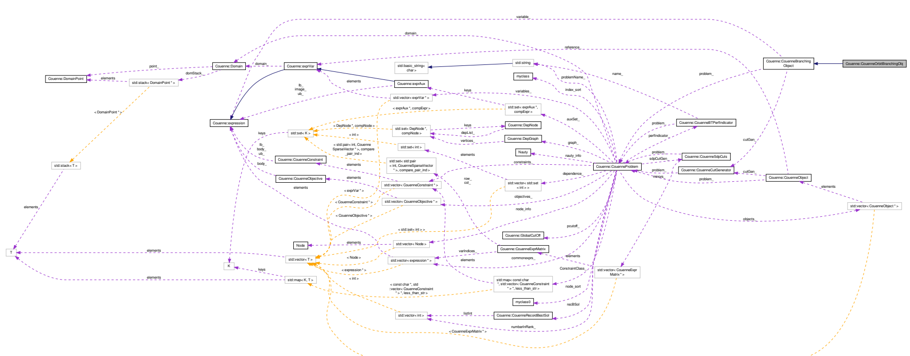
"Spatial" branching object.

`#include <CouenneOrbitBranchingObj.hpp>`

Inheritance diagram for Couenne::CouenneOrbitBranchingObj:



Collaboration diagram for Couenne::CouenneOrbitBranchingObj:



Public Member Functions

- CouenneOrbitBranchingObj (OsiSolverInterface ∗solver, const OsiObject ∗originalObject, JnlstPtr jnlst, CouenneCutGenerator ∗c, CouenneProblem ∗p, expression ∗var, int way, CouNumber brpoint, bool doFBBT, bool doConvCuts)

    Constructor.
- CouenneOrbitBranchingObj (const CouenneOrbitBranchingObj &src)

Copy constructor.

- virtual OsiBranchingObject ∗ clone () const

  cloning method

- virtual double branch (OsiSolverInterface ∗solver=NULL)

  Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

- virtual bool boundBranch () const

  does this branching object only change variable bounds?

- void setSimulate (bool s)

  set simulate_ field below

Additional Inherited Members

7.33.1 Detailed Description

"Spatial" branching object.

Branching can also be performed on continuous variables.

Definition at line 36 of file CouenneOrbitBranchingObj.hpp.

7.33.2 Constructor & Destructor Documentation

7.33.2.1 Couenne::CouenneOrbitBranchingObj::CouenneOrbitBranchingObj (OsiSolverInterface ∗ *solver,* const OsiObject ∗ *originalObject,* JnlstPtr *jnlst,* CouenneCutGenerator ∗ *c,* CouenneProblem ∗ *p,* expression ∗ *var,* int *way,* CouNumber *brpoint,* bool *doFBBT,* bool *doConvCuts*)

Constructor.

7.33.2.2 Couenne::CouenneOrbitBranchingObj::CouenneOrbitBranchingObj (const CouenneOrbitBranchingObj & *src*) [inline]

Copy constructor.

Definition at line 53 of file CouenneOrbitBranchingObj.hpp.

7.33.3 Member Function Documentation

7.33.3.1 virtual OsiBranchingObject∗ Couenne::CouenneOrbitBranchingObj::clone ( ) const [inline], [virtual]

cloning method

Reimplemented from Couenne::CouenneBranchingObject.

Definition at line 58 of file CouenneOrbitBranchingObj.hpp.

7.33.3.2 virtual double Couenne::CouenneOrbitBranchingObj::branch (OsiSolverInterface ∗ *solver* = NULL) [virtual]

Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Returns change in guessed objective on next branch

Reimplemented from Couenne::CouenneBranchingObject.

7.33.3.3 virtual bool Couenne::CouenneOrbitBranchingObj::boundBranch ( ) const [inline], [virtual]

does this branching object only change variable bounds?

Reimplemented from Couenne::CouenneBranchingObject.

Definition at line 69 of file CouenneOrbitBranchingObj.hpp.

7.33.3.4 void Couenne::CouenneOrbitBranchingObj::setSimulate (bool *s*) [inline]

set simulate_ field below

Reimplemented from Couenne::CouenneBranchingObject.

Definition at line 73 of file CouenneOrbitBranchingObj.hpp.

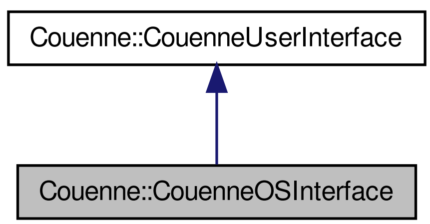
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/branch/CouenneOrbitBranchingObj.hpp

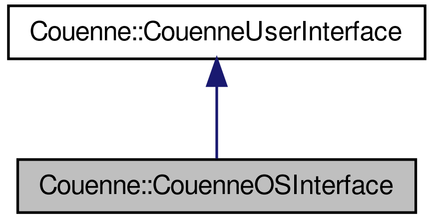
7.34 Couenne::CouenneOSInterface Class Reference

`#include <CouenneOSInterface.hpp>`

Inheritance diagram for Couenne::CouenneOSInterface:



Collaboration diagram for Couenne::CouenneOSInterface:



Public Member Functions

- CouenneOSInterface (Ipopt::SmartPtr< Ipopt::OptionsList > options_, Ipopt::SmartPtr< Ipopt::Journalist > jnlst_)
- ∼CouenneOSInterface ()
- CouenneProblem ∗ getCouenneProblem ()

  Should return the problem to solve in algebraic form.
- Ipopt::SmartPtr< Bonmin::TMINLP > getTMINLP ()

  Should return the problem to solve as TMINLP.
- bool writeSolution (Bonmin::Bab &bab)

  Called after B&B finished.

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

Additional Inherited Members

7.34.1 Detailed Description

Definition at line 36 of file CouenneOSInterface.hpp.

7.34.2 Constructor & Destructor Documentation

7.34.2.1 Couenne::CouenneOSInterface::CouenneOSInterface (Ipopt::SmartPtr< Ipopt::OptionsList > *options_*, Ipopt::SmartPtr< Ipopt::Journalist > *jnlst_*) [inline]

Definition at line 46 of file CouenneOSInterface.hpp.

7.34.2.2 Couenne::CouenneOSInterface::∼CouenneOSInterface ( )

7.34.3 Member Function Documentation

7.34.3.1 static void Couenne::CouenneOSInterface::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

7.34.3.2 CouenneProblem∗ Couenne::CouenneOSInterface::getCouenneProblem ( ) [virtual]

Should return the problem to solve in algebraic form.

NOTE: Couenne is (currently) going to modify this problem!

Implements Couenne::CouenneUserInterface.

7.34.3.3 Ipopt::SmartPtr<Bonmin::TMINLP> Couenne::CouenneOSInterface::getTMINLP ( ) [virtual]

Should return the problem to solve as TMINLP.

Implements Couenne::CouenneUserInterface.

7.34.3.4 bool Couenne::CouenneOSInterface::writeSolution (Bonmin::Bab & *bab*) [virtual]

Called after B&B finished.

Should write solution information.

Reimplemented from Couenne::CouenneUserInterface.

The documentation for this class was generated from the following file:

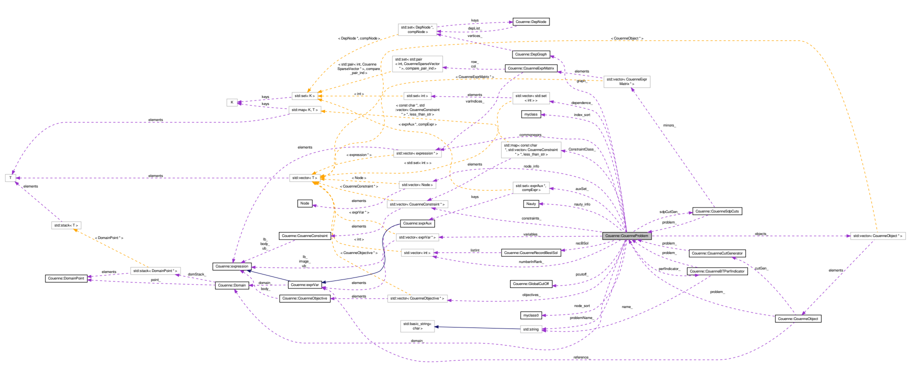
- /home/ted/COIN/trunk/Couenne/src/main/CouenneOSInterface.hpp

7.35 Couenne::CouenneProblem Class Reference

Class for MINLP problems with symbolic information.

`#include <CouenneProblem.hpp>`

Collaboration diagram for Couenne::CouenneProblem:



Public Types

- enum multiSep { MulSepNone, MulSepSimple, MulSepTight }

Type of multilinear separation.

Public Member Functions

- CouenneProblem (ASL ∗=NULL, Bonmin::BabSetupBase ∗base=NULL, JnlstPtr jnlst=NULL)

  Constructor.
- CouenneProblem (const CouenneProblem &)

  Copy constructor.
- ∼CouenneProblem ()

  Destructor.
- void initOptions (Ipopt::SmartPtr< Ipopt::OptionsList > options)

  initializes parameters like doOBBT
- CouenneProblem ∗ clone () const

  Clone method (for use within CouenneCutGenerator::clone)
- int nObjs () const

  Get number of objectives.
- int nCons () const

  Get number of constraints.
- int nOrigCons () const

  Get number of original constraints.
- int nOrigVars () const

  Number of orig. variables.
- int nDefVars () const

  Number of def'd variables.
- int nOrigIntVars () const

  Number of original integers.
- int nIntVars () const

  Number of integer variables.
- int nVars () const

  Total number of variables.
- void setNDefVars (int ndefined__)
- std::vector< int > ∗ Find_Orbit (int) const
- void sym_setup ()
- void Compute_Symmetry () const
- void Print_Orbits () const
- void ChangeBounds (const double ∗, const double ∗, int) const
- bool compare (register Node &a, register Node &b) const
- Nauty ∗ getNtyInfo ()
- void setupSymmetry ()

  empty if no NTY, symmetry data structure setup otherwise
- int evalOrder (int i) const

  get evaluation order index
- int ∗ evalVector ()

  get evaluation order vector (numbering_)
- CouenneConstraint ∗ Con (int i) const

  i-th constraint
- CouenneObjective ∗ Obj (int i) const

i-th objective
- exprVar ∗ Var (int i) const

  Return pointer to i-th variable.
- std::vector< exprVar ∗ > & Variables ()

  Return vector of variables (symbolic representation)
- std::set< exprAux ∗, compExpr > ∗& AuxSet ()

  Return pointer to set for comparisons.
- DepGraph ∗ getDepGraph ()

  Return pointer to dependence graph.
- Domain ∗ domain () const

  return current point & bounds
- std::vector< expression ∗ > & commonExprs ()
- CouNumber & X (int i) const

  x_i
- CouNumber & Lb (int i) const

  lower bound on x_i
- CouNumber & Ub (int i) const

  upper bound on x_i
- CouNumber ∗ X () const

  Return vector of variables.
- CouNumber ∗ Lb () const

  Return vector of lower bounds.
- CouNumber ∗ Ub () const

  Return vector of upper bounds.
- CouNumber ∗& bestSol () const

  Best known solution (read from file)
- CouNumber bestObj () const

  Objective of best known solution.
- bool ∗& Commuted ()

  Get vector of commuted variables.
- void addObjective (expression ∗, const std::string &="min")

  Add (non linear) objective function.
- void addEQConstraint (expression ∗, expression ∗=NULL)

  Add equality constraint $h(x) = b$*.*
- void addGEConstraint (expression ∗, expression ∗=NULL)

  Add $\geq$ *constraint,* $h(x) \geq b$*.*
- void addLEConstraint (expression ∗, expression ∗=NULL)

  Add $\leq$ *constraint,* $h(x) \leq b$*.*
- void addRNGConstraint (expression ∗, expression ∗=NULL, expression ∗=NULL)

  Add range constraint, $a \leq h(x) \leq b$*.*
- void setObjective (int indObj=0, expression ∗=NULL, const std::string &="min")

  Add (non linear) objective function.
- expression ∗ addVariable (bool isint=false, Domain ∗d=NULL)

  Add original variable.
- exprAux ∗ addAuxiliary (expression ∗)

  Add auxiliary variable and associate it with expression given as argument (used in standardization)
- void reformulate (CouenneCutGenerator ∗=NULL)

preprocess problem in order to extract linear relaxations etc.

- bool standardize ()

  Break problem's nonlinear constraints in simple expressions to be convexified later.

- void print (std::ostream &=std::cout)

  Display current representation of problem: objective, linear and nonlinear constraints, and auxiliary variables.

- bool doFBBT () const

  shall we do Feasibility Based Bound Tightening?

- bool doRCBT () const

  shall we do reduced cost Bound Tightening?

- bool doOBBT () const

  shall we do Optimality Based Bound Tightening?

- bool doABT () const

  shall we do Aggressive Bound Tightening?

- int logObbtLev () const

  How often shall we do OBBT?

- int logAbtLev () const

  How often shall we do ABT?

- void writeAMPL (const std::string &fname, bool aux)

  Write nonlinear problem to a .mod file (with lots of defined variables)

- void writeGAMS (const std::string &fname)

  Write nonlinear problem to a .gms file.

- void writeLP (const std::string &fname)

  Write nonlinear problem to a .lp file.

- void initAuxs () const

  Initialize auxiliary variables and their bounds from original variables.

- void getAuxs (CouNumber ∗) const

  Get auxiliary variables from original variables.

- bool boundTightening (t_chg_bounds ∗, const CglTreeInfo info, Bonmin::BabInfo ∗=NULL) const

  tighten bounds using propagation, implied bounds and reduced costs

- bool btCore (t_chg_bounds ∗chg_bds) const

  core of the bound tightening procedure

- int obbt (const CouenneCutGenerator ∗cg, const OsiSolverInterface &csi, OsiCuts &cs, const CglTreeInfo &info, Bonmin::BabInfo ∗babInfo, t_chg_bounds ∗chg_bds)

  Optimality Based Bound Tightening.

- bool aggressiveBT (Bonmin::OsiTMINLPInterface ∗nlp, t_chg_bounds ∗, const CglTreeInfo &info, Bonmin::BabInfo ∗=NULL) const

  aggressive bound tightening.

- int redCostBT (const OsiSolverInterface ∗psi, t_chg_bounds ∗chg_bds) const

  procedure to strengthen variable bounds.

- int tightenBounds (t_chg_bounds ∗) const

  "Forward" bound tightening, that is, propagate bound of variable x in an expression $w = f(x)$ to the bounds of w.

- int impliedBounds (t_chg_bounds ∗) const

  "Backward" bound tightening, aka implied bounds.

- void fillQuadIndices ()

  Look for quadratic terms to be used with SDP cuts.

- void fillObjCoeff (double ∗&)

  Fill vector with coefficients of objective function.

- void auxiliarize (exprVar ∗, exprVar ∗=NULL)

  Replace all occurrences of original variable with new aux given as argument.
- void setCutOff (CouNumber cutoff, const CouNumber ∗sol=NULL) const

  Set cutoff.
- void resetCutOff (CouNumber value=COUENNE_INFINITY) const

  Reset cutoff.
- CouNumber getCutOff () const

  Get cutoff.
- CouNumber ∗ getCutOffSol () const

  Get cutoff solution.
- void installCutOff () const

  Make cutoff known to the problem.
- ConstJnlstPtr Jnlst () const

  Provide Journalist.
- bool checkNLP (const double ∗solution, double &obj, bool recompute=false) const

  Check if solution is MINLP feasible.
- int getIntegerCandidate (const double ∗xFrac, double ∗xInt, double ∗lb, double ∗ub) const

  generate integer NLP point Y starting from fractional solution using bound tightening
- bool readOptimum (std::string ∗fname=NULL)

  Read best known solution from file given in argument.
- exprAux ∗ linStandardize (bool addAux, CouNumber c0, LinMap &lmap, QuadMap &qmap)

  standardization of linear exprOp's
- int splitAux (CouNumber, expression ∗, expression ∗&, bool ∗, enum expression::auxSign &)

  split a constraint w - f(x) = c into w's index (it is returned) and rest = f(x) + c
- void indcoe2vector (int ∗indexL, CouNumber ∗coeff, std::vector< std::pair< exprVar ∗, CouNumber > > &lcoeff)

  translates pair (indices, coefficients) into vector with pointers to variables
- void indcoe2vector (int ∗indexI, int ∗indexJ, CouNumber ∗coeff, std::vector< quadElem > &qcoeff)

  translates triplet (indicesI, indicesJ, coefficients) into vector with pointers to variables
- void decomposeTerm (expression ∗term, CouNumber initCoe, CouNumber &c0, LinMap &lmap, QuadMap &qmap)

  given (expression ∗) element of sum, returns (coe,ind0,ind1) depending on element:
- const std::string & problemName () const

  return problem name
- void setProblemName (std::string &problemName__)
- const std::vector< std::set< int > > & Dependence () const

  return inverse dependence structure
- const std::vector< CouenneObject ∗ > & Objects () const

  return object vector
- int findSOS (CbcModel ∗CbcModelPtr, OsiSolverInterface ∗solver, OsiObject ∗∗objects)

  find SOS constraints in problem
- void setMaxCpuTime (double time)

  set maximum CPU time
- double getMaxCpuTime () const

  return maximum CPU time
- void setBase (Bonmin::BabSetupBase ∗base)

save CouenneBase

- void createUnusedOriginals ()

  Some originals may be unused due to their zero multiplicity (that happens when they are duplicates).
- void restoreUnusedOriginals (CouNumber ∗=NULL) const

  Some originals may be unused due to their zero multiplicity (that happens when they are duplicates).
- int ∗ unusedOriginalsIndices ()

  return indices of neglected redundant variables
- int nUnusedOriginals ()

  number of unused originals
- enum multiSep MultilinSep () const

  return type of separator for multilinear terms
- bool fbbtReachedIterLimit () const

  true if latest call to FBBT terminated due to iteration limit reached
- bool orbitalBranching () const

  return true if orbital branching activated
- void setCheckAuxBounds (bool value)

  set the value for checkAuxBounds.
- bool checkAuxBounds () const

  return true if bounds of auxiliary variables have to be satisfied whenever a solution is tested for MINLP feasibiliry
- enum TrilinDecompType getTrilinDecompType ()

  return type of decomposition of quadrilinear terms
- Bonmin::BabSetupBase ∗ bonBase () const

  options
- double constObjVal () const

  returns constant objective value if it contains no variables
- CouenneSdpCuts ∗ getSdpCutGen ()

  Returns pointer to sdp cut generator.
- int getLastPrioSort () const
- void setLastPrioSort (int givenLastPS)
- CouenneRecordBestSol ∗ getRecordBestSol () const

  returns recorded best solution
- double getFeasTol ()

  returns feasibility tolerance
- double checkObj (const CouNumber ∗sol, const double &precision) const

  Recompute objective value for sol.
- bool checkInt (const CouNumber ∗sol, const int from, const int upto, const std::vector< int > listInt, const bool origVarOnly, const bool stopAtFirstViol, const double precision, double &maxViol) const

  check integrality of vars in sol with index between from and upto (original vars only if origVarOnly == true); return true if all integer vars are within precision of an integer value
- bool checkBounds (const CouNumber ∗sol, const bool stopAtFirstViol, const double precision, double &maxViol) const

  Check bounds; returns true iff feasible for given precision.
- bool checkAux (const CouNumber ∗sol, const bool stopAtFirstViol, const double precision, double &maxViol) const

  returns true iff value of all auxiliaries are within bounds
- bool checkCons (const CouNumber ∗sol, const bool stopAtFirstViol, const double precision, double &maxViol) const

  returns true iff value of all auxiliaries are within bounds

- bool checkNLP2 (const double ∗solution, const double obj, const bool careAboutObj, const bool stopAtFirstViol, const bool checkAll, const double precision) const

  Return true if either solution or recomputed_solution obtained using getAuxs() from the original variables in solution is feasible within precision (the solution with minimum violation is then stored in recBSol->modSol, as well as its value and violation); return false otherwise.
- bool checkNLP0 (const double ∗solution, double &obj, bool recompute_obj=false, const bool careAboutObj=false, const bool stopAtFirstViol=true, const bool checkAll=false, const double precision=-1) const

  And finally a method to get both.
- std::vector< CouenneConstraint ∗ > ∗ ConstraintClass (const char ∗str)

  return particular constraint class.

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

  Add list of options to be read from file.

Public Attributes

- int minDepthPrint_
- int minNodePrint_
- bool doPrint_
- std::vector< Node > node_info
- Nauty ∗ nauty_info
- myclass0 node_sort
- myclass index_sort

Protected Member Functions

- int fake_tighten (char direction, int index, const double ∗X, CouNumber ∗olb, CouNumber ∗oub, t_chg_bounds ∗chg_bds, t_chg_bounds ∗f_chg) const

  single fake tightening.
- int obbtInner (OsiSolverInterface ∗, OsiCuts &, t_chg_bounds ∗, Bonmin::BabInfo ∗) const

  Optimality Based Bound Tightening – inner loop.
- int obbt_iter (OsiSolverInterface ∗csi, t_chg_bounds ∗chg_bds, const **CoinWarmStart** ∗warmstart, Bonmin::BabInfo ∗babInfo, double ∗objcoe, int sense, int index) const
- int call_iter (OsiSolverInterface ∗csi, t_chg_bounds ∗chg_bds, const **CoinWarmStart** ∗warmstart, Bonmin::BabInfo ∗babInfo, double ∗objcoe, enum nodeType type, int sense) const
- void analyzeSparsity (CouNumber, LinMap &, QuadMap &)

  analyze sparsity of potential exprQuad/exprGroup and change linear/quadratic maps accordingly, if necessary by adding new auxiliary variables and including them in the linear map
- void flattenMul (expression ∗mul, CouNumber &coe, std::map< int, CouNumber > &indices)

  re-organizes multiplication and stores indices (and exponents) of its variables
- void realign ()

  clear all spurious variables pointers not referring to the variables_ vector
- void fillDependence (Bonmin::BabSetupBase ∗base, CouenneCutGenerator ∗=NULL)

  fill dependence_ structure
- void fillIntegerRank () const

  fill freeIntegers_ array
- int testIntFix (int index, CouNumber xFrac, enum fixType ∗fixed, CouNumber ∗xInt, CouNumber ∗dualL, CouNumber ∗dualR, CouNumber ∗olb, CouNumber ∗oub, bool patient) const

  Test fixing of an integer variable (used in getIntegerCandidate())

Protected Attributes

- std::string problemName_
  problem name
- std::vector< exprVar ∗ > variables_
  Variables (original, auxiliary, and defined)
- std::vector< CouenneObjective ∗ > objectives_
  Objectives.
- std::vector< CouenneConstraint ∗ > constraints_
  Constraints.
- std::vector< expression ∗ > commonexprs_
  AMPL's common expressions (read from AMPL through structures cexps and cexps1)
- Domain domain_
  current point and bounds;
- std::set< exprAux ∗, compExpr > ∗ auxSet_
  Expression map for comparison in standardization and to count occurrences of an auxiliary.
- int curnvars_
  Number of elements in the x_, lb_, ub_ arrays.
- int nIntVars_
  Number of discrete variables.
- CouNumber ∗ optimum_
  Best solution known to be loaded from file – for testing purposes.
- CouNumber bestObj_
  Best known objective function.
- bool ∗ commuted_
  Variables that have commuted to auxiliary.
- int ∗ numbering_
  numbering of variables.
- int ndefined_
  Number of "defined variables" (aka "common expressions")
- DepGraph ∗ graph_
  Dependence (acyclic) graph: shows dependence of all auxiliary variables on one another and on original variables.
- int nOrigVars_
  Number of original variables.
- int nOrigCons_
  Number of original constraints (disregarding those that turned into auxiliary variable definition)
- int nOrigIntVars_
  Number of original integer variables.
- GlobalCutOff ∗ pcutoff_
  Pointer to a global cutoff object.
- bool created_pcutoff_
  flag indicating if this class is creator of global cutoff object
- bool doFBBT_
  do Feasibility-based bound tightening
- bool doRCBT_
  do reduced cost bound tightening
- bool doOBBT_

do Optimality-based bound tightening

- bool doABT_

  do Aggressive bound tightening
- int logObbtLev_

  frequency of Optimality-based bound tightening
- int logAbtLev_

  frequency of Aggressive bound tightening
- JnlstPtr jnlst_

  SmartPointer to the Journalist.
- CouNumber opt_window_

  window around known optimum (for testing purposes)
- bool useQuadratic_

  Use quadratic expressions?
- CouNumber feas_tolerance_

  feasibility tolerance (to be used in checkNLP)
- std::vector< std::set< int > > dependence_

  inverse dependence structure: for each variable x give set of auxiliary variables (or better, their indices) whose expression depends on x
- std::vector< CouenneObject ∗ > objects_

  vector of pointer to CouenneObjects.
- int ∗ integerRank_

  each element is true if variable is integer and, if auxiliary, depends on no integer
- std::vector< int > numberInRank_

  numberInRank_ [i] is the number of integer variables in rank i
- double maxCpuTime_

  maximum cpu time
- Bonmin::BabSetupBase ∗ bonBase_

  options
- ASL ∗ asl_

  AMPL structure pointer (temporary — looking forward to embedding into OS...)
- int ∗ unusedOriginalsIndices_

  some originals may be unused due to their zero multiplicity (that happens when they are duplicates).
- int nUnusedOriginals_

  number of unused originals
- int lastPrioSort_
- CouenneRecordBestSol ∗ recBSol
- enum multiSep multilinSep_

  Type of Multilinear separation.
- int max_fbbt_iter_

  number of FBBT iterations
- bool fbbtReachedIterLimit_

  true if FBBT exited for iteration limits as opposed to inability to further tighten bounds
- bool orbitalBranching_

  use orbital branching?
- bool checkAuxBounds_

  check bounds on auxiliary variables when verifying MINLP feasibility of a solution.
- enum TrilinDecompType trilinDecompType_

return type of decomposition of quadrilinear terms

- double constObjVal_

  constant value of the objective if no variable is declared in it

- CouenneBTPerfIndicator ∗ perfIndicator_

  Performance indicator for FBBT – to be moved away from CouenneProblem when we do it with FBBT.

- std::map< const char ∗, std::vector < CouenneConstraint ∗ > ∗, less_than_str > ConstraintClass_

  Return particular constraint class.

- CouenneSdpCuts ∗ sdpCutGen_

  Temporary pointer to SDP cut generator.

Friends

- class exprMul

7.35.1 Detailed Description

Class for MINLP problems with symbolic information.

It is read from an AMPL .nl file and contains variables, AMPL's "defined variables" (aka common expressions), objective(s), and constraints in the form of expression's. Changes throughout the program occur in standardization.

Definition at line 169 of file CouenneProblem.hpp.

7.35.2 Member Enumeration Documentation

7.35.2.1 enum **Couenne::CouenneProblem::multiSep**

Type of multilinear separation.

Enumerator:

MulSepNone

MulSepSimple

MulSepTight

Definition at line 179 of file CouenneProblem.hpp.

7.35.3 Constructor & Destructor Documentation

7.35.3.1 Couenne::CouenneProblem::CouenneProblem (ASL ∗ = NULL, Bonmin::BabSetupBase ∗ *base* = NULL, JnlstPtr *jnlst* = NULL)

Constructor.

7.35.3.2 Couenne::CouenneProblem::CouenneProblem (const CouenneProblem &)

Copy constructor.

7.35.3.3 Couenne::CouenneProblem::∼CouenneProblem ( )

Destructor.

7.35.4 Member Function Documentation

7.35.4.1 void Couenne::CouenneProblem::initOptions (Ipopt::SmartPtr< Ipopt::OptionsList > *options*)

initializes parameters like doOBBT

7.35.4.2 CouenneProblem∗ Couenne::CouenneProblem::clone ( ) const [inline]

Clone method (for use within CouenneCutGenerator::clone)

Definition at line 365 of file CouenneProblem.hpp.

7.35.4.3 int Couenne::CouenneProblem::nObjs ( ) const [inline]

Get number of objectives.

Definition at line 368 of file CouenneProblem.hpp.

7.35.4.4 int Couenne::CouenneProblem::nCons ( ) const [inline]

Get number of constraints.

Definition at line 369 of file CouenneProblem.hpp.

7.35.4.5 int Couenne::CouenneProblem::nOrigCons ( ) const [inline]

Get number of original constraints.

Definition at line 370 of file CouenneProblem.hpp.

7.35.4.6 int Couenne::CouenneProblem::nOrigVars ( ) const [inline]

Number of orig. variables.

Definition at line 372 of file CouenneProblem.hpp.

7.35.4.7 int Couenne::CouenneProblem::nDefVars ( ) const [inline]

Number of def'd variables.

Definition at line 373 of file CouenneProblem.hpp.

7.35.4.8 int Couenne::CouenneProblem::nOrigIntVars ( ) const [inline]

Number of original integers.

Definition at line 374 of file CouenneProblem.hpp.

7.35.4.9 int Couenne::CouenneProblem::nIntVars ( ) const [inline]

Number of integer variables.

Definition at line 375 of file CouenneProblem.hpp.

7.35.4.10 int Couenne::CouenneProblem::nVars ( ) const [inline]

Total number of variables.

Definition at line 376 of file CouenneProblem.hpp.

7.35.4.11 void Couenne::CouenneProblem::setNDefVars (int *ndefined__*) [inline]

Definition at line 378 of file CouenneProblem.hpp.

7.35.4.12 std::vector<int>* Couenne::CouenneProblem::Find_Orbit (int) const

7.35.4.13 void Couenne::CouenneProblem::sym_setup ( )

7.35.4.14 void Couenne::CouenneProblem::Compute_Symmetry ( ) const

7.35.4.15 void Couenne::CouenneProblem::Print_Orbits ( ) const

7.35.4.16 void Couenne::CouenneProblem::ChangeBounds (const double *, const double *, int) const

7.35.4.17 bool Couenne::CouenneProblem::compare (register Node & *a*, register Node & *b*) const [inline]

7.35.4.18 Nauty* Couenne::CouenneProblem::getNtyInfo ( ) [inline]

Definition at line 394 of file CouenneProblem.hpp.

7.35.4.19 void Couenne::CouenneProblem::setupSymmetry ( )

empty if no NTY, symmetry data structure setup otherwise

7.35.4.20 int Couenne::CouenneProblem::evalOrder (int *i*) const [inline]

get evaluation order index

Definition at line 403 of file CouenneProblem.hpp.

7.35.4.21 int* Couenne::CouenneProblem::evalVector ( ) [inline]

get evaluation order vector (numbering_)

Definition at line 407 of file CouenneProblem.hpp.

7.35.4.22 CouenneConstraint* Couenne::CouenneProblem::Con (int *i*) const [inline]

i-th constraint

Definition at line 411 of file CouenneProblem.hpp.

7.35.4.23 CouenneObjective* Couenne::CouenneProblem::Obj (int *i*) const [inline]

i-th objective

Definition at line 412 of file CouenneProblem.hpp.

7.35.4.24 exprVar* Couenne::CouenneProblem::Var (int *i*) const [inline]

Return pointer to i-th variable.

Definition at line 415 of file CouenneProblem.hpp.

7.35.4.25 std::vector<exprVar *>& Couenne::CouenneProblem::Variables ( ) [inline]

Return vector of variables (symbolic representation)

Definition at line 419 of file CouenneProblem.hpp.

7.35.4.26 std::set<exprAux *, compExpr>*& Couenne::CouenneProblem::AuxSet ( ) [inline]

Return pointer to set for comparisons.

Definition at line 423 of file CouenneProblem.hpp.

7.35.4.27 DepGraph* Couenne::CouenneProblem::getDepGraph ( ) [inline]

Return pointer to dependence graph.

Definition at line 427 of file CouenneProblem.hpp.

7.35.4.28 Domain* Couenne::CouenneProblem::domain ( ) const [inline]

return current point & bounds

Definition at line 431 of file CouenneProblem.hpp.

7.35.4.29 std::vector<expression *>& Couenne::CouenneProblem::commonExprs ( ) [inline]

Definition at line 434 of file CouenneProblem.hpp.

7.35.4.30 CouNumber& Couenne::CouenneProblem::X (int *i*) const [inline]

x_i

Definition at line 437 of file CouenneProblem.hpp.

7.35.4.31 CouNumber& Couenne::CouenneProblem::Lb (int *i*) const [inline]

lower bound on x_i

Definition at line 438 of file CouenneProblem.hpp.

7.35.4.32 CouNumber& Couenne::CouenneProblem::Ub (int *i*) const [inline]

upper bound on x_i

Definition at line 439 of file CouenneProblem.hpp.

7.35.4.33 CouNumber* Couenne::CouenneProblem::X ( ) const [inline]

Return vector of variables.

Definition at line 442 of file CouenneProblem.hpp.

7.35.4.34 CouNumber* Couenne::CouenneProblem::Lb ( ) const [inline]

Return vector of lower bounds.

Definition at line 443 of file CouenneProblem.hpp.

7.35.4.35 CouNumber* Couenne::CouenneProblem::Ub ( ) const [inline]

Return vector of upper bounds.

Definition at line 444 of file CouenneProblem.hpp.

7.35.4.36 CouNumber∗& Couenne::CouenneProblem::bestSol ( ) const [inline]

Best known solution (read from file)

Definition at line 447 of file CouenneProblem.hpp.

7.35.4.37 CouNumber Couenne::CouenneProblem::bestObj ( ) const [inline]

Objective of best known solution.

Definition at line 448 of file CouenneProblem.hpp.

7.35.4.38 bool∗& Couenne::CouenneProblem::Commuted ( ) [inline]

Get vector of commuted variables.

Definition at line 451 of file CouenneProblem.hpp.

7.35.4.39 void Couenne::CouenneProblem::addObjective (expression ∗, const std::string & = "min")

Add (non linear) objective function.

7.35.4.40 void Couenne::CouenneProblem::addEQConstraint (expression ∗, expression ∗ = NULL)

Add equality constraint $h(x) = b$.

7.35.4.41 void Couenne::CouenneProblem::addGEConstraint (expression ∗, expression ∗ = NULL)

Add $\geq$ constraint, $h(x) \geq b$.

7.35.4.42 void Couenne::CouenneProblem::addLEConstraint (expression ∗, expression ∗ = NULL)

Add $\leq$ constraint, $h(x) \leq b$.

7.35.4.43 void Couenne::CouenneProblem::addRNGConstraint (expression ∗, expression ∗ = NULL, expression ∗ = NULL)

Add range constraint, $a \leq h(x) \leq b$.

7.35.4.44 void Couenne::CouenneProblem::setObjective (int *indObj* = 0, expression ∗ = NULL, const std::string & = "min")

Add (non linear) objective function.

7.35.4.45 expression∗ Couenne::CouenneProblem::addVariable (bool *isint* = false, Domain ∗ *d* = NULL)

Add original variable.

Parameters

isint	if true, this variable is integer, otherwise it is continuous

7.35.4.46 exprAux∗ Couenne::CouenneProblem::addAuxiliary (expression ∗)

Add auxiliary variable and associate it with expression given as argument (used in standardization)

7.35.4.47 void Couenne::CouenneProblem::reformulate (CouenneCutGenerator * = NULL)

preprocess problem in order to extract linear relaxations etc.

7.35.4.48 bool Couenne::CouenneProblem::standardize ( )

Break problem's nonlinear constraints in simple expressions to be convexified later.

Return true if problem looks feasible, false if proven infeasible.

7.35.4.49 void Couenne::CouenneProblem::print (std::ostream & = std::cout)

Display current representation of problem: objective, linear and nonlinear constraints, and auxiliary variables.

7.35.4.50 bool Couenne::CouenneProblem::doFBBT ( ) const [inline]

shall we do Feasibility Based Bound Tightening?

Definition at line 498 of file CouenneProblem.hpp.

7.35.4.51 bool Couenne::CouenneProblem::doRCBT ( ) const [inline]

shall we do reduced cost Bound Tightening?

Definition at line 499 of file CouenneProblem.hpp.

7.35.4.52 bool Couenne::CouenneProblem::doOBBT ( ) const [inline]

shall we do Optimality Based Bound Tightening?

Definition at line 500 of file CouenneProblem.hpp.

7.35.4.53 bool Couenne::CouenneProblem::doABT ( ) const [inline]

shall we do Aggressive Bound Tightening?

Definition at line 501 of file CouenneProblem.hpp.

7.35.4.54 int Couenne::CouenneProblem::logObbtLev ( ) const [inline]

How often shall we do OBBT?

Definition at line 503 of file CouenneProblem.hpp.

7.35.4.55 int Couenne::CouenneProblem::logAbtLev ( ) const [inline]

How often shall we do ABT?

Definition at line 504 of file CouenneProblem.hpp.

7.35.4.56 void Couenne::CouenneProblem::writeAMPL (const std::string & *fname*, bool *aux*)

Write nonlinear problem to a .mod file (with lots of defined variables)

Parameters

fname	Name of the .mod file to be written
aux	controls the use of auxiliaries. If true, a problem is written with auxiliary variables written with their associated expression, i.e. $w_i = h_i(x,y,w)$ and bounds $l_i \leq w_i \leq u_i$, while if false these constraints are written in the form $l_i \leq h_i(x,y) \leq u_i$.

Note: if used before standardization, writes original AMPL formulation

7.35.4.57 void Couenne::CouenneProblem::writeGAMS (const std::string & *fname*)

Write nonlinear problem to a .gms file.

Parameters

fname	Name of the .gams file to be written.

7.35.4.58 void Couenne::CouenneProblem::writeLP (const std::string & *fname*)

Write nonlinear problem to a .lp file.

Note: only works with MIQCQPs (and MISOCPs in the future)

Parameters

fname	Name of the .lp file to be written

7.35.4.59 void Couenne::CouenneProblem::initAuxs ( ) const

Initialize auxiliary variables and their bounds from original variables.

7.35.4.60 void Couenne::CouenneProblem::getAuxs (CouNumber ∗) const

Get auxiliary variables from original variables.

7.35.4.61 bool Couenne::CouenneProblem::boundTightening (t_chg_bounds ∗ , const CglTreeInfo *info*, Bonmin::BabInfo ∗ = NULL) const

tighten bounds using propagation, implied bounds and reduced costs

7.35.4.62 bool Couenne::CouenneProblem::btCore (t_chg_bounds ∗ *chg_bds*) const

core of the bound tightening procedure

7.35.4.63 int Couenne::CouenneProblem::obbt (const CouenneCutGenerator ∗ *cg*, const OsiSolverInterface & *csi*, OsiCuts & *cs*, const CglTreeInfo & *info*, Bonmin::BabInfo ∗ *babInfo*, t_chg_bounds ∗ *chg_bds*)

Optimality Based Bound Tightening.

7.35.4.64 bool Couenne::CouenneProblem::aggressiveBT (Bonmin::OsiTMINLPInterface ∗ *nlp*, t_chg_bounds ∗ , const CglTreeInfo & *info*, Bonmin::BabInfo ∗ = NULL) const

aggressive bound tightening.

Fake bounds in order to cut portions of the solution space by fathoming on bounds/infeasibility

7.35.4.65 int Couenne::CouenneProblem::redCostBT (const OsiSolverInterface ∗ *psi*, t_chg_bounds ∗ *chg_bds*) const

procedure to strengthen variable bounds.

Return false if problem turns out to be infeasible with given bounds, true otherwise.

7.35.4.66 int Couenne::CouenneProblem::tightenBounds (t_chg_bounds ∗) const

"Forward" bound tightening, that is, propagate bound of variable x in an expression $w = f(x)$ to the bounds of w.

7.35.4.67 int Couenne::CouenneProblem::impliedBounds (t_chg_bounds *) const

"Backward" bound tightening, aka implied bounds.

7.35.4.68 void Couenne::CouenneProblem::fillQuadIndices ( )

Look for quadratic terms to be used with SDP cuts.

7.35.4.69 void Couenne::CouenneProblem::fillObjCoeff (double *&)

Fill vector with coefficients of objective function.

7.35.4.70 void Couenne::CouenneProblem::auxiliarize (exprVar * , exprVar * = NULL)

Replace all occurrences of original variable with new aux given as argument.

7.35.4.71 void Couenne::CouenneProblem::setCutOff (CouNumber *cutoff*, const CouNumber * *sol* = NULL) const

Set cutoff.

7.35.4.72 void Couenne::CouenneProblem::resetCutOff (CouNumber *value* = COUENNE_INFINITY) const

Reset cutoff.

7.35.4.73 CouNumber Couenne::CouenneProblem::getCutOff ( ) const

Get cutoff.

7.35.4.74 CouNumber* Couenne::CouenneProblem::getCutOffSol ( ) const

Get cutoff solution.

7.35.4.75 void Couenne::CouenneProblem::installCutOff ( ) const

Make cutoff known to the problem.

7.35.4.76 ConstJnlstPtr Couenne::CouenneProblem::Jnlst ( ) const

Provide Journalist.

7.35.4.77 bool Couenne::CouenneProblem::checkNLP (const double * *solution*, double & *obj*, bool *recompute* = false) const

Check if solution is MINLP feasible.

7.35.4.78 int Couenne::CouenneProblem::getIntegerCandidate (const double * *xFrac*, double * *xInt*, double * *lb*, double * *ub*) const

generate integer NLP point Y starting from fractional solution using bound tightening

7.35.4.79 bool Couenne::CouenneProblem::readOptimum (std::string * *fname* = NULL)

Read best known solution from file given in argument.

7.35.4.80 static void Couenne::CouenneProblem::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.35.4.81 exprAux∗ Couenne::CouenneProblem::linStandardize (bool *addAux,* CouNumber *c0,* LinMap & *lmap,* QuadMap & *qmap*)

standardization of linear exprOp's

7.35.4.82 int Couenne::CouenneProblem::splitAux (CouNumber , expression ∗ , expression ∗& , bool ∗ , enum expression::auxSign &)

split a constraint w - f(x) = c into w's index (it is returned) and rest = f(x) + c

7.35.4.83 void Couenne::CouenneProblem::indcoe2vector (int ∗ *indexL,* CouNumber ∗ *coeff,* std::vector< std::pair< exprVar ∗, CouNumber > > & *lcoeff*)

translates pair (indices, coefficients) into vector with pointers to variables

7.35.4.84 void Couenne::CouenneProblem::indcoe2vector (int ∗ *indexI,* int ∗ *indexJ,* CouNumber ∗ *coeff,* std::vector< quadElem > & *qcoeff*)

translates triplet (indicesI, indicesJ, coefficients) into vector with pointers to variables

7.35.4.85 void Couenne::CouenneProblem::decomposeTerm (expression ∗ *term,* CouNumber *initCoe,* CouNumber & *c0,* LinMap & *lmap,* QuadMap & *qmap*)

given (expression ∗) element of sum, returns (coe,ind0,ind1) depending on element:

1) a ∗ x_i ^ 2 —> (a,i,?) return COU_EXPRPOW 2) a ∗ x_i —> (a,i,?) return COU_EXPRVAR 3) a ∗ x_i ∗ x_j —> (a,i,j) return COU_EXPRMUL 4) a —> (a,?,?) return COU_EXPRCONST

x_i and/or x_j may come from standardizing other (linear or quadratic operator) sub-expressions

7.35.4.86 const std::string& Couenne::CouenneProblem::problemName ( ) const [inline]

return problem name

Definition at line 654 of file CouenneProblem.hpp.

7.35.4.87 void Couenne::CouenneProblem::setProblemName (std::string & *problemName__*) [inline]

Definition at line 657 of file CouenneProblem.hpp.

7.35.4.88 const std::vector<std::set <int> >& Couenne::CouenneProblem::Dependence ( ) const [inline]

return inverse dependence structure

Definition at line 661 of file CouenneProblem.hpp.

7.35.4.89 const std::vector<CouenneObject ∗>& Couenne::CouenneProblem::Objects ( ) const [inline]

return object vector

Definition at line 665 of file CouenneProblem.hpp.

7.35.4.90 int Couenne::CouenneProblem::findSOS (CbcModel ∗ *CbcModelPtr,* OsiSolverInterface ∗ *solver,* OsiObject ∗∗ *objects*)

find SOS constraints in problem

7.35.4.91 void Couenne::CouenneProblem::setMaxCpuTime (double *time*) [inline]

set maximum CPU time

Definition at line 674 of file CouenneProblem.hpp.

7.35.4.92 double Couenne::CouenneProblem::getMaxCpuTime ( ) const [inline]

return maximum CPU time

Definition at line 678 of file CouenneProblem.hpp.

7.35.4.93 void Couenne::CouenneProblem::setBase (Bonmin::BabSetupBase * *base*)

save CouenneBase

7.35.4.94 void Couenne::CouenneProblem::createUnusedOriginals ( )

Some originals may be unused due to their zero multiplicity (that happens when they are duplicates).

This procedure creates a structure for quickly checking and restoring their value after solving.

7.35.4.95 void Couenne::CouenneProblem::restoreUnusedOriginals (CouNumber * = NULL) const

Some originals may be unused due to their zero multiplicity (that happens when they are duplicates).

This procedure restores their value after solving

7.35.4.96 int* Couenne::CouenneProblem::unusedOriginalsIndices ( ) [inline]

return indices of neglected redundant variables

Definition at line 696 of file CouenneProblem.hpp.

7.35.4.97 int Couenne::CouenneProblem::nUnusedOriginals ( ) [inline]

number of unused originals

Definition at line 700 of file CouenneProblem.hpp.

7.35.4.98 enum multiSep Couenne::CouenneProblem::MultilinSep ( ) const [inline]

return type of separator for multilinear terms

Definition at line 704 of file CouenneProblem.hpp.

7.35.4.99 bool Couenne::CouenneProblem::fbbtReachedIterLimit ( ) const [inline]

true if latest call to FBBT terminated due to iteration limit reached

Definition at line 708 of file CouenneProblem.hpp.

7.35.4.100 bool Couenne::CouenneProblem::orbitalBranching ( ) const [inline]

return true if orbital branching activated

Definition at line 712 of file CouenneProblem.hpp.

7.35.4.101 void Couenne::CouenneProblem::setCheckAuxBounds (bool *value*) [inline]

set the value for checkAuxBounds.

When true, all MINLP feasible solutions will additionally be tested for feasibility with respect to auxiliary variable bounds. This is normally not needed.

Definition at line 718 of file CouenneProblem.hpp.

7.35.4.102 bool Couenne::CouenneProblem::checkAuxBounds ( ) const [inline]

return true if bounds of auxiliary variables have to be satisfied whenever a solution is tested for MINLP feasibiliry

Definition at line 723 of file CouenneProblem.hpp.

7.35.4.103 enum TrilinDecompType Couenne::CouenneProblem::getTrilinDecompType ( ) [inline]

return type of decomposition of quadrilinear terms

Definition at line 727 of file CouenneProblem.hpp.

7.35.4.104 Bonmin::BabSetupBase∗ Couenne::CouenneProblem::bonBase ( ) const [inline]

options

Definition at line 731 of file CouenneProblem.hpp.

7.35.4.105 double Couenne::CouenneProblem::constObjVal ( ) const [inline]

returns constant objective value if it contains no variables

Definition at line 734 of file CouenneProblem.hpp.

7.35.4.106 CouenneSdpCuts∗ Couenne::CouenneProblem::getSdpCutGen ( ) [inline]

Returns pointer to sdp cut generator.

Definition at line 737 of file CouenneProblem.hpp.

7.35.4.107 int Couenne::CouenneProblem::fake_tighten (char *direction*, int *index*, const double ∗ *X*, CouNumber ∗ *olb*, CouNumber ∗ *oub*, t_chg_bounds ∗ *chg_bds*, t_chg_bounds ∗ *f_chg*) const [protected]

single fake tightening.

Return

-1 if infeasible 0 if no improvement +1 if improved

Parameters

direction	0: left, 1: right
index	index of the variable tested
X	point round which tightening is done
olb	cur. lower bound
oub	cur. upper bound

7.35.4.108 int Couenne::CouenneProblem::obbtInner (OsiSolverInterface ∗ , OsiCuts & , t_chg_bounds ∗ , Bonmin::BabInfo ∗) const [protected]

Optimality Based Bound Tightening – inner loop.

7.35.4.109 int Couenne::CouenneProblem::obbt_iter (OsiSolverInterface ∗ *csi*, t_chg_bounds ∗ *chg_bds*, const CoinWarmStart ∗ *warmstart*, Bonmin::BabInfo ∗ *babInfo*, double ∗ *objcoe*, int *sense*, int *index*) const [protected]

7.35.4.110 int Couenne::CouenneProblem::call_iter (OsiSolverInterface ∗ *csi*, t_chg_bounds ∗ *chg_bds*, const CoinWarmStart ∗ *warmstart*, Bonmin::BabInfo ∗ *babInfo*, double ∗ *objcoe*, enum nodeType *type*, int *sense*) const [protected]

7.35.4.111 void Couenne::CouenneProblem::analyzeSparsity (CouNumber , LinMap & , QuadMap &) [protected]

analyze sparsity of potential exprQuad/exprGroup and change linear/quadratic maps accordingly, if necessary by adding new auxiliary variables and including them in the linear map

7.35.4.112 void Couenne::CouenneProblem::flattenMul (expression * *mul*, CouNumber & *coe*, std::map< int, CouNumber > & *indices*) [protected]

re-organizes multiplication and stores indices (and exponents) of its variables

7.35.4.113 void Couenne::CouenneProblem::realign ( ) [protected]

clear all spurious variables pointers not referring to the variables_ vector

7.35.4.114 void Couenne::CouenneProblem::fillDependence (Bonmin::BabSetupBase * *base*, CouenneCutGenerator * = NULL) [protected]

fill dependence_ structure

7.35.4.115 void Couenne::CouenneProblem::fillIntegerRank ( ) const [protected]

fill freeIntegers_ array

7.35.4.116 int Couenne::CouenneProblem::testIntFix (int *index*, CouNumber *xFrac*, enum fixType * *fixed*, CouNumber * *xInt*, CouNumber * *dualL*, CouNumber * *dualR*, CouNumber * *olb*, CouNumber * *oub*, bool *patient*) const [protected]

Test fixing of an integer variable (used in getIntegerCandidate())

7.35.4.117 int Couenne::CouenneProblem::getLastPrioSort ( ) const [inline]

Definition at line 810 of file CouenneProblem.hpp.

7.35.4.118 void Couenne::CouenneProblem::setLastPrioSort (int *givenLastPS*)

7.35.4.119 CouenneRecordBestSol* Couenne::CouenneProblem::getRecordBestSol ( ) const [inline]

returns recorded best solution

Definition at line 817 of file CouenneProblem.hpp.

7.35.4.120 double Couenne::CouenneProblem::getFeasTol ( ) [inline]

returns feasibility tolerance

Definition at line 821 of file CouenneProblem.hpp.

7.35.4.121 double Couenne::CouenneProblem::checkObj (const CouNumber * *sol*, const double & *precision*) const

Recompute objective value for sol.

7.35.4.122 bool Couenne::CouenneProblem::checkInt (const CouNumber * *sol*, const int *from*, const int *upto*, const std::vector< int > *listInt*, const bool *origVarOnly*, const bool *stopAtFirstViol*, const double *precision*, double & *maxViol*) const

check integrality of vars in sol with index between from and upto (original vars only if origVarOnly == true); return true if all integer vars are within precision of an integer value

7.35.4.123 bool Couenne::CouenneProblem::checkBounds (const CouNumber * *sol*, const bool *stopAtFirstViol*, const double *precision*, double & *maxViol*) const

Check bounds; returns true iff feasible for given precision.

7.35.4.124 bool Couenne::CouenneProblem::checkAux (const CouNumber * *sol*, const bool *stopAtFirstViol*, const double *precision*, double & *maxViol*) const

returns true iff value of all auxiliaries are within bounds

7.35.4.125 bool Couenne::CouenneProblem::checkCons (const CouNumber * *sol*, const bool *stopAtFirstViol*, const double *precision*, double & *maxViol*) const

returns true iff value of all auxiliaries are within bounds

7.35.4.126 bool Couenne::CouenneProblem::checkNLP2 (const double * *solution*, const double *obj*, const bool *careAboutObj*, const bool *stopAtFirstViol*, const bool *checkAll*, const double *precision*) const

Return true if either solution or recomputed_solution obtained using getAuxs() from the original variables in solution is feasible within precision (the solution with minimum violation is then stored in recBSol->modSol, as well as its value and violation); return false otherwise.

If stopAtFirstViol == true, recBSol->modSol is meaningless upon return. If stopAtFirstViol == false, recBSol->modSol contains the solution with minimum violation, although this violation might be larger than precision. This is useful for cases where the current solution must be considered valid (e.g., because Cbc is going to accept it anyway), although it violates precision requirements. Value of obj matters only if careAboutObj == true; the code then tries to balance violation of constraints and value of objective. if checkAll = false, check only integrality/bounds for original vars and constraints; consider only recomputed_sol if checkAll == true, check also integrality/bounds on auxs; consider both recomputed_sol and solution if careAboutObj is set to true, then stopAtFirstViol must be set to false too.

7.35.4.127 bool Couenne::CouenneProblem::checkNLP0 (const double * *solution*, double & *obj*, bool *recompute_obj* = `false`, const bool *careAboutObj* = `false`, const bool *stopAtFirstViol* = `true`, const bool *checkAll* = `false`, const double *precision* = `-1`) const

And finally a method to get both.

7.35.4.128 std::vector<CouenneConstraint *>* Couenne::CouenneProblem::ConstraintClass (const char * *str*) `[inline]`

return particular constraint class.

Classes:

1) "convex": convex constraints; 2) "PSDcon": constraints of the form X 0 3) "normal": regular constraints

Definition at line 896 of file CouenneProblem.hpp.

7.35.5 Friends And Related Function Documentation

7.35.5.1 friend class exprMul `[friend]`

Definition at line 171 of file CouenneProblem.hpp.

7.35.6 Member Data Documentation

7.35.6.1 int Couenne::CouenneProblem::minDepthPrint_

Definition at line 182 of file CouenneProblem.hpp.

7.35.6.2 int Couenne::CouenneProblem::minNodePrint_

Definition at line 185 of file CouenneProblem.hpp.

7.35.6.3 bool Couenne::CouenneProblem::doPrint_

Definition at line 188 of file CouenneProblem.hpp.

7.35.6.4 std::string Couenne::CouenneProblem::problemName_ [protected]

problem name

Definition at line 193 of file CouenneProblem.hpp.

7.35.6.5 std::vector<exprVar *> Couenne::CouenneProblem::variables_ [protected]

Variables (original, auxiliary, and defined)

Definition at line 195 of file CouenneProblem.hpp.

7.35.6.6 std::vector<CouenneObjective *> Couenne::CouenneProblem::objectives_ [protected]

Objectives.

Definition at line 196 of file CouenneProblem.hpp.

7.35.6.7 std::vector<CouenneConstraint *> Couenne::CouenneProblem::constraints_ [protected]

Constraints.

Definition at line 197 of file CouenneProblem.hpp.

7.35.6.8 std::vector<expression *> Couenne::CouenneProblem::commonexprs_ [protected]

AMPL's common expressions (read from AMPL through structures cexps and cexps1)

Definition at line 200 of file CouenneProblem.hpp.

7.35.6.9 Domain Couenne::CouenneProblem::domain_ [mutable], [protected]

current point and bounds;

Definition at line 202 of file CouenneProblem.hpp.

7.35.6.10 std::set<exprAux *, compExpr>* Couenne::CouenneProblem::auxSet_ [protected]

Expression map for comparison in standardization and to count occurrences of an auxiliary.

Definition at line 206 of file CouenneProblem.hpp.

7.35.6.11 int Couenne::CouenneProblem::curnvars_ [mutable], [protected]

Number of elements in the x_, lb_, ub_ arrays.

Definition at line 209 of file CouenneProblem.hpp.

7.35.6.12 int Couenne::CouenneProblem::nIntVars_ [protected]

Number of discrete variables.

Definition at line 212 of file CouenneProblem.hpp.

7.35.6.13 CouNumber* Couenne::CouenneProblem::optimum_ [mutable], [protected]

Best solution known to be loaded from file – for testing purposes.

Definition at line 215 of file CouenneProblem.hpp.

7.35.6.14 CouNumber Couenne::CouenneProblem::bestObj_ [protected]

Best known objective function.

Definition at line 218 of file CouenneProblem.hpp.

7.35.6.15 bool* Couenne::CouenneProblem::commuted_ [protected]

Variables that have commuted to auxiliary.

Definition at line 221 of file CouenneProblem.hpp.

7.35.6.16 int* Couenne::CouenneProblem::numbering_ [protected]

numbering of variables.

No variable xi with associated pi(i) greater than pi(j) should be evaluated before variable xj

Definition at line 225 of file CouenneProblem.hpp.

7.35.6.17 int Couenne::CouenneProblem::ndefined_ [protected]

Number of "defined variables" (aka "common expressions")

Definition at line 228 of file CouenneProblem.hpp.

7.35.6.18 DepGraph* Couenne::CouenneProblem::graph_ [protected]

Dependence (acyclic) graph: shows dependence of all auxiliary variables on one another and on original variables.

Used to create a numbering of all variables for evaluation and bound tightening (reverse order for implied bounds)

Definition at line 234 of file CouenneProblem.hpp.

7.35.6.19 int Couenne::CouenneProblem::nOrigVars_ [protected]

Number of original variables.

Definition at line 237 of file CouenneProblem.hpp.

7.35.6.20 int Couenne::CouenneProblem::nOrigCons_ [protected]

Number of original constraints (disregarding those that turned into auxiliary variable definition)

Definition at line 241 of file CouenneProblem.hpp.

7.35.6.21 int Couenne::CouenneProblem::nOrigIntVars_ [protected]

Number of original integer variables.

Definition at line 244 of file CouenneProblem.hpp.

7.35.6.22 GlobalCutOff* Couenne::CouenneProblem::pcutoff_ [mutable], [protected]

Pointer to a global cutoff object.

Definition at line 247 of file CouenneProblem.hpp.

7.35.6.23 bool Couenne::CouenneProblem::created_pcutoff_ [mutable], [protected]

flag indicating if this class is creator of global cutoff object

Definition at line 250 of file CouenneProblem.hpp.

7.35.6.24 bool Couenne::CouenneProblem::doFBBT_ [protected]

do Feasibility-based bound tightening

Definition at line 252 of file CouenneProblem.hpp.

7.35.6.25 bool Couenne::CouenneProblem::doRCBT_ [protected]

do reduced cost bound tightening

Definition at line 253 of file CouenneProblem.hpp.

7.35.6.26 bool Couenne::CouenneProblem::doOBBT_ [protected]

do Optimality-based bound tightening

Definition at line 254 of file CouenneProblem.hpp.

7.35.6.27 bool Couenne::CouenneProblem::doABT_ [protected]

do Aggressive bound tightening

Definition at line 255 of file CouenneProblem.hpp.

7.35.6.28 int Couenne::CouenneProblem::logObbtLev_ [protected]

frequency of Optimality-based bound tightening

Definition at line 257 of file CouenneProblem.hpp.

7.35.6.29 int Couenne::CouenneProblem::logAbtLev_ [protected]

frequency of Aggressive bound tightening

Definition at line 258 of file CouenneProblem.hpp.

7.35.6.30 JnlstPtr Couenne::CouenneProblem::jnlst_ [protected]

SmartPointer to the Journalist.

Definition at line 261 of file CouenneProblem.hpp.

7.35.6.31 CouNumber Couenne::CouenneProblem::opt_window_ [protected]

window around known optimum (for testing purposes)

Definition at line 264 of file CouenneProblem.hpp.

7.35.6.32 bool Couenne::CouenneProblem::useQuadratic_ [protected]

Use quadratic expressions?

Definition at line 267 of file CouenneProblem.hpp.

7.35.6.33 CouNumber Couenne::CouenneProblem::feas_tolerance_ [protected]

feasibility tolerance (to be used in checkNLP)

Definition at line 270 of file CouenneProblem.hpp.

7.35.6.34 std::vector<std::set <int> > Couenne::CouenneProblem::dependence_ [protected]

inverse dependence structure: for each variable x give set of auxiliary variables (or better, their indices) whose expression depends on x

Definition at line 275 of file CouenneProblem.hpp.

7.35.6.35 std::vector<CouenneObject *> Couenne::CouenneProblem::objects_ [protected]

vector of pointer to CouenneObjects.

Used by CouenneVarObjects when finding all objects related to (having as argument) a single variable

Definition at line 280 of file CouenneProblem.hpp.

7.35.6.36 int* Couenne::CouenneProblem::integerRank_ [mutable], [protected]

each element is true if variable is integer and, if auxiliary, depends on no integer

Definition at line 284 of file CouenneProblem.hpp.

7.35.6.37 std::vector<int> Couenne::CouenneProblem::numberInRank_ [mutable], [protected]

numberInRank_ [i] is the number of integer variables in rank i

Definition at line 287 of file CouenneProblem.hpp.

7.35.6.38 double Couenne::CouenneProblem::maxCpuTime_ [protected]

maximum cpu time

Definition at line 290 of file CouenneProblem.hpp.

7.35.6.39 Bonmin::BabSetupBase* Couenne::CouenneProblem::bonBase_ [protected]

options

Definition at line 293 of file CouenneProblem.hpp.

7.35.6.40 ASL* Couenne::CouenneProblem::asl_ [protected]

AMPL structure pointer (temporary — looking forward to embedding into OS...)

Definition at line 296 of file CouenneProblem.hpp.

7.35.6.41 int* Couenne::CouenneProblem::unusedOriginalsIndices_ [protected]

some originals may be unused due to their zero multiplicity (that happens when they are duplicates).

This array keeps track of their indices and is sorted by evaluation order

Definition at line 301 of file CouenneProblem.hpp.

7.35.6.42 int Couenne::CouenneProblem::nUnusedOriginals_ [protected]

number of unused originals

Definition at line 304 of file CouenneProblem.hpp.

7.35.6.43 int Couenne::CouenneProblem::lastPrioSort_ [protected]

Definition at line 307 of file CouenneProblem.hpp.

7.35.6.44 CouenneRecordBestSol* Couenne::CouenneProblem::recBSol [protected]

Definition at line 310 of file CouenneProblem.hpp.

7.35.6.45 enum multiSep Couenne::CouenneProblem::multilinSep_ [protected]

Type of Multilinear separation.

Definition at line 313 of file CouenneProblem.hpp.

7.35.6.46 int Couenne::CouenneProblem::max_fbbt_iter_ [protected]

number of FBBT iterations

Definition at line 316 of file CouenneProblem.hpp.

7.35.6.47 bool Couenne::CouenneProblem::fbbtReachedIterLimit_ [mutable], [protected]

true if FBBT exited for iteration limits as opposed to inability to further tighten bounds

Definition at line 320 of file CouenneProblem.hpp.

7.35.6.48 bool Couenne::CouenneProblem::orbitalBranching_ [protected]

use orbital branching?

Definition at line 323 of file CouenneProblem.hpp.

7.35.6.49 bool Couenne::CouenneProblem::checkAuxBounds_ [protected]

check bounds on auxiliary variables when verifying MINLP feasibility of a solution.

Usually this is not needed, unless some manipulation on auxiliary variables is done before Branch-and-Bound

Definition at line 329 of file CouenneProblem.hpp.

7.35.6.50 enum TrilinDecompType Couenne::CouenneProblem::trilinDecompType_ [protected]

return type of decomposition of quadrilinear terms

Definition at line 332 of file CouenneProblem.hpp.

7.35.6.51 double Couenne::CouenneProblem::constObjVal_ [protected]

constant value of the objective if no variable is declared in it

Definition at line 335 of file CouenneProblem.hpp.

7.35.6.52 CouenneBTPerfIndicator* Couenne::CouenneProblem::perfIndicator_ [protected]

Performance indicator for FBBT – to be moved away from CouenneProblem when we do it with FBBT.

Definition at line 339 of file CouenneProblem.hpp.

7.35.6.53 std::map<const char *, std::vector <CouenneConstraint *> *, less_than_str> Couenne::CouenneProblem::ConstraintClass_ [protected]

Return particular constraint class.

Classes:

1) "convex": convex constraints; 2) "PSDcon": constraints of the form X 0 3) "normal": regular constraints

Definition at line 346 of file CouenneProblem.hpp.

7.35.6.54 CouenneSdpCuts* Couenne::CouenneProblem::sdpCutGen_ [protected]

Temporary pointer to SDP cut generator.

A little dirty as it is generated DURING standardization, but necessary to avoid meddling with different spaces

Definition at line 351 of file CouenneProblem.hpp.

7.35.6.55 std::vector<Node> Couenne::CouenneProblem::node_info [mutable]

Definition at line 383 of file CouenneProblem.hpp.

7.35.6.56 Nauty* Couenne::CouenneProblem::nauty_info [mutable]

Definition at line 384 of file CouenneProblem.hpp.

7.35.6.57 myclass0 Couenne::CouenneProblem::node_sort

Definition at line 386 of file CouenneProblem.hpp.

7.35.6.58 myclass Couenne::CouenneProblem::index_sort

Definition at line 387 of file CouenneProblem.hpp.

The documentation for this class was generated from the following file:

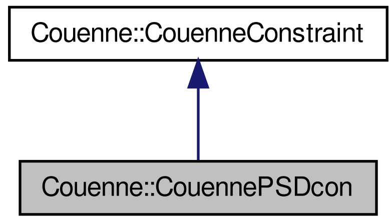
- /home/ted/COIN/trunk/Couenne/src/problem/CouenneProblem.hpp

7.36 Couenne::CouennePSDcon Class Reference

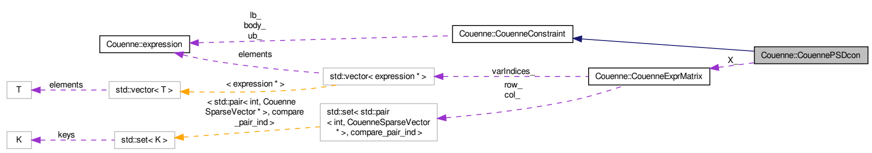
Class to represent positive semidefinite constraints //////////////////.

`#include <CouennePSDcon.hpp>`

Inheritance diagram for Couenne::CouennePSDcon:



Collaboration diagram for Couenne::CouennePSDcon:



Public Member Functions

- CouennePSDcon (CouenneExprMatrix ∗X)

  Constructor.
- ∼CouennePSDcon ()

  Destructor.
- CouennePSDcon (const CouennePSDcon &c, Domain ∗d=NULL)

  Copy constructor.
- CouennePSDcon & operator= (const CouennePSDcon &c)

  Assignment operator.
- CouenneConstraint ∗ clone (Domain ∗d=NULL) const

  Cloning method.
- CouenneExprMatrix ∗ getX () const

  return X
- exprAux ∗ standardize (CouenneProblem ∗)

  Decompose body of constraint through auxiliary variables.
- void print (std::ostream &=std::cout)

  Print constraint.

Protected Attributes

- CouenneExprMatrix ∗ X_

  contains indices of matrix X 0

7.36.1 Detailed Description

Class to represent positive semidefinite constraints //////////////////.

Definition at line 24 of file CouennePSDcon.hpp.

7.36.2 Constructor & Destructor Documentation

7.36.2.1 Couenne::CouennePSDcon::CouennePSDcon (**CouenneExprMatrix** ∗ *X*) [inline]

Constructor.

Definition at line 33 of file CouennePSDcon.hpp.

7.36.2.2 Couenne::CouennePSDcon::∼CouennePSDcon ( )

Destructor.

7.36.2.3 Couenne::CouennePSDcon::CouennePSDcon (const **CouennePSDcon** & *c*, **Domain** ∗ *d* = NULL)

Copy constructor.

7.36.3 Member Function Documentation

7.36.3.1 **CouennePSDcon**& Couenne::CouennePSDcon::operator= (const **CouennePSDcon** & *c*)

Assignment operator.

7.36.3.2 **CouenneConstraint**∗ Couenne::CouennePSDcon::clone (**Domain** ∗ *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::CouenneConstraint.

Definition at line 47 of file CouennePSDcon.hpp.

7.36.3.3 **CouenneExprMatrix**∗ Couenne::CouennePSDcon::getX ( ) const [inline]

return X

Definition at line 51 of file CouennePSDcon.hpp.

7.36.3.4 **exprAux**∗ Couenne::CouennePSDcon::standardize (**CouenneProblem** ∗) [virtual]

Decompose body of constraint through auxiliary variables.

Reimplemented from Couenne::CouenneConstraint.

7.36.3.5 void Couenne::CouennePSDcon::print (std::ostream & = std::cout) [virtual]

Print constraint.

Reimplemented from Couenne::CouenneConstraint.

7.36.4 Member Data Documentation

7.36.4.1 CouenneExprMatrix* Couenne::CouennePSDcon::X_ [protected]

contains indices of matrix X 0

Definition at line 28 of file CouennePSDcon.hpp.

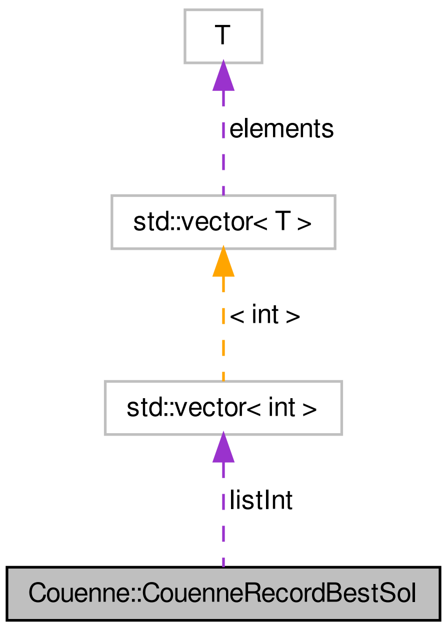
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouennePSDcon.hpp

7.37 Couenne::CouenneRecordBestSol Class Reference

`#include <CouenneRecordBestSol.hpp>`

Collaboration diagram for Couenne::CouenneRecordBestSol:



Public Member Functions

- CouenneRecordBestSol ()

    Constructor.
- CouenneRecordBestSol (const CouenneRecordBestSol &other)

    Copy constructor.
- ∼CouenneRecordBestSol ()

    Destructor.
- int getCardInitDom () const

- bool ∗ getInitIsInt () const
- std::vector< int > getListInt () const
- void setInitIsInt (const bool ∗givenIsInt, const int givenCard)
- CouNumber ∗ getInitDomLb () const
- void setInitDomLb (const CouNumber ∗givenLb, const int givenCard)
- CouNumber ∗ getInitDomUb () const
- void setInitDomUb (const CouNumber ∗givenUb, const int givenCard)
- void setHasSol (const bool givenHasSol)
- bool getHasSol () const
- void setSol (const double ∗givenSol, const int givenCard, const double givenMaxViol)
- int getCardSol () const
- void setCardSol (const int givenCard)
- double ∗ getSol () const
- double getMaxViol () const
- void setVal (const double givenVal)
- double getVal ()
- void update (const double ∗givenSol, const int givenCard, const double givenVal, const double givenMaxViol)
- void update ()
- int compareAndSave (const double ∗solA, const double solAVal, const double solAMaxViol, const bool solAIsFeas, const double ∗solB, const double solBVal, const double solBMaxViol, const bool solBIsFeas, const int cardSol, const double precision)
- int getCardModSol () const
- double ∗ getModSol (const int expectedCard)
- double getModSolVal () const
- double getModSolMaxViol () const
- void setModSol (const double ∗givenModSol, const int givenModCard, const double givenModVal, const double givenModMaxViol)
- void printSol (FILE ∗fsol) const

Public Attributes

- int cardInitDom
- bool ∗ initIsInt
- std::vector< int > listInt
- CouNumber ∗ initDomLb
- CouNumber ∗ initDomUb
- bool hasSol
- int cardSol
- double ∗ sol
- double val
- double maxViol
- int cardModSol
- double ∗ modSol
- double modSolVal
- double modSolMaxViol

7.37.1 Detailed Description

Definition at line 19 of file CouenneRecordBestSol.hpp.

7.37.2 Constructor & Destructor Documentation

7.37.2.1 Couenne::CouenneRecordBestSol::CouenneRecordBestSol ( )

Constructor.

7.37.2.2 Couenne::CouenneRecordBestSol::CouenneRecordBestSol (const CouenneRecordBestSol & *other*)

Copy constructor.

7.37.2.3 Couenne::CouenneRecordBestSol::∼CouenneRecordBestSol ( )

Destructor.

7.37.3 Member Function Documentation

7.37.3.1 int Couenne::CouenneRecordBestSol::getCardInitDom ( ) const [inline]

Definition at line 61 of file CouenneRecordBestSol.hpp.

7.37.3.2 bool∗ Couenne::CouenneRecordBestSol::getInitIsInt ( ) const [inline]

Definition at line 62 of file CouenneRecordBestSol.hpp.

7.37.3.3 std::vector<int> Couenne::CouenneRecordBestSol::getListInt ( ) const [inline]

Definition at line 63 of file CouenneRecordBestSol.hpp.

7.37.3.4 void Couenne::CouenneRecordBestSol::setInitIsInt (const bool ∗ *givenIsInt,* const int *givenCard*)

7.37.3.5 CouNumber∗ Couenne::CouenneRecordBestSol::getInitDomLb ( ) const [inline]

Definition at line 66 of file CouenneRecordBestSol.hpp.

7.37.3.6 void Couenne::CouenneRecordBestSol::setInitDomLb (const CouNumber ∗ *givenLb,* const int *givenCard*)

7.37.3.7 CouNumber∗ Couenne::CouenneRecordBestSol::getInitDomUb ( ) const [inline]

Definition at line 68 of file CouenneRecordBestSol.hpp.

7.37.3.8 void Couenne::CouenneRecordBestSol::setInitDomUb (const CouNumber ∗ *givenUb,* const int *givenCard*)

7.37.3.9 void Couenne::CouenneRecordBestSol::setHasSol (const bool *givenHasSol*)

7.37.3.10 bool Couenne::CouenneRecordBestSol::getHasSol ( ) const [inline]

Definition at line 72 of file CouenneRecordBestSol.hpp.

7.37.3.11 void Couenne::CouenneRecordBestSol::setSol (const double ∗ *givenSol,* const int *givenCard,* const double *givenMaxViol*)

7.37.3.12 int Couenne::CouenneRecordBestSol::getCardSol ( ) const [inline]

Definition at line 75 of file CouenneRecordBestSol.hpp.

7.37.3.13 void Couenne::CouenneRecordBestSol::setCardSol (const int *givenCard*)

7.37.3.14 double* Couenne::CouenneRecordBestSol::getSol ( ) const [inline]

Definition at line 77 of file CouenneRecordBestSol.hpp.

7.37.3.15 double Couenne::CouenneRecordBestSol::getMaxViol ( ) const [inline]

Definition at line 78 of file CouenneRecordBestSol.hpp.

7.37.3.16 void Couenne::CouenneRecordBestSol::setVal (const double *givenVal*)

7.37.3.17 double Couenne::CouenneRecordBestSol::getVal ( ) [inline]

Definition at line 80 of file CouenneRecordBestSol.hpp.

7.37.3.18 void Couenne::CouenneRecordBestSol::update (const double * *givenSol*, const int *givenCard*, const double *givenVal*, const double *givenMaxViol*)

7.37.3.19 void Couenne::CouenneRecordBestSol::update ( )

7.37.3.20 int Couenne::CouenneRecordBestSol::compareAndSave (const double * *solA*, const double *solAVal*, const double *solAMaxViol*, const bool *solAIsFeas*, const double * *solB*, const double *solBVal*, const double *solBMaxViol*, const bool *solBIsFeas*, const int *cardSol*, const double *precision*)

7.37.3.21 int Couenne::CouenneRecordBestSol::getCardModSol ( ) const [inline]

Definition at line 103 of file CouenneRecordBestSol.hpp.

7.37.3.22 double* Couenne::CouenneRecordBestSol::getModSol (const int *expectedCard*)

7.37.3.23 double Couenne::CouenneRecordBestSol::getModSolVal ( ) const [inline]

Definition at line 105 of file CouenneRecordBestSol.hpp.

7.37.3.24 double Couenne::CouenneRecordBestSol::getModSolMaxViol ( ) const [inline]

Definition at line 106 of file CouenneRecordBestSol.hpp.

7.37.3.25 void Couenne::CouenneRecordBestSol::setModSol (const double * *givenModSol*, const int *givenModCard*, const double *givenModVal*, const double *givenModMaxViol*)

7.37.3.26 void Couenne::CouenneRecordBestSol::printSol (FILE * *fsol*) const

7.37.4 Member Data Documentation

7.37.4.1 int Couenne::CouenneRecordBestSol::cardInitDom

Definition at line 24 of file CouenneRecordBestSol.hpp.

7.37.4.2 bool* Couenne::CouenneRecordBestSol::initIsInt

Definition at line 26 of file CouenneRecordBestSol.hpp.

7.37.4.3 std::vector<int> Couenne::CouenneRecordBestSol::listInt

Definition at line 28 of file CouenneRecordBestSol.hpp.

7.37.4.4 CouNumber* Couenne::CouenneRecordBestSol::initDomLb

Definition at line 30 of file CouenneRecordBestSol.hpp.

7.37.4.5 CouNumber* Couenne::CouenneRecordBestSol::initDomUb

Definition at line 32 of file CouenneRecordBestSol.hpp.

7.37.4.6 bool Couenne::CouenneRecordBestSol::hasSol

Definition at line 35 of file CouenneRecordBestSol.hpp.

7.37.4.7 int Couenne::CouenneRecordBestSol::cardSol

Definition at line 37 of file CouenneRecordBestSol.hpp.

7.37.4.8 double* Couenne::CouenneRecordBestSol::sol

Definition at line 39 of file CouenneRecordBestSol.hpp.

7.37.4.9 double Couenne::CouenneRecordBestSol::val

Definition at line 41 of file CouenneRecordBestSol.hpp.

7.37.4.10 double Couenne::CouenneRecordBestSol::maxViol

Definition at line 43 of file CouenneRecordBestSol.hpp.

7.37.4.11 int Couenne::CouenneRecordBestSol::cardModSol

Definition at line 46 of file CouenneRecordBestSol.hpp.

7.37.4.12 double* Couenne::CouenneRecordBestSol::modSol

Definition at line 47 of file CouenneRecordBestSol.hpp.

7.37.4.13 double Couenne::CouenneRecordBestSol::modSolVal

Definition at line 48 of file CouenneRecordBestSol.hpp.

7.37.4.14 double Couenne::CouenneRecordBestSol::modSolMaxViol

Definition at line 49 of file CouenneRecordBestSol.hpp.

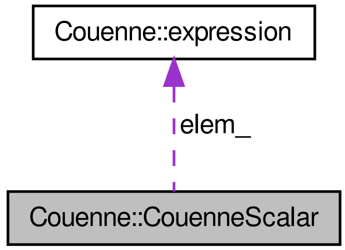
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/problem/CouenneRecordBestSol.hpp

7.38 Couenne::CouenneScalar Class Reference

```
#include <CouenneMatrix.hpp>
```

Collaboration diagram for Couenne::CouenneScalar:



Public Member Functions

- CouenneScalar (int index, expression *elem)
- ∼CouenneScalar ()
- CouenneScalar (const CouenneScalar &rhs)
- CouenneScalar & operator= (const CouenneScalar &rhs)
- CouenneScalar * clone ()
- int getIndex () const
- expression * getElem () const
- bool operator< (const CouenneScalar &rhs) const
- void print () const

Protected Attributes

- int index_

  index of element in vector
- expression * elem_

  element

Friends

- bool operator< (const CouenneScalar &first, const CouenneScalar &second)

7.38.1 Detailed Description

Definition at line 25 of file CouenneMatrix.hpp.

7.38.2 Constructor & Destructor Documentation

7.38.2.1 Couenne::CouenneScalar::CouenneScalar (int *index,* expression * *elem*) [inline]

Definition at line 34 of file CouenneMatrix.hpp.

7.38.2.2 Couenne::CouenneScalar::∼CouenneScalar ( )

7.38.2.3 Couenne::CouenneScalar::CouenneScalar (const CouenneScalar & *rhs*) [inline]

Definition at line 40 of file CouenneMatrix.hpp.

7.38.3 Member Function Documentation

7.38.3.1 CouenneScalar& Couenne::CouenneScalar::operator= (const CouenneScalar & *rhs*) [inline]

Definition at line 44 of file CouenneMatrix.hpp.

7.38.3.2 CouenneScalar* Couenne::CouenneScalar::clone ( ) [inline]

Definition at line 50 of file CouenneMatrix.hpp.

7.38.3.3 int Couenne::CouenneScalar::getIndex ( ) const [inline]

Definition at line 52 of file CouenneMatrix.hpp.

7.38.3.4 expression* Couenne::CouenneScalar::getElem ( ) const [inline]

Definition at line 53 of file CouenneMatrix.hpp.

7.38.3.5 bool Couenne::CouenneScalar::operator< (const CouenneScalar & *rhs*) const [inline]

Definition at line 55 of file CouenneMatrix.hpp.

7.38.3.6 void Couenne::CouenneScalar::print ( ) const

7.38.4 Friends And Related Function Documentation

7.38.4.1 bool operator< (const CouenneScalar & *first,* const CouenneScalar & *second*) [friend]

Definition at line 62 of file CouenneMatrix.hpp.

7.38.5 Member Data Documentation

7.38.5.1 int Couenne::CouenneScalar::index_ [protected]

index of element in vector

Definition at line 29 of file CouenneMatrix.hpp.

7.38.5.2 expression* Couenne::CouenneScalar::elem_ [protected]

element

Definition at line 30 of file CouenneMatrix.hpp.

The documentation for this class was generated from the following file:

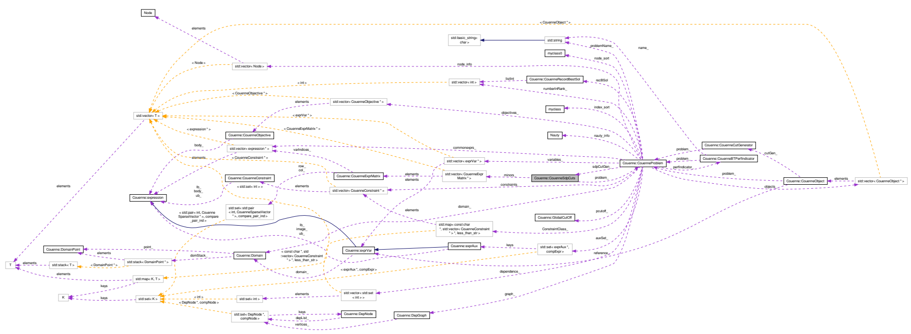
- /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouenneMatrix.hpp

7.39 Couenne::CouenneSdpCuts Class Reference

These are cuts of the form.

`#include <CouenneSdpCuts.hpp>`

Collaboration diagram for Couenne::CouenneSdpCuts:



Public Member Functions

- CouenneSdpCuts (CouenneProblem ∗, JnlstPtr, const Ipopt::SmartPtr< Ipopt::OptionsList >)

  Constructor.
- ∼CouenneSdpCuts ()

  Destructor.
- CouenneSdpCuts & operator= (const CouenneSdpCuts &)

  Assignment.
- CouenneSdpCuts (const CouenneSdpCuts &)

  Copy constructor.
- virtual CglCutGenerator ∗ clone () const

  Cloning constructor.
- const bool doNotUse () const
- virtual void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

  The main CglCutGenerator.
- void updateSol ()

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

  Add list of options to be read from file.

Protected Attributes

- CouenneProblem ∗ problem_

  pointer to problem info
- bool doNotUse_

  after construction, true if there are enough product terms to justify application.
- std::vector< CouenneExprMatrix ∗ > minors_

minors on which to apply cuts

- int numEigVec_

  number of eigenvectors to be used (default: n)

- bool onlyNegEV_

  only use negative eigenvalues (default: yes)

- bool useSparsity_

  Sparsify eigenvalues before writing inequality (default: no)

- bool fillMissingTerms_

  If minor not fully dense, create fictitious auxiliary variables that will be used in sdp cuts only (tighter than sdp cuts without)

7.39.1 Detailed Description

These are cuts of the form.

a' X a >= 0

where X is a matrix constrained to be PSD.

Typical application is in problems with products forming a matrix of auxiliary variables X0 = (x_ij)_{i,j in N}, and x_ij is the auxiliary variable for x_i ∗ x_j. After reformulation, matrices like X0 arise naturally and can be used to separate cuts that help strengthen the lower bound. See Sherali and Fraticelli for the base idea, and Qualizza, Belotti and Margot for an efficient rework and its implementation. Andrea Qualizza's code has been made open source and is used here (thanks Andrea!).

Definition at line 43 of file CouenneSdpCuts.hpp.

7.39.2 Constructor & Destructor Documentation

7.39.2.1 Couenne::CouenneSdpCuts::CouenneSdpCuts (CouenneProblem ∗ , JnlstPtr , const Ipopt::SmartPtr< Ipopt::OptionsList >)

Constructor.

7.39.2.2 Couenne::CouenneSdpCuts::∼CouenneSdpCuts ( )

Destructor.

7.39.2.3 Couenne::CouenneSdpCuts::CouenneSdpCuts (const CouenneSdpCuts &)

Copy constructor.

7.39.3 Member Function Documentation

7.39.3.1 CouenneSdpCuts& Couenne::CouenneSdpCuts::operator= (const CouenneSdpCuts &)

Assignment.

7.39.3.2 virtual CglCutGenerator∗ Couenne::CouenneSdpCuts::clone ( ) const [virtual]

Cloning constructor.

7.39.3.3 const bool Couenne::CouenneSdpCuts::doNotUse ( ) const [inline]

Definition at line 76 of file CouenneSdpCuts.hpp.

7.39.3.4 virtual void Couenne::CouenneSdpCuts::generateCuts (const OsiSolverInterface & , OsiCuts & , const CglTreeInfo = CglTreeInfo()) const [virtual]

The main CglCutGenerator.

7.39.3.5 static void Couenne::CouenneSdpCuts::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.39.3.6 void Couenne::CouenneSdpCuts::updateSol ( )

7.39.4 Member Data Documentation

7.39.4.1 CouenneProblem* Couenne::CouenneSdpCuts::problem_ [protected]

pointer to problem info

Definition at line 47 of file CouenneSdpCuts.hpp.

7.39.4.2 bool Couenne::CouenneSdpCuts::doNotUse_ [protected]

after construction, true if there are enough product terms to justify application.

If not, do not add this cut generator

Definition at line 49 of file CouenneSdpCuts.hpp.

7.39.4.3 std::vector<CouenneExprMatrix *> Couenne::CouenneSdpCuts::minors_ [protected]

minors on which to apply cuts

Definition at line 53 of file CouenneSdpCuts.hpp.

7.39.4.4 int Couenne::CouenneSdpCuts::numEigVec_ [protected]

number of eigenvectors to be used (default: n)

Definition at line 55 of file CouenneSdpCuts.hpp.

7.39.4.5 bool Couenne::CouenneSdpCuts::onlyNegEV_ [protected]

only use negative eigenvalues (default: yes)

Definition at line 57 of file CouenneSdpCuts.hpp.

7.39.4.6 bool Couenne::CouenneSdpCuts::useSparsity_ [protected]

Sparsify eigenvalues before writing inequality (default: no)

Definition at line 59 of file CouenneSdpCuts.hpp.

7.39.4.7 bool Couenne::CouenneSdpCuts::fillMissingTerms_ [protected]

If minor not fully dense, create fictitious auxiliary variables that will be used in sdp cuts only (tighter than sdp cuts without)

Definition at line 61 of file CouenneSdpCuts.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouenneSdpCuts.hpp

7.40 Couenne::CouenneSetup Class Reference

`#include <BonCouenneSetup.hpp>`

Public Member Functions

- CouenneSetup ()

  Default constructor.
- CouenneSetup (const CouenneSetup &other)

  Copy constructor.
- virtual Bonmin::BabSetupBase * clone () const

  virtual copy constructor.
- virtual ∼CouenneSetup ()

  destructor
- bool InitializeCouenne (char **argv=NULL, CouenneProblem *couenneProb=NULL, Ipopt::SmartPtr< Bonmin::-TMINLP > tminlp=NULL, CouenneInterface *ci=NULL, Bonmin::Bab *bb=NULL)

  Initialize from command line arguments.
- virtual void registerOptions ()

  register the options
- virtual void readOptionsFile ()

  Get the basic options if don't already have them.
- CouenneCutGenerator * couennePtr () const

  return pointer to cut generator (used to get pointer to problem)
- bool displayStats ()

  true if one wants to display statistics at the end of program
- void addMilpCutGenerators ()

  add cut generators
- void setDoubleParameter (const DoubleParameter &p, const double val)

  modify parameter (used for MaxTime)
- double getDoubleParameter (const DoubleParameter &p) const

  modify parameter (used for MaxTime)
- void setNodeComparisonMethod (Bonmin::BabSetupBase::NodeComparison c)

Static Public Member Functions

- static void registerAllOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

  Register all Couenne options.

7.40.1 Detailed Description

Definition at line 43 of file BonCouenneSetup.hpp.

7.40.2 Constructor & Destructor Documentation

7.40.2.1 Couenne::CouenneSetup::CouenneSetup ( ) [inline]

Default constructor.

Definition at line 46 of file BonCouenneSetup.hpp.

7.40.2.2 Couenne::CouenneSetup::CouenneSetup (const CouenneSetup & *other*) [inline]

Copy constructor.

Definition at line 55 of file BonCouenneSetup.hpp.

7.40.2.3 virtual Couenne::CouenneSetup::∼CouenneSetup ( ) [virtual]

destructor

7.40.3 Member Function Documentation

7.40.3.1 virtual Bonmin::BabSetupBase∗ Couenne::CouenneSetup::clone ( ) const [inline], [virtual]

virtual copy constructor.

Definition at line 62 of file BonCouenneSetup.hpp.

7.40.3.2 bool Couenne::CouenneSetup::InitializeCouenne (char ∗∗ *argv* = NULL, CouenneProblem ∗ *couenneProb* = NULL, Ipopt::SmartPtr< Bonmin::TMINLP > *tminlp* = NULL, CouenneInterface ∗ *ci* = NULL, Bonmin::Bab ∗ *bb* = NULL)

Initialize from command line arguments.

7.40.3.3 virtual void Couenne::CouenneSetup::registerOptions ( ) [virtual]

register the options

7.40.3.4 static void Couenne::CouenneSetup::registerAllOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Register all Couenne options.

7.40.3.5 virtual void Couenne::CouenneSetup::readOptionsFile ( ) [inline], [virtual]

Get the basic options if don't already have them.

Definition at line 81 of file BonCouenneSetup.hpp.

7.40.3.6 CouenneCutGenerator∗ Couenne::CouenneSetup::couennePtr ( ) const [inline]

return pointer to cut generator (used to get pointer to problem)

Definition at line 87 of file BonCouenneSetup.hpp.

7.40.3.7 bool Couenne::CouenneSetup::displayStats ( ) [inline]

true if one wants to display statistics at the end of program

Definition at line 91 of file BonCouenneSetup.hpp.

7.40.3.8 void Couenne::CouenneSetup::addMilpCutGenerators ( )

add cut generators

7.40.3.9 void Couenne::CouenneSetup::setDoubleParameter (const DoubleParameter & *p*, const double *val*) [inline]

modify parameter (used for MaxTime)

Definition at line 98 of file BonCouenneSetup.hpp.

7.40.3.10 double Couenne::CouenneSetup::getDoubleParameter (const DoubleParameter & *p*) const [inline]

modify parameter (used for MaxTime)

Definition at line 102 of file BonCouenneSetup.hpp.

7.40.3.11 void Couenne::CouenneSetup::setNodeComparisonMethod (Bonmin::BabSetupBase::NodeComparison *c*) [inline]

Definition at line 105 of file BonCouenneSetup.hpp.

The documentation for this class was generated from the following file:

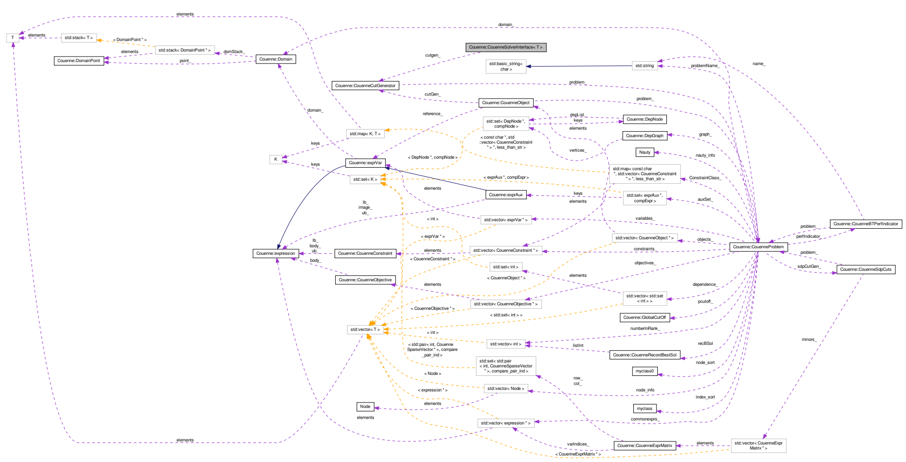
- /home/ted/COIN/trunk/Couenne/src/main/BonCouenneSetup.hpp

7.41 Couenne::CouenneSolverInterface< T > Class Template Reference

Solver interface class with a pointer to a Couenne cut generator.

`#include <CouenneSolverInterface.hpp>`

Collaboration diagram for Couenne::CouenneSolverInterface< T >:



Public Member Functions

- CouenneSolverInterface (CouenneCutGenerator ∗cg=NULL)

  Constructor.
- CouenneSolverInterface (const CouenneSolverInterface &src)

  Copy constructor.
- ∼CouenneSolverInterface ()

  Destructor.
- virtual OsiSolverInterface ∗ clone (bool copyData=true) const

  Clone.
- virtual bool isProvenPrimalInfeasible () const

  we need to overwrite this since we might have internal knowledge
- virtual bool isProvenOptimal () const

we need to overwrite this since we might have internal knowledge
- CouenneCutGenerator ∗ CutGen ()

  Return cut generator pointer.
- void setCutGenPtr (CouenneCutGenerator ∗cg)

  Set cut generator pointer after setup, to avoid changes in the pointer due to cut generator cloning (it happens twice in the algorithm)
- virtual void initialSolve ()

  Solve initial LP relaxation.
- virtual void resolve ()

  Resolve an LP relaxation after problem modification.
- virtual void resolve_nobt ()

  Resolve an LP without applying bound tightening beforehand.
- virtual int tightenBounds (int lightweight)

  Tighten bounds on all variables (including continuous).
- bool isProvenDualInfeasible () const

  *set doingResolve_*
- virtual double getObjValue () const

  Get the objective function value.

Methods for strong branching.

- virtual void markHotStart ()

  Create a hot start snapshot of the optimization process.
- virtual void solveFromHotStart ()

  Optimize starting from the hot start snapshot.
- virtual void unmarkHotStart ()

  Delete the hot start snapshot.

Protected Member Functions

- virtual int tightenBoundsCLP (int lightweight)

  Copy of the Clp version — not light version.
- virtual int tightenBoundsCLP_Light (int lightweight)

  Copy of the Clp version — light version.

Protected Attributes

- CouenneCutGenerator ∗ cutgen_

  The pointer to the Couenne cut generator.
- bool knowInfeasible_

  Flag indicating that infeasibility was detected during solveFromHotStart.
- bool knowOptimal_

  Flag indicating that optimality was detected during solveFromHotStart.
- bool knowDualInfeasible_

  Flag indicating this problem's continuous relaxation is unbounded.

7.41.1 Detailed Description

template<class T>class Couenne::CouenneSolverInterface< T >

Solver interface class with a pointer to a Couenne cut generator.

Its main purposes are:

1) to apply bound tightening before re-solving 2) to replace OsiSolverInterface::isInteger () with problem_ -> [expression] -> isInteger () 3) to use NLP solution at branching

Definition at line 27 of file CouenneSolverInterface.hpp.

7.41.2 Constructor & Destructor Documentation

7.41.2.1 template< class T > Couenne::CouenneSolverInterface< T >::CouenneSolverInterface (CouenneCutGenerator * *cg* = NULL)

Constructor.

7.41.2.2 template< class T > Couenne::CouenneSolverInterface< T >::CouenneSolverInterface (const CouenneSolverInterface< T > & *src*)

Copy constructor.

7.41.2.3 template< class T > Couenne::CouenneSolverInterface< T >::~CouenneSolverInterface ( )

Destructor.

7.41.3 Member Function Documentation

7.41.3.1 template< class T > virtual OsiSolverInterface* Couenne::CouenneSolverInterface< T >::clone (bool *copyData* = true) const [inline], [virtual]

Clone.

Definition at line 41 of file CouenneSolverInterface.hpp.

7.41.3.2 template< class T > virtual bool Couenne::CouenneSolverInterface< T >::isProvenPrimalInfeasible ( ) const [virtual]

we need to overwrite this since we might have internal knowledge

7.41.3.3 template< class T > virtual bool Couenne::CouenneSolverInterface< T >::isProvenOptimal ( ) const [virtual]

we need to overwrite this since we might have internal knowledge

7.41.3.4 template< class T > CouenneCutGenerator* Couenne::CouenneSolverInterface< T >::CutGen ( ) [inline]

Return cut generator pointer.

Definition at line 51 of file CouenneSolverInterface.hpp.

7.41.3.5 template<class T > void Couenne::CouenneSolverInterface< T >::setCutGenPtr (CouenneCutGenerator * *cg*) [inline]

Set cut generator pointer after setup, to avoid changes in the pointer due to cut generator cloning (it happens twice in the algorithm)

Definition at line 57 of file CouenneSolverInterface.hpp.

7.41.3.6 template<class T > virtual void Couenne::CouenneSolverInterface< T >::initialSolve ( ) [virtual]

Solve initial LP relaxation.

7.41.3.7 template<class T > virtual void Couenne::CouenneSolverInterface< T >::resolve ( ) [virtual]

Resolve an LP relaxation after problem modification.

7.41.3.8 template<class T > virtual void Couenne::CouenneSolverInterface< T >::resolve_nobt ( ) [inline], [virtual]

Resolve an LP without applying bound tightening beforehand.

Definition at line 70 of file CouenneSolverInterface.hpp.

7.41.3.9 template<class T > virtual void Couenne::CouenneSolverInterface< T >::markHotStart ( ) [virtual]

Create a hot start snapshot of the optimization process.

7.41.3.10 template<class T > virtual void Couenne::CouenneSolverInterface< T >::solveFromHotStart ( ) [virtual]

Optimize starting from the hot start snapshot.

7.41.3.11 template<class T > virtual void Couenne::CouenneSolverInterface< T >::unmarkHotStart ( ) [virtual]

Delete the hot start snapshot.

7.41.3.12 template<class T > virtual int Couenne::CouenneSolverInterface< T >::tightenBounds (int *lightweight*) [virtual]

Tighten bounds on all variables (including continuous).

7.41.3.13 template<class T > bool Couenne::CouenneSolverInterface< T >::isProvenDualInfeasible ( ) const

set doingResolve_

is this problem unbounded?

7.41.3.14 template<class T > virtual double Couenne::CouenneSolverInterface< T >::getObjValue ( ) const [virtual]

Get the objective function value.

Modified due to possible constant objectives passed to Couenne

7.41.3.15 template<class T > virtual int Couenne::CouenneSolverInterface< T >::tightenBoundsCLP (int *lightweight*) [protected], [virtual]

Copy of the Clp version — not light version.

7.41.3.16 template< class T > virtual int Couenne::CouenneSolverInterface< T >::tightenBoundsCLP_Light (int *lightweight*) [protected], [virtual]

Copy of the Clp version — light version.

7.41.4 Member Data Documentation

7.41.4.1 template< class T > CouenneCutGenerator* Couenne::CouenneSolverInterface< T >::cutgen_ [protected]

The pointer to the Couenne cut generator.

Gives us a lot of information, for instance the nlp solver pointer, and the chance to do bound tightening before resolve ().

Definition at line 116 of file CouenneSolverInterface.hpp.

7.41.4.2 template< class T > bool Couenne::CouenneSolverInterface< T >::knowInfeasible_ [protected]

Flag indicating that infeasibility was detected during solveFromHotStart.

Definition at line 119 of file CouenneSolverInterface.hpp.

7.41.4.3 template< class T > bool Couenne::CouenneSolverInterface< T >::knowOptimal_ [protected]

Flag indicating that optimality was detected during solveFromHotStart.

Definition at line 122 of file CouenneSolverInterface.hpp.

7.41.4.4 template< class T > bool Couenne::CouenneSolverInterface< T >::knowDualInfeasible_ [protected]

Flag indicating this problem's continuous relaxation is unbounded.

Definition at line 125 of file CouenneSolverInterface.hpp.

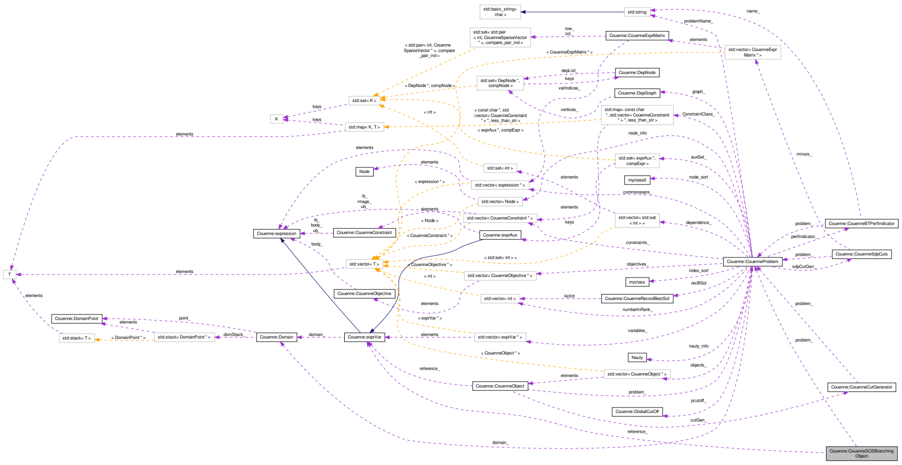
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/problem/CouenneSolverInterface.hpp

7.42 Couenne::CouenneSOSBranchingObject Class Reference

```
#include <CouenneSOSObject.hpp>
```

Collaboration diagram for Couenne::CouenneSOSBranchingObject:



Public Member Functions

- CouenneSOSBranchingObject ()
- CouenneSOSBranchingObject (CouenneProblem ∗p, exprVar ∗ref, OsiSolverInterface ∗solver, const OsiSOS ∗originalObject, int way, double separator, JnlstPtr jnlst, bool doFBBT, bool doConvCuts)
- CouenneSOSBranchingObject (const CouenneSOSBranchingObject &src)
- virtual OsiBranchingObject ∗ clone () const

  Clone.
- virtual double branch (OsiSolverInterface ∗solver)

  Does next branch and updates state.

Protected Attributes

- CouenneProblem ∗ problem_

  pointer to Couenne problem
- exprVar ∗ reference_

  The (auxiliary) variable this branching object refers to.
- JnlstPtr jnlst_

  SmartPointer to the Journalist.
- bool doFBBT_

  shall we do Feasibility based Bound Tightening (FBBT) at branching?
- bool doConvCuts_

  shall we add convexification cuts at branching?

7.42.1 Detailed Description

Definition at line 27 of file CouenneSOSObject.hpp.

7.42.2 Constructor & Destructor Documentation

7.42.2.1 Couenne::CouenneSOSBranchingObject::CouenneSOSBranchingObject ( ) [inline]

Definition at line 51 of file CouenneSOSObject.hpp.

7.42.2.2 Couenne::CouenneSOSBranchingObject::CouenneSOSBranchingObject (CouenneProblem * *p*, exprVar * *ref*, OsiSolverInterface * *solver*, const OsiSOS * *originalObject*, int *way*, double *separator*, JnlstPtr *jnlst*, bool *doFBBT*, bool *doConvCuts*) [inline]

Definition at line 54 of file CouenneSOSObject.hpp.

7.42.2.3 Couenne::CouenneSOSBranchingObject::CouenneSOSBranchingObject (const CouenneSOSBranchingObject & *src*) [inline]

Definition at line 73 of file CouenneSOSObject.hpp.

7.42.3 Member Function Documentation

7.42.3.1 virtual OsiBranchingObject* Couenne::CouenneSOSBranchingObject::clone ( ) const [inline], [virtual]

Clone.

Definition at line 83 of file CouenneSOSObject.hpp.

7.42.3.2 virtual double Couenne::CouenneSOSBranchingObject::branch (OsiSolverInterface * *solver*) [virtual]

Does next branch and updates state.

7.42.4 Member Data Documentation

7.42.4.1 CouenneProblem* Couenne::CouenneSOSBranchingObject::problem_ [protected]

pointer to Couenne problem

Definition at line 32 of file CouenneSOSObject.hpp.

7.42.4.2 exprVar* Couenne::CouenneSOSBranchingObject::reference_ [protected]

The (auxiliary) variable this branching object refers to.

If the expression is w=f(x,y), this is w, as opposed to CouenneBranchingObject, where it would be either x or y.

Definition at line 37 of file CouenneSOSObject.hpp.

7.42.4.3 JnlstPtr Couenne::CouenneSOSBranchingObject::jnlst_ [protected]

SmartPointer to the Journalist.

Definition at line 40 of file CouenneSOSObject.hpp.

7.42.4.4 bool Couenne::CouenneSOSBranchingObject::doFBBT_ [protected]

shall we do Feasibility based Bound Tightening (FBBT) at branching?

Definition at line 43 of file CouenneSOSObject.hpp.

7.42.4.5 bool Couenne::CouenneSOSBranchingObject::doConvCuts_ [protected]

shall we add convexification cuts at branching?

Definition at line 46 of file CouenneSOSObject.hpp.

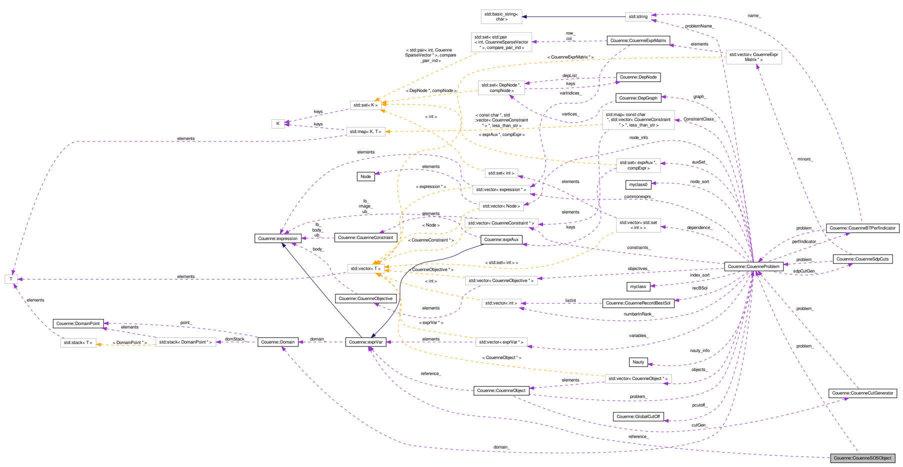
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/branch/CouenneSOSObject.hpp

7.43 Couenne::CouenneSOSObject Class Reference

`#include <CouenneSOSObject.hpp>`

Collaboration diagram for Couenne::CouenneSOSObject:



Public Member Functions

- CouenneSOSObject (OsiSolverInterface ∗solver, int nelem, int ∗indices, double ∗weights, int type, CouenneProblem ∗problem, exprVar ∗ref, JnlstPtr jnlst, bool doFBBT, bool doConvCuts)
- CouenneSOSObject (const CouenneSOSObject &src)

    Copy constructor.
- virtual OsiObject ∗ clone () const

    Cloning method.
- OsiBranchingObject ∗ createBranch (OsiSolverInterface ∗si, const OsiBranchingInformation ∗info, int way) const

    create branching objects

Protected Attributes

- CouenneProblem ∗ problem_

    pointer to Couenne problem
- exprVar ∗ reference_

    The (auxiliary) variable this branching object refers to.
- JnlstPtr jnlst_

SmartPointer to the Journalist.
- bool doFBBT_

  shall we do Feasibility based Bound Tightening (FBBT) at branching?
- bool doConvCuts_

  shall we add convexification cuts at branching?

7.43.1 Detailed Description

Definition at line 95 of file CouenneSOSObject.hpp.

7.43.2 Constructor & Destructor Documentation

7.43.2.1 Couenne::CouenneSOSObject::CouenneSOSObject (OsiSolverInterface * *solver*, int *nelem*, int * *indices*, double * *weights*, int *type*, CouenneProblem * *problem*, exprVar * *ref*, JnlstPtr *jnlst*, bool *doFBBT*, bool *doConvCuts*) [inline]

Definition at line 118 of file CouenneSOSObject.hpp.

7.43.2.2 Couenne::CouenneSOSObject::CouenneSOSObject (const CouenneSOSObject & *src*) [inline]

Copy constructor.

Definition at line 134 of file CouenneSOSObject.hpp.

7.43.3 Member Function Documentation

7.43.3.1 virtual OsiObject* Couenne::CouenneSOSObject::clone ( ) const [inline], [virtual]

Cloning method.

Definition at line 143 of file CouenneSOSObject.hpp.

7.43.3.2 OsiBranchingObject* Couenne::CouenneSOSObject::createBranch (OsiSolverInterface * *si*, const OsiBranchingInformation * *info*, int *way*) const

create branching objects

7.43.4 Member Data Documentation

7.43.4.1 CouenneProblem* Couenne::CouenneSOSObject::problem_ [protected]

pointer to Couenne problem

Definition at line 100 of file CouenneSOSObject.hpp.

7.43.4.2 exprVar* Couenne::CouenneSOSObject::reference_ [protected]

The (auxiliary) variable this branching object refers to.

If the expression is w=f(x,y), this is w, as opposed to CouenneBranchingObject, where it would be either x or y.

Definition at line 105 of file CouenneSOSObject.hpp.

7.43.4.3 JnlstPtr Couenne::CouenneSOSObject::jnlst_ [protected]

SmartPointer to the Journalist.

Definition at line 108 of file CouenneSOSObject.hpp.

7.43.4.4 bool Couenne::CouenneSOSObject::doFBBT_ [protected]

shall we do Feasibility based Bound Tightening (FBBT) at branching?

Definition at line 111 of file CouenneSOSObject.hpp.

7.43.4.5 bool Couenne::CouenneSOSObject::doConvCuts_ [protected]

shall we add convexification cuts at branching?

Definition at line 114 of file CouenneSOSObject.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/branch/CouenneSOSObject.hpp

7.44 Couenne::CouenneSparseBndVec< T > Class Template Reference

```
#include <CouenneSparseBndVec.hpp>
```

Public Member Functions

- CouenneSparseBndVec (unsigned int size)

  Constructor.
- CouenneSparseBndVec (CouenneSparseBndVec &src)

  Copy constructor.
- ∼CouenneSparseBndVec ()

  Destructor.
- void reset ()

  Reset (eeeeasy!)
- T & operator[] (register unsigned int index)

  Access – the only chance for garbage to be returned (and for valgrind to complain) is when object[ind] is READ without making sure it has been written.
- T ∗ data ()

  Return data in DENSE format – use with care.
- unsigned int ∗ indices ()

  Return indices in DENSE format – for use with data()
- unsigned int nElements ()

  Return current size.
- void resize (unsigned int newsize)

  Resize.

7.44.1 Detailed Description

template<class T>class Couenne::CouenneSparseBndVec< T >

Definition at line 16 of file CouenneSparseBndVec.hpp.

7.44.2 Constructor & Destructor Documentation

7.44.2.1 template<class T > Couenne::CouenneSparseBndVec< T >::CouenneSparseBndVec (unsigned int *size*) [inline]

Constructor.

Definition at line 51 of file CouenneSparseBndVec.hpp.

7.44.2.2 template<class T > Couenne::CouenneSparseBndVec< T >::CouenneSparseBndVec (CouenneSparseBndVec< T > & *src*) [inline]

Copy constructor.

assert: src.sInd [ind] == i

Definition at line 62 of file CouenneSparseBndVec.hpp.

7.44.2.3 template<class T > Couenne::CouenneSparseBndVec< T >::∼CouenneSparseBndVec ( ) [inline]

Destructor.

Definition at line 76 of file CouenneSparseBndVec.hpp.

7.44.3 Member Function Documentation

7.44.3.1 template<class T > void Couenne::CouenneSparseBndVec< T >::reset ( ) [inline]

Reset (eeeeasy!)

Definition at line 83 of file CouenneSparseBndVec.hpp.

7.44.3.2 template<class T > T& Couenne::CouenneSparseBndVec< T >::operator[] (register unsigned int *index*) [inline]

Access – the only chance for garbage to be returned (and for valgrind to complain) is when object[ind] is READ without making sure it has been written.

This should not happen to the end user as read operations are only performed on the dense structure, after this object has been populated.

Definition at line 91 of file CouenneSparseBndVec.hpp.

7.44.3.3 template<class T > T∗ Couenne::CouenneSparseBndVec< T >::data ( ) [inline]

Return data in DENSE format – use with care.

Definition at line 103 of file CouenneSparseBndVec.hpp.

7.44.3.4 template<class T > unsigned int∗ Couenne::CouenneSparseBndVec< T >::indices ( ) [inline]

Return indices in DENSE format – for use with data()

Definition at line 107 of file CouenneSparseBndVec.hpp.

7.44.3.5 template<class T > unsigned int Couenne::CouenneSparseBndVec< T >::nElements ( ) [inline]

Return current size.

Definition at line 111 of file CouenneSparseBndVec.hpp.

7.44.3.6 template< class T > void Couenne::CouenneSparseBndVec< T >::resize (unsigned int *newsize*) [inline]

Resize.

Definition at line 115 of file CouenneSparseBndVec.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneSparseBndVec.hpp

7.45 Couenne::CouenneSparseMatrix Class Reference

Class for sparse Matrixs (used in modifying distances in FP)

`#include <CouenneSparseMatrix.hpp>`

Public Member Functions

- CouenneSparseMatrix ()

  Constructor.
- CouenneSparseMatrix (const CouenneSparseMatrix &)

  Copy constructor.
- CouenneSparseMatrix & operator= (const CouenneSparseMatrix &rhs)

  Assignment.
- CouenneSparseMatrix * clone ()

  Clone.
- virtual ~CouenneSparseMatrix ()

  Destructor.
- int & num ()

  Get methods.
- double *& val ()

  values
- int *& col ()

  column indices
- int *& row ()

  row indices

7.45.1 Detailed Description

Class for sparse Matrixs (used in modifying distances in FP)

Definition at line 17 of file CouenneSparseMatrix.hpp.

7.45.2 Constructor & Destructor Documentation

7.45.2.1 Couenne::CouenneSparseMatrix::CouenneSparseMatrix ( )

Constructor.

7.45.2.2 Couenne::CouenneSparseMatrix::CouenneSparseMatrix (const **CouenneSparseMatrix** &)

Copy constructor.

7.45.2.3 virtual Couenne::CouenneSparseMatrix::∼CouenneSparseMatrix ( ) [virtual]

Destructor.

7.45.3 Member Function Documentation

7.45.3.1 **CouenneSparseMatrix**& Couenne::CouenneSparseMatrix::operator= (const **CouenneSparseMatrix** & *rhs*)

Assignment.

7.45.3.2 **CouenneSparseMatrix*** Couenne::CouenneSparseMatrix::clone ( )

Clone.

7.45.3.3 int& Couenne::CouenneSparseMatrix::num ( ) [inline]

Get methods.

number of elements

Definition at line 37 of file CouenneSparseMatrix.hpp.

7.45.3.4 double*& Couenne::CouenneSparseMatrix::val ( ) [inline]

values

Definition at line 38 of file CouenneSparseMatrix.hpp.

7.45.3.5 int*& Couenne::CouenneSparseMatrix::col ( ) [inline]

column indices

Definition at line 39 of file CouenneSparseMatrix.hpp.

7.45.3.6 int*& Couenne::CouenneSparseMatrix::row ( ) [inline]

row indices

Definition at line 40 of file CouenneSparseMatrix.hpp.

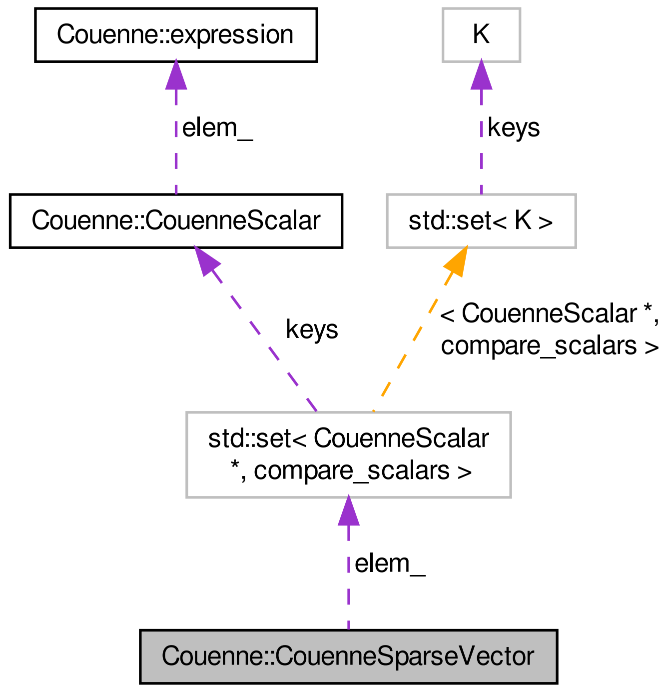
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/util/CouenneSparseMatrix.hpp

7.46 Couenne::CouenneSparseVector Class Reference

```
#include <CouenneMatrix.hpp>
```

Collaboration diagram for Couenne::CouenneSparseVector:



Classes

- struct compare_scalars

Public Member Functions

- CouenneSparseVector ()
- ∼CouenneSparseVector ()
- CouenneSparseVector (const CouenneSparseVector &rhs)
- CouenneSparseVector & operator= (const CouenneSparseVector &rhs)
- CouenneSparseVector ∗ clone ()
- void add_element (int index, expression ∗elem)
- void print () const
- const std::set< CouenneScalar ∗, compare_scalars > & getElements ()

    returns elements of vector as (ordered) set
- double operator∗ (const CouenneSparseVector &factor) const

    vector ∗ vector (dot product)
- CouenneSparseVector & operator∗ (const CouenneExprMatrix &post) const

    vector ∗ matrix

- double multiply_thres (const CouenneSparseVector &v2, double thres) const

  stops multiplication if above threshold

Protected Attributes

- std::set< CouenneScalar
  *, compare_scalars > elem_

7.46.1 Detailed Description

Definition at line 66 of file CouenneMatrix.hpp.

7.46.2 Constructor & Destructor Documentation

7.46.2.1 Couenne::CouenneSparseVector::CouenneSparseVector ( ) [inline]

Definition at line 82 of file CouenneMatrix.hpp.

7.46.2.2 Couenne::CouenneSparseVector::∼CouenneSparseVector ( )

7.46.2.3 Couenne::CouenneSparseVector::CouenneSparseVector (const CouenneSparseVector & *rhs*)

7.46.3 Member Function Documentation

7.46.3.1 CouenneSparseVector& Couenne::CouenneSparseVector::operator= (const CouenneSparseVector & *rhs*)

7.46.3.2 CouenneSparseVector* Couenne::CouenneSparseVector::clone ( ) [inline]

Definition at line 87 of file CouenneMatrix.hpp.

7.46.3.3 void Couenne::CouenneSparseVector::add_element (int *index,* expression * *elem*)

7.46.3.4 void Couenne::CouenneSparseVector::print ( ) const

7.46.3.5 const std::set<CouenneScalar *, compare_scalars>& Couenne::CouenneSparseVector::getElements ( ) [inline]

returns elements of vector as (ordered) set

Definition at line 93 of file CouenneMatrix.hpp.

7.46.3.6 double Couenne::CouenneSparseVector::operator* (const CouenneSparseVector & *factor*) const

vector * vector (dot product)

7.46.3.7 CouenneSparseVector& Couenne::CouenneSparseVector::operator* (const CouenneExprMatrix & *post*) const

vector * matrix

7.46.3.8 double Couenne::CouenneSparseVector::multiply_thres (const CouenneSparseVector & *v2,* double *thres*) const

stops multiplication if above threshold

7.46.4 Member Data Documentation

7.46.4.1 std::set<CouenneScalar ∗, compare_scalars> Couenne::CouenneSparseVector::elem_ [protected]

Definition at line 78 of file CouenneMatrix.hpp.

The documentation for this class was generated from the following file:

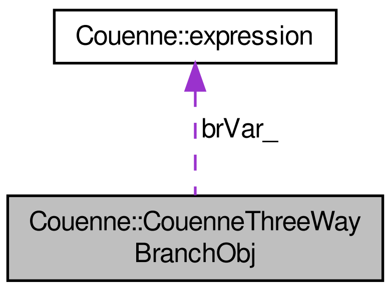
- /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouenneMatrix.hpp

7.47 Couenne::CouenneThreeWayBranchObj Class Reference

Spatial, three-way branching object.

`#include <CouenneThreeWayBranchObj.hpp>`

Collaboration diagram for Couenne::CouenneThreeWayBranchObj:



Public Member Functions

- CouenneThreeWayBranchObj (JnlstPtr jnlst, expression ∗, CouNumber, CouNumber, int=THREE_CENTER)

    Constructor.
- CouenneThreeWayBranchObj (const CouenneThreeWayBranchObj &src)

    Copy constructor.
- virtual OsiBranchingObject ∗ clone () const

    Cloning method.
- virtual double branch (OsiSolverInterface ∗solver=NULL)

    Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Protected Attributes

- expression ∗ brVar_

    The variable this branching object refers to.
- CouNumber lcrop_

left divider
- CouNumber rcrop_

  right divider
- int firstBranch_

  First branch to be performed: 0 is left, 1 is central, 2 is right.
- JnlstPtr jnlst_

  True if the associated variable is integer.

7.47.1 Detailed Description

Spatial, three-way branching object.

Branching is performed on continuous variables but a better convexification is sought around the current point by dividing the interval in three parts

Definition at line 28 of file CouenneThreeWayBranchObj.hpp.

7.47.2 Constructor & Destructor Documentation

7.47.2.1 Couenne::CouenneThreeWayBranchObj::CouenneThreeWayBranchObj (JnlstPtr *jnlst*, expression ∗ , CouNumber , CouNumber , int = THREE_CENTER)

Constructor.

7.47.2.2 Couenne::CouenneThreeWayBranchObj::CouenneThreeWayBranchObj (const CouenneThreeWayBranchObj & *src*) [inline]

Copy constructor.

Definition at line 42 of file CouenneThreeWayBranchObj.hpp.

7.47.3 Member Function Documentation

7.47.3.1 virtual OsiBranchingObject∗ Couenne::CouenneThreeWayBranchObj::clone ( ) const [inline], [virtual]

Cloning method.

Definition at line 51 of file CouenneThreeWayBranchObj.hpp.

7.47.3.2 virtual double Couenne::CouenneThreeWayBranchObj::branch (OsiSolverInterface ∗ *solver* = NULL) [virtual]

Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Returns change in guessed objective on next (what does "next" mean here?) branch

7.47.4 Member Data Documentation

7.47.4.1 expression∗ Couenne::CouenneThreeWayBranchObj::brVar_ [protected]

The variable this branching object refers to.

If the corresponding CouenneObject was created on w=f(x,y), it is either x or y.

Definition at line 67 of file CouenneThreeWayBranchObj.hpp.

7.47.4.2 CouNumber Couenne::CouenneThreeWayBranchObj::lcrop_ [protected]

left divider

Definition at line 69 of file CouenneThreeWayBranchObj.hpp.

7.47.4.3 CouNumber Couenne::CouenneThreeWayBranchObj::rcrop_ [protected]

right divider

Definition at line 70 of file CouenneThreeWayBranchObj.hpp.

7.47.4.4 int Couenne::CouenneThreeWayBranchObj::firstBranch_ [protected]

First branch to be performed: 0 is left, 1 is central, 2 is right.

Definition at line 73 of file CouenneThreeWayBranchObj.hpp.

7.47.4.5 JnlstPtr Couenne::CouenneThreeWayBranchObj::jnlst_ [protected]

True if the associated variable is integer.

SmartPointer to the Journalist

Definition at line 79 of file CouenneThreeWayBranchObj.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/branch/CouenneThreeWayBranchObj.hpp

7.48 Couenne::CouenneTNLP Class Reference

Class for handling NLPs using CouenneProblem.

`#include <CouenneTNLP.hpp>`

Public Member Functions

- CouenneTNLP ()
  Empty constructor.
- CouenneTNLP (CouenneProblem ∗)
  Constructor.
- CouenneTNLP (const CouenneTNLP &)
  Copy constructor.
- CouenneTNLP & operator= (const CouenneTNLP &rhs)
  Assignment.
- CouenneTNLP ∗ clone ()
  Clone.
- virtual ∼CouenneTNLP ()
  Destructor.
- void setInitSol (const double ∗sol)
  set initial solution
- CouNumber ∗ getSolution ()
  returns best solution (if it exists)
- CouNumber getSolValue ()

returns value of the best solution

- virtual bool get_nlp_info (Ipopt::Index &n, Ipopt::Index &m, Ipopt::Index &nnz_jac_g, Ipopt::Index &nnz_h_lag, enum Ipopt::TNLP::IndexStyleEnum &index_style)

  return the number of variables and constraints, and the number of non-zeros in the jacobian and the hessian.
- virtual bool get_bounds_info (Ipopt::Index n, Ipopt::Number ∗x_l, Ipopt::Number ∗x_u, Ipopt::Index m, Ipopt::-Number ∗g_l, Ipopt::Number ∗g_u)

  return the information about the bound on the variables and constraints.
- virtual bool get_variables_linearity (Ipopt::Index n, Ipopt::TNLP::LinearityType ∗var_types)

  return the variables linearity (TNLP::Linear or TNLP::NonLinear).
- virtual bool get_constraints_linearity (Ipopt::Index m, Ipopt::TNLP::LinearityType ∗const_types)

  return the constraint linearity.
- virtual bool get_starting_point (Ipopt::Index n, bool init_x, Ipopt::Number ∗x, bool init_z, Ipopt::Number ∗z_L, Ipopt::Number ∗z_U, Ipopt::Index m, bool init_lambda, Ipopt::Number ∗lambda)

  return the starting point.
- virtual bool eval_f (Ipopt::Index n, const Ipopt::Number ∗x, bool new_x, Ipopt::Number &obj_value)

  return the value of the objective function
- virtual bool eval_grad_f (Ipopt::Index n, const Ipopt::Number ∗x, bool new_x, Ipopt::Number ∗grad_f)

  return the vector of the gradient of the objective w.r.t. x
- virtual bool eval_g (Ipopt::Index n, const Ipopt::Number ∗x, bool new_x, Ipopt::Index m, Ipopt::Number ∗g)

  return the vector of constraint values
- virtual bool eval_jac_g (Ipopt::Index n, const Ipopt::Number ∗x, bool new_x, Ipopt::Index m, Ipopt::Index nele_jac, Ipopt::Index ∗iRow, Ipopt::Index ∗jCol, Ipopt::Number ∗values)

  return the jacobian of the constraints.
- virtual bool eval_h (Ipopt::Index n, const Ipopt::Number ∗x, bool new_x, Ipopt::Number obj_factor, Ipopt::Index m, const Ipopt::Number ∗lambda, bool new_lambda, Ipopt::Index nele_hess, Ipopt::Index ∗iRow, Ipopt::Index ∗jCol, Ipopt::Number ∗values)

  return the hessian of the lagrangian.
- virtual void finalize_solution (Ipopt::SolverReturn status, Ipopt::Index n, const Ipopt::Number ∗x, const Ipopt::-Number ∗z_L, const Ipopt::Number ∗z_U, Ipopt::Index m, const Ipopt::Number ∗g, const Ipopt::Number ∗lambda, Ipopt::Number obj_value, const Ipopt::IpoptData ∗ip_data, Ipopt::IpoptCalculatedQuantities ∗ip_cq)

  This method is called when the algorithm is complete so the TNLP can store/write the solution.
- virtual bool intermediate_callback (Ipopt::AlgorithmMode mode, Ipopt::Index iter, Ipopt::Number obj_value, Ipopt-::Number inf_pr, Ipopt::Number inf_du, Ipopt::Number mu, Ipopt::Number d_norm, Ipopt::Number regularization-_size, Ipopt::Number alpha_du, Ipopt::Number alpha_pr, Ipopt::Index ls_trials, const Ipopt::IpoptData ∗ip_data, Ipopt::IpoptCalculatedQuantities ∗ip_cq)

  Intermediate Callback method for the user.

Methods for quasi-Newton approximation. If the second

derivatives are approximated by Ipopt, it is better to do this only in the space of nonlinear variables.

The following methods are call by Ipopt if the quasi-Newton approximation is selected. If -1 is returned as number of nonlinear variables, Ipopt assumes that all variables are nonlinear. Otherwise, it calls get_list_of_nonlinear_variables with an array into which the indices of the nonlinear variables should be written - the array has the lengths num_nonlin-_vars, which is identical with the return value of get_number_of_nonlinear_variables (). It is assumed that the indices are counted starting with 1 in the FORTRAN_STYLE, and 0 for the C_STYLE.

- virtual Ipopt::Index get_number_of_nonlinear_variables ()
- virtual bool get_list_of_nonlinear_variables (Ipopt::Index num_nonlin_vars, Ipopt::Index ∗pos_nonlin_vars)

  get real list

- virtual void setObjective (expression ∗newObj)

    Change objective function and modify gradient expressions accordingly.

- CouenneSparseMatrix ∗& optHessian ()

    Get methods.

- bool & getSaveOptHessian ()

    *set and get saveOptHessian_*

7.48.1 Detailed Description

Class for handling NLPs using CouenneProblem.

Definition at line 27 of file CouenneTNLP.hpp.

7.48.2 Constructor & Destructor Documentation

7.48.2.1 Couenne::CouenneTNLP::CouenneTNLP ( )

Empty constructor.

7.48.2.2 Couenne::CouenneTNLP::CouenneTNLP (CouenneProblem ∗)

Constructor.

7.48.2.3 Couenne::CouenneTNLP::CouenneTNLP (const CouenneTNLP &)

Copy constructor.

7.48.2.4 virtual Couenne::CouenneTNLP::∼CouenneTNLP ( ) [virtual]

Destructor.

7.48.3 Member Function Documentation

7.48.3.1 CouenneTNLP& Couenne::CouenneTNLP::operator= (const CouenneTNLP & *rhs*)

Assignment.

7.48.3.2 CouenneTNLP∗ Couenne::CouenneTNLP::clone ( )

Clone.

7.48.3.3 void Couenne::CouenneTNLP::setInitSol (const double ∗ *sol*)

set initial solution

7.48.3.4 CouNumber∗ Couenne::CouenneTNLP::getSolution ( ) [inline]

returns best solution (if it exists)

Definition at line 53 of file CouenneTNLP.hpp.

7.48.3.5 CouNumber Couenne::CouenneTNLP::getSolValue ( ) [inline]

returns value of the best solution

Definition at line 57 of file CouenneTNLP.hpp.

7.48.3.6 virtual bool Couenne::CouenneTNLP::get_nlp_info (Ipopt::Index & *n*, Ipopt::Index & *m*, Ipopt::Index & *nnz_jac_g*, Ipopt::Index & *nnz_h_lag*, enum Ipopt::TNLP::IndexStyleEnum & *index_style*) [virtual]

return the number of variables and constraints, and the number of non-zeros in the jacobian and the hessian.

The index_style parameter lets you specify C or Fortran style indexing for the sparse matrix iRow and jCol parameters. C_STYLE is 0-based, and FORTRAN_STYLE is 1-based.

7.48.3.7 virtual bool Couenne::CouenneTNLP::get_bounds_info (Ipopt::Index *n*, Ipopt::Number ∗ *x_l*, Ipopt::Number ∗ *x_u*, Ipopt::Index *m*, Ipopt::Number ∗ *g_l*, Ipopt::Number ∗ *g_u*) [virtual]

return the information about the bound on the variables and constraints.

The value that indicates that a bound does not exist is specified in the parameters nlp_lower_bound_inf and nlp_upper-_bound_inf. By default, nlp_lower_bound_inf is -1e19 and nlp_upper_bound_inf is 1e19. (see TNLPAdapter)

7.48.3.8 virtual bool Couenne::CouenneTNLP::get_variables_linearity (Ipopt::Index *n*, Ipopt::TNLP::LinearityType ∗ *var_types*) [virtual]

return the variables linearity (TNLP::Linear or TNLP::NonLinear).

The var_types array should be allocated with length at least n. (default implementation just return false and does not fill the array).

7.48.3.9 virtual bool Couenne::CouenneTNLP::get_constraints_linearity (Ipopt::Index *m*, Ipopt::TNLP::LinearityType ∗ *const_types*) [virtual]

return the constraint linearity.

array should be alocated with length at least n. (default implementation just return false and does not fill the array).

7.48.3.10 virtual bool Couenne::CouenneTNLP::get_starting_point (Ipopt::Index *n*, bool *init_x*, Ipopt::Number ∗ *x*, bool *init_z*, Ipopt::Number ∗ *z_L*, Ipopt::Number ∗ *z_U*, Ipopt::Index *m*, bool *init_lambda*, Ipopt::Number ∗ *lambda*) [virtual]

return the starting point.

The bool variables indicate whether the algorithm wants you to initialize x, z_L/z_u, and lambda, respectively. If, for some reason, the algorithm wants you to initialize these and you cannot, return false, which will cause Ipopt to stop. You will have to run Ipopt with different options then.

7.48.3.11 virtual bool Couenne::CouenneTNLP::eval_f (Ipopt::Index *n*, const Ipopt::Number ∗ *x*, bool *new_x*, Ipopt::Number & *obj_value*) [virtual]

return the value of the objective function

7.48.3.12 virtual bool Couenne::CouenneTNLP::eval_grad_f (Ipopt::Index *n*, const Ipopt::Number ∗ *x*, bool *new_x*, Ipopt::Number ∗ *grad_f*) [virtual]

return the vector of the gradient of the objective w.r.t. x

7.48.3.13 virtual bool Couenne::CouenneTNLP::eval_g (Ipopt::Index *n*, const Ipopt::Number ∗ *x*, bool *new_x*, Ipopt::Index *m*, Ipopt::Number ∗ *g*) [virtual]

return the vector of constraint values

7.48.3.14 virtual bool Couenne::CouenneTNLP::eval_jac_g (Ipopt::Index *n*, const Ipopt::Number ∗ *x*, bool *new_x*, Ipopt::Index *m*, Ipopt::Index *nele_jac*, Ipopt::Index ∗ *iRow*, Ipopt::Index ∗ *jCol*, Ipopt::Number ∗ *values*) [virtual]

return the jacobian of the constraints.

The vectors iRow and jCol only need to be set once. The first call is used to set the structure only (iRow and jCol will be non-NULL, and values will be NULL) For subsequent calls, iRow and jCol will be NULL.

7.48.3.15 virtual bool Couenne::CouenneTNLP::eval_h (Ipopt::Index *n*, const Ipopt::Number ∗ *x*, bool *new_x*, Ipopt::Number *obj_factor*, Ipopt::Index *m*, const Ipopt::Number ∗ *lambda*, bool *new_lambda*, Ipopt::Index *nele_hess*, Ipopt::Index ∗ *iRow*, Ipopt::Index ∗ *jCol*, Ipopt::Number ∗ *values*) [virtual]

return the hessian of the lagrangian.

The vectors iRow and jCol only need to be set once (during the first call). The first call is used to set the structure only (iRow and jCol will be non-NULL, and values will be NULL) For subsequent calls, iRow and jCol will be NULL. This matrix is symmetric - specify the lower diagonal only. A default implementation is provided, in case the user wants to se quasi-Newton approximations to estimate the second derivatives and doesn't not neet to implement this method.

7.48.3.16 virtual void Couenne::CouenneTNLP::finalize_solution (Ipopt::SolverReturn *status*, Ipopt::Index *n*, const Ipopt::Number ∗ *x*, const Ipopt::Number ∗ *z_L*, const Ipopt::Number ∗ *z_U*, Ipopt::Index *m*, const Ipopt::Number ∗ *g*, const Ipopt::Number ∗ *lambda*, Ipopt::Number *obj_value*, const Ipopt::IpoptData ∗ *ip_data*, Ipopt::IpoptCalculatedQuantities ∗ *ip_cq*) [virtual]

This method is called when the algorithm is complete so the TNLP can store/write the solution.

7.48.3.17 virtual bool Couenne::CouenneTNLP::intermediate_callback (Ipopt::AlgorithmMode *mode*, Ipopt::Index *iter*, Ipopt::Number *obj_value*, Ipopt::Number *inf_pr*, Ipopt::Number *inf_du*, Ipopt::Number *mu*, Ipopt::Number *d_norm*, Ipopt::Number *regularization_size*, Ipopt::Number *alpha_du*, Ipopt::Number *alpha_pr*, Ipopt::Index *ls_trials*, const Ipopt::IpoptData ∗ *ip_data*, Ipopt::IpoptCalculatedQuantities ∗ *ip_cq*) [virtual]

Intermediate Callback method for the user.

Providing dummy default implementation. For details see IntermediateCallBack in IpNLP.hpp.

7.48.3.18 virtual Ipopt::Index Couenne::CouenneTNLP::get_number_of_nonlinear_variables ( ) [virtual]

7.48.3.19 virtual bool Couenne::CouenneTNLP::get_list_of_nonlinear_variables (Ipopt::Index *num_nonlin_vars*, Ipopt::Index ∗ *pos_nonlin_vars*) [virtual]

get real list

7.48.3.20 virtual void Couenne::CouenneTNLP::setObjective (expression ∗ *newObj*) [virtual]

Change objective function and modify gradient expressions accordingly.

7.48.3.21 CouenneSparseMatrix∗& Couenne::CouenneTNLP::optHessian ( ) [inline]

Get methods.

Definition at line 182 of file CouenneTNLP.hpp.

7.48.3.22 bool& Couenne::CouenneTNLP::getSaveOptHessian ( ) [inline]

set and get saveOptHessian_

Definition at line 186 of file CouenneTNLP.hpp.

The documentation for this class was generated from the following file:

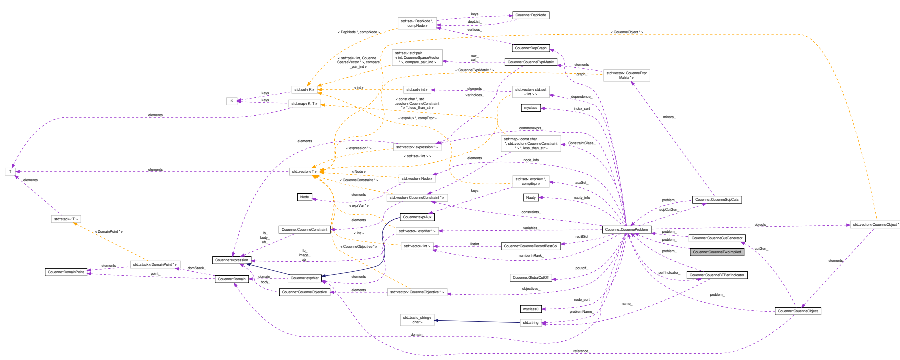
- /home/ted/COIN/trunk/Couenne/src/interfaces/CouenneTNLP.hpp

7.49 Couenne::CouenneTwoImplied Class Reference

Cut Generator for implied bounds derived from pairs of linear (in)equalities.

```
#include <CouenneTwoImplied.hpp>
```

Collaboration diagram for Couenne::CouenneTwoImplied:



Public Member Functions

- CouenneTwoImplied (CouenneProblem ∗, JnlstPtr, const Ipopt::SmartPtr< Ipopt::OptionsList >)

    constructor
- CouenneTwoImplied (const CouenneTwoImplied &)

    copy constructor
- ∼CouenneTwoImplied ()

    destructor
- CouenneTwoImplied ∗ clone () const

    clone method (necessary for the abstract CglCutGenerator class)
- void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

    the main CglCutGenerator

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > roptions)

    Add list of options to be read from file.

Protected Attributes

- CouenneProblem ∗ problem_

    pointer to problem data structure (used for post-BT)
- JnlstPtr jnlst_

    Journalist.
- int nMaxTrials_

    maximum number of trials in every call

- double totalTime_

  Total CPU time spent separating cuts.
- double totalInitTime_

  CPU time spent columning the row formulation.
- bool firstCall_

  first call indicator
- int depthLevelling_

  Depth of the BB tree where to start decreasing chance of running this.
- int depthStopSeparate_

  Depth of the BB tree where stop separation.

7.49.1 Detailed Description

Cut Generator for implied bounds derived from pairs of linear (in)equalities.

Implied bounds usually work on a SINGLE inequality of the form

$\ell_j \leq \sum_{i \in N_+} a_{ji} x_i + \sum_{i \in N_-} a_{ji} x_i \leq u_j$

where $a_{ji} > 0$ for $i \in N_+$ and $a_{ji} < 0$ for $i \in N_-$, and allow one to infer better bounds $[x_i^L, x_i^U]$ on all variables with nonzero coefficients:

(1) $x_i^L \geq (\ell_j - \sum_{i \in N_+} a_{ji} x_i^U - \sum_{i \in N_-} a_{ji} x_i^L)/a_{ji} \qquad \forall i \in N_+$

(2) $x_i^U \leq (u_j - \sum_{i \in N_+} a_{ji} x_i^L - \sum_{i \in N_-} a_{ji} x_i^U)/a_{ji} \qquad \forall i \in N_+$

(3) $x_i^L \geq (u_j - \sum_{i \in N_+} a_{ji} x_i^L - \sum_{i \in N_-} a_{ji} x_i^U)/a_{ji} \qquad \forall i \in N_-$

(4) $x_i^U \leq (\ell_j - \sum_{i \in N_+} a_{ji} x_i^U - \sum_{i \in N_-} a_{ji} x_i^L)/a_{ji} \qquad \forall i \in N_+$

Consider now two inequalities:

$\ell_h \leq \sum_{i \in N_+^1} a_{hi} x_i + \sum_{i \in N_-^1} a_{hi} x_i \leq u_h$

$\ell_k \leq \sum_{i \in N_+^2} a_{ki} x_i + \sum_{i \in N_-^2} a_{ki} x_i \leq u_k$

and their CONVEX combination using α and $1-\alpha$, where $\alpha \in [0,1]$:

$\ell' \leq \sum_{i \in N} b_i x_i \leq u'$

with $N = N_+^1 \cup N_-^1 \cup N_+^2 \cup N_-^2$, $\ell' = \alpha \ell_h + (1-\alpha)\ell_k$, and $u' = \alpha u_h + (1-\alpha) u_k$. As an example where this might be useful, consider

$x + y \geq 2$

$x - y \geq 1$

with $x \in [0,4]$ and $y \in [0,1]$. (This is similar to an example given in Tawarmalani and Sahinidis to explain FBBT != OBBT, I believe.) The sum of the two above inequalities gives $x \geq 1.5$, while using only the implied bounds on the single inequalities gives $x \geq 1$.

The key consideration here is that the b_i coefficients, ℓ' , and u' are functions of α , which determines which, among (1)-(4), to apply. In general,

if $b_i > 0$ then

$x_i^L \geq (l' - \sum_{j \in N'_+} b_j x_j^U - \sum_{j \in N'_-} b_j x_j^L)/b_i$,

$x_i^U \leq (u' - \sum_{j \in N'_+} b_j x_j^L - \sum_{j \in N'_-} b_j x_j^U)/b_i$;

if $b_i < 0$ then

$x_i^L \geq (l' - \sum_{j \in N'_+} b_j x_j^U - \sum_{j \in N'_-} b_j x_j^L)/b_i$,

$x_i^U \leq (u' - \sum_{j \in N'_+} b_j x_j^L - \sum_{j \in N'_-} b_j x_j^U)/b_i$.

Each lower/upper bound is therefore a piecewise rational function of α , given that b_i and the content of N'_+ and N'_- depend on α . These functions are continuous (easy to prove) but not differentiable at some points of $[0,1]$.

The purpose of this procedure is to find the maximum of the lower bounding function and the minimum of the upper bounding function.

Divide the interval $[0,1]$ into at most $m+1$ intervals (where m is the number of coefficients not identically zero, or the number of b_i that are nonzero for at least one value of α). The limits c_i of the subintervals are the zeros of each coefficient, i.e. the values of α such that $\alpha a_{ki} + (1-\alpha) a_{hi} = 0$, or $c_i = \frac{-a_{hi}}{a_{ki} - a_{hi}}$.

Sorting these values gives us something to do on every interval $[c_j, c_{j+1}]$ when computing a new value of x_i^L and x_i^U , which I'll denote L_i and U_i in the following.

0) if $c_j = c_i$ then

- compute $VL = \lim_{c_j \to \alpha} L_i(\alpha)$
- if $= +\infty$, infeasible else compute derivative DL (should be $+\infty$)

1) else

- compute $VL = \lim_{\alpha \to c_j} L_i(\alpha)$ (can be retrieved from previous interval as $L_i(\alpha)$ is continuous)
- compute $DL = \lim_{\alpha \to c_j} dL_i(\alpha)$

update x^L with VL if necessary.

2) if $c_{j+1} = c_i$ then

- compute $VR = \lim_{\alpha \to c_{j+1}} L_i(\alpha)$
- if = $+\infty$, infeasible else compute derivative DR (should be $-\infty$)

3) else

- compute $VR = \lim_{\alpha \to c_{j+1}} L_i(\alpha)$
- compute $DR = \lim_{\alpha \to c_{j+1}} dL_i(\alpha)$

update x^L with VR if necessary.

if $DL > 0$ and $DR < 0$, there might be a maximum in between, otherwise continue to next interval

compute internal maximum VI, update x^L with VI if necessary.

Apply a similar procedure for the upper bound

This should be applied for any h,k,i , therefore we might have a lot to do. First, select possible pairs (h,k) among those for which there exists at least one variable that satisfies neither of the following conditions:

a) same sign coefficient, constraints (h,k) both $\geq$ or both $\leq$

b) opposite sign coefficient, constraints (h,k) $(\leq,\geq)$ or $(\geq,\leq)$

as in those cases, no c_i would be in $[0,1]$

Definition at line 174 of file CouenneTwoImplied.hpp.

7.49.2 Constructor & Destructor Documentation

7.49.2.1 Couenne::CouenneTwoImplied::CouenneTwoImplied (CouenneProblem *, JnlstPtr, const Ipopt::SmartPtr< Ipopt::OptionsList >)

constructor

7.49.2.2 Couenne::CouenneTwoImplied::CouenneTwoImplied (const CouenneTwoImplied &)

copy constructor

7.49.2.3 Couenne::CouenneTwoImplied::~CouenneTwoImplied ( )

destructor

7.49.3 Member Function Documentation

7.49.3.1 CouenneTwoImplied* Couenne::CouenneTwoImplied::clone ( ) const [inline]

clone method (necessary for the abstract CglCutGenerator class)

Definition at line 190 of file CouenneTwoImplied.hpp.

7.49.3.2 void Couenne::CouenneTwoImplied::generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo = CglTreeInfo()) const

the main CglCutGenerator

7.49.3.3 static void Couenne::CouenneTwoImplied::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions > *roptions*) [static]

Add list of options to be read from file.

7.49.4 Member Data Documentation

7.49.4.1 CouenneProblem* Couenne::CouenneTwoImplied::problem_ [protected]

pointer to problem data structure (used for post-BT)

Definition at line 208 of file CouenneTwoImplied.hpp.

7.49.4.2 JnlstPtr Couenne::CouenneTwoImplied::jnlst_ [protected]

Journalist.

Definition at line 211 of file CouenneTwoImplied.hpp.

7.49.4.3 int Couenne::CouenneTwoImplied::nMaxTrials_ [protected]

maximum number of trials in every call

Definition at line 214 of file CouenneTwoImplied.hpp.

7.49.4.4 double Couenne::CouenneTwoImplied::totalTime_ [mutable], [protected]

Total CPU time spent separating cuts.

Definition at line 217 of file CouenneTwoImplied.hpp.

7.49.4.5 double Couenne::CouenneTwoImplied::totalInitTime_ [mutable], [protected]

CPU time spent columning the row formulation.

Definition at line 220 of file CouenneTwoImplied.hpp.

7.49.4.6 bool Couenne::CouenneTwoImplied::firstCall_ [mutable], [protected]

first call indicator

Definition at line 223 of file CouenneTwoImplied.hpp.

7.49.4.7 int Couenne::CouenneTwoImplied::depthLevelling_ [protected]

Depth of the BB tree where to start decreasing chance of running this.

Definition at line 226 of file CouenneTwoImplied.hpp.

7.49.4.8 int Couenne::CouenneTwoImplied::depthStopSeparate_ [protected]

Depth of the BB tree where stop separation.

Definition at line 229 of file CouenneTwoImplied.hpp.

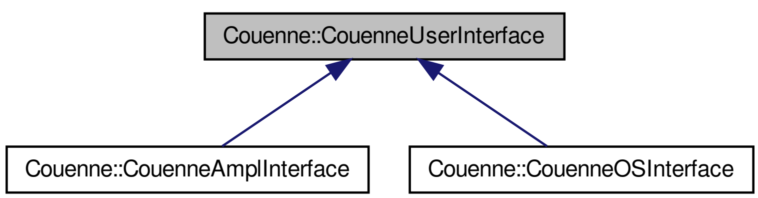
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/bound_tightening/twoImpliedBT/CouenneTwoImplied.hpp

7.50 Couenne::CouenneUserInterface Class Reference

`#include <CouenneUserInterface.hpp>`

Inheritance diagram for Couenne::CouenneUserInterface:



Public Member Functions

- CouenneUserInterface (Ipopt::SmartPtr< Ipopt::OptionsList > options_, Ipopt::SmartPtr< Ipopt::Journalist > jnlst_)
- virtual ∼CouenneUserInterface ()
- virtual bool setupJournals ()

  Setup journals for printing.

- virtual CouenneProblem ∗ getCouenneProblem ()=0

    Should return the problem to solve in algebraic form.
- virtual Ipopt::SmartPtr
  < Bonmin::TMINLP > getTMINLP ()=0

    Should return the problem to solve as TMINLP.
- virtual bool addBabPlugins (Bonmin::Bab &bab)

    Called after B&B object is setup.
- virtual bool writeSolution (Bonmin::Bab &bab)

    Called after B&B finished.

Protected Attributes

- Ipopt::SmartPtr
  < Ipopt::OptionsList > options
- Ipopt::SmartPtr
  < Ipopt::Journalist > jnlst

7.50.1 Detailed Description

Definition at line 32 of file CouenneUserInterface.hpp.

7.50.2 Constructor & Destructor Documentation

7.50.2.1 Couenne::CouenneUserInterface::CouenneUserInterface (Ipopt::SmartPtr< Ipopt::OptionsList > *options_*, Ipopt::SmartPtr< Ipopt::Journalist > *jnlst_*) [inline]

Definition at line 38 of file CouenneUserInterface.hpp.

7.50.2.2 virtual Couenne::CouenneUserInterface::∼CouenneUserInterface ( ) [inline], [virtual]

Definition at line 42 of file CouenneUserInterface.hpp.

7.50.3 Member Function Documentation

7.50.3.1 virtual bool Couenne::CouenneUserInterface::setupJournals ( ) [inline], [virtual]

Setup journals for printing.

Default is to have one journal that prints to stdout.

Definition at line 47 of file CouenneUserInterface.hpp.

7.50.3.2 virtual CouenneProblem∗ Couenne::CouenneUserInterface::getCouenneProblem ( ) [pure virtual]

Should return the problem to solve in algebraic form.

NOTE: Couenne is (currently) going to modify this problem!

Implemented in Couenne::CouenneOSInterface, and Couenne::CouenneAmplInterface.

7.50.3.3 virtual Ipopt::SmartPtr<Bonmin::TMINLP> Couenne::CouenneUserInterface::getTMINLP ( ) [pure virtual]

Should return the problem to solve as TMINLP.

Implemented in Couenne::CouenneOSInterface, and Couenne::CouenneAmplInterface.

7.50.3.4 virtual bool Couenne::CouenneUserInterface::addBabPlugins (Bonmin::Bab & *bab*) [inline], [virtual]

Called after B&B object is setup.

User should add plugins like cut generators, bound tighteners, or heuristics here.

Definition at line 65 of file CouenneUserInterface.hpp.

7.50.3.5 virtual bool Couenne::CouenneUserInterface::writeSolution (Bonmin::Bab & *bab*) [inline], [virtual]

Called after B&B finished.

Should write solution information.

Reimplemented in Couenne::CouenneOSInterface, and Couenne::CouenneAmplInterface.

Definition at line 79 of file CouenneUserInterface.hpp.

7.50.4 Member Data Documentation

7.50.4.1 Ipopt::SmartPtr<Ipopt::OptionsList> Couenne::CouenneUserInterface::options [protected]

Definition at line 34 of file CouenneUserInterface.hpp.

7.50.4.2 Ipopt::SmartPtr<Ipopt::Journalist> Couenne::CouenneUserInterface::jnlst [protected]

Definition at line 35 of file CouenneUserInterface.hpp.

The documentation for this class was generated from the following file:

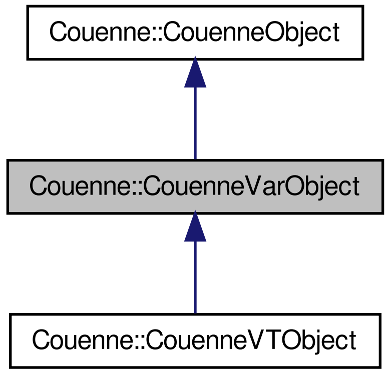
- /home/ted/COIN/trunk/Couenne/src/interfaces/CouenneUserInterface.hpp

7.51 Couenne::CouenneVarObject Class Reference

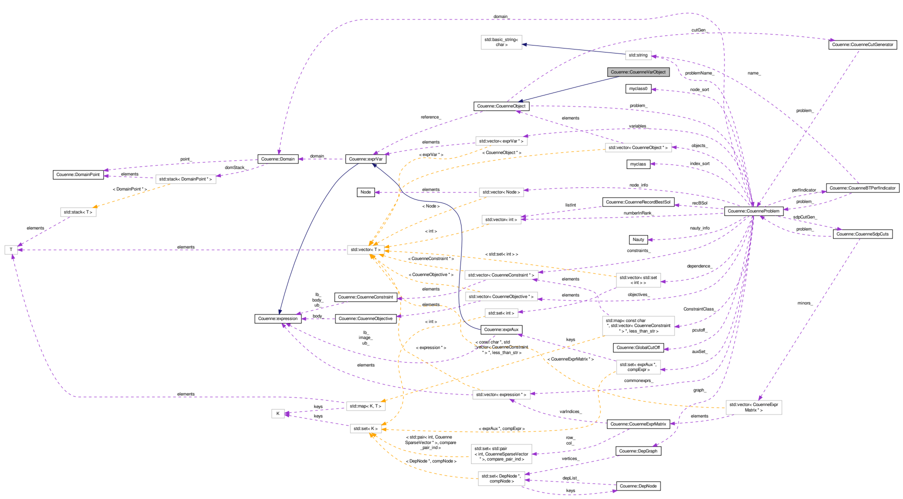
OsiObject for variables in a MINLP.

`#include <CouenneVarObject.hpp>`

Inheritance diagram for Couenne::CouenneVarObject:



Collaboration diagram for Couenne::CouenneVarObject:



Public Member Functions

- CouenneVarObject (CouenneCutGenerator ∗c, CouenneProblem ∗p, exprVar ∗ref, Bonmin::BabSetupBase ∗base, JnlstPtr jnlst, int varSelection)

  Constructor with information for branching point selection strategy.
- CouenneVarObject (const CouenneVarObject &src)

  Copy constructor.
- ∼CouenneVarObject ()

  Destructor.
- virtual CouenneObject ∗ clone () const

Cloning method.

- virtual double infeasibility (const OsiBranchingInformation *info, int &way) const

  compute infeasibility of this variable x as the sum/min/max of all infeasibilities of auxiliaries w whose defining function depends on x |w - f(x)|

- virtual double checkInfeasibility (const OsiBranchingInformation *info) const

  compute infeasibility of this variable, |w - f(x)|, where w is the auxiliary variable defined as w = f(x)

- virtual OsiBranchingObject * createBranch (OsiSolverInterface *, const OsiBranchingInformation *, int) const

  create CouenneBranchingObject or CouenneThreeWayBranchObj based on this object

- virtual double feasibleRegion (OsiSolverInterface *, const OsiBranchingInformation *) const

  fix nonlinear coordinates of current integer-nonlinear feasible solution

- virtual bool isCuttable () const

  are we on the bad or good side of the expression?

Protected Member Functions

- CouNumber computeBranchingPoint (const OsiBranchingInformation *info, int &bestWay, const CouenneObject *&criticalObject) const

  Method computing the branching point.

Protected Attributes

- int varSelection_

  branching scheme used.

Additional Inherited Members

7.51.1 Detailed Description

OsiObject for variables in a MINLP.

Definition at line 22 of file CouenneVarObject.hpp.

7.51.2 Constructor & Destructor Documentation

7.51.2.1 Couenne::CouenneVarObject::CouenneVarObject (**CouenneCutGenerator** * *c*, **CouenneProblem** * *p*, **exprVar** * *ref*, Bonmin::BabSetupBase * *base*, **JnlstPtr** *jnlst*, int *varSelection*)

Constructor with information for branching point selection strategy.

7.51.2.2 Couenne::CouenneVarObject::CouenneVarObject (const **CouenneVarObject** & *src*) [inline]

Copy constructor.

Definition at line 35 of file CouenneVarObject.hpp.

7.51.2.3 Couenne::CouenneVarObject::∼CouenneVarObject ( ) [inline]

Destructor.

Definition at line 40 of file CouenneVarObject.hpp.

7.51.3 Member Function Documentation

7.51.3.1 virtual CouenneObject∗ Couenne::CouenneVarObject::clone ( ) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::CouenneObject.

Reimplemented in Couenne::CouenneVTObject.

Definition at line 43 of file CouenneVarObject.hpp.

7.51.3.2 virtual double Couenne::CouenneVarObject::infeasibility (const OsiBranchingInformation ∗ *info*, int & *way*) const [virtual]

compute infeasibility of this variable x as the sum/min/max of all infeasibilities of auxiliaries w whose defining function depends on x |w - f(x)|

TODO: suggest way

Reimplemented from Couenne::CouenneObject.

Reimplemented in Couenne::CouenneVTObject.

7.51.3.3 virtual double Couenne::CouenneVarObject::checkInfeasibility (const OsiBranchingInformation ∗ *info*) const [virtual]

compute infeasibility of this variable, |w - f(x)|, where w is the auxiliary variable defined as w = f(x)

Reimplemented from Couenne::CouenneObject.

7.51.3.4 virtual OsiBranchingObject∗ Couenne::CouenneVarObject::createBranch (OsiSolverInterface ∗, const OsiBranchingInformation ∗, int) const [virtual]

create CouenneBranchingObject or CouenneThreeWayBranchObj based on this object

Reimplemented from Couenne::CouenneObject.

7.51.3.5 virtual double Couenne::CouenneVarObject::feasibleRegion (OsiSolverInterface ∗, const OsiBranchingInformation ∗) const [virtual]

fix nonlinear coordinates of current integer-nonlinear feasible solution

Reimplemented from Couenne::CouenneObject.

7.51.3.6 virtual bool Couenne::CouenneVarObject::isCuttable ( ) const [virtual]

are we on the bad or good side of the expression?

Reimplemented from Couenne::CouenneObject.

7.51.3.7 CouNumber Couenne::CouenneVarObject::computeBranchingPoint (const OsiBranchingInformation ∗ *info*, int & *bestWay*, const CouenneObject ∗& *criticalObject*) const [protected]

Method computing the branching point.

7.51.4 Member Data Documentation

7.51.4.1 int Couenne::CouenneVarObject::varSelection_ [protected]

branching scheme used.

Experimental: still figuring out why plain LP branching doesn't work with strong/reliability branching

Definition at line 73 of file CouenneVarObject.hpp.

The documentation for this class was generated from the following file:

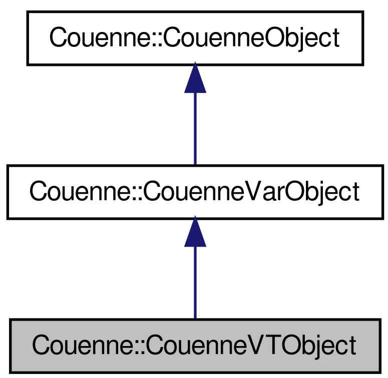
- /home/ted/COIN/trunk/Couenne/src/branch/CouenneVarObject.hpp

7.52 Couenne::CouenneVTObject Class Reference

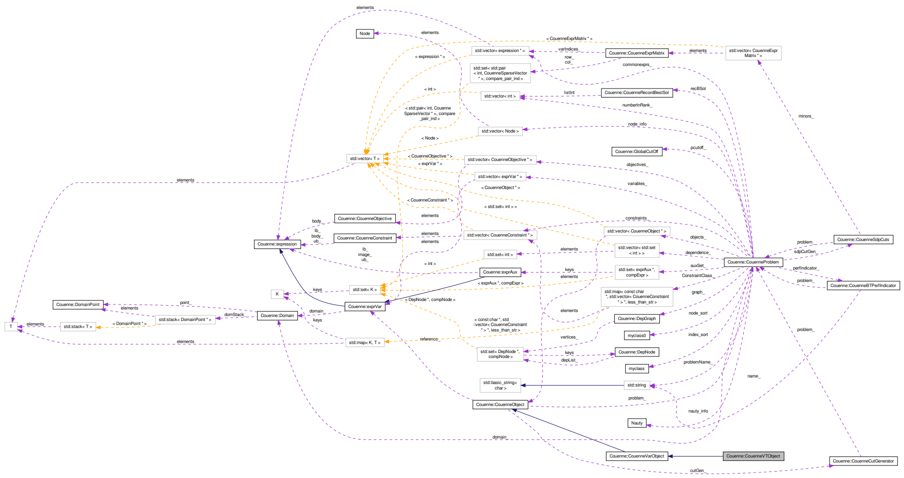
OsiObject for violation transfer on variables in a MINLP.

`#include <CouenneVTObject.hpp>`

Inheritance diagram for Couenne::CouenneVTObject:



Collaboration diagram for Couenne::CouenneVTObject:



Public Member Functions

- CouenneVTObject (CouenneCutGenerator ∗c, CouenneProblem ∗p, exprVar ∗ref, Bonmin::BabSetupBase ∗base, JnlstPtr jnlst, int varSelection)

    Constructor with information for branching point selection strategy.
- CouenneVTObject (const CouenneVTObject &src)

    Copy constructor.
- ∼CouenneVTObject ()

    Destructor.
- virtual CouenneObject ∗ clone () const

    Cloning method.
- virtual double infeasibility (const OsiBranchingInformation ∗info, int &way) const

    compute infeasibility of this variable x as the sum/min/max of all infeasibilities of auxiliaries w whose defining function depends on x |w - f(x)|

Additional Inherited Members

7.52.1 Detailed Description

OsiObject for violation transfer on variables in a MINLP.

Definition at line 19 of file CouenneVTObject.hpp.

7.52.2 Constructor & Destructor Documentation

7.52.2.1 Couenne::CouenneVTObject::CouenneVTObject (CouenneCutGenerator ∗ *c,* CouenneProblem ∗ *p,* exprVar ∗ *ref,* Bonmin::BabSetupBase ∗ *base,* JnlstPtr *jnlst,* int *varSelection*) [inline]

Constructor with information for branching point selection strategy.

Definition at line 24 of file CouenneVTObject.hpp.

7.52.2.2 Couenne::CouenneVTObject::CouenneVTObject (const CouenneVTObject & *src*) [inline]

Copy constructor.

Definition at line 35 of file CouenneVTObject.hpp.

7.52.2.3 Couenne::CouenneVTObject::∼CouenneVTObject ( ) [inline]

Destructor.

Definition at line 39 of file CouenneVTObject.hpp.

7.52.3 Member Function Documentation

7.52.3.1 virtual CouenneObject∗ Couenne::CouenneVTObject::clone ( ) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::CouenneVarObject.

Definition at line 42 of file CouenneVTObject.hpp.

7.52.3.2 virtual double Couenne::CouenneVTObject::infeasibility (const OsiBranchingInformation ∗ *info*, int & *way*) const [virtual]

compute infeasibility of this variable x as the sum/min/max of all infeasibilities of auxiliaries w whose defining function depends on x |w - f(x)|

Reimplemented from Couenne::CouenneVarObject.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/branch/CouenneVTObject.hpp

7.53 Couenne::CouExpr Class Reference

`#include <CouExpr.hpp>`

Public Member Functions

- CouExpr (expression ∗e)
- CouExpr (const CouExpr &e)
- CouExpr & operator= (CouExpr &e)
- expression ∗ Expression () const

7.53.1 Detailed Description

Definition at line 17 of file CouExpr.hpp.

7.53.2 Constructor & Destructor Documentation

7.53.2.1 Couenne::CouExpr::CouExpr (expression ∗ *e*) [inline]

Definition at line 25 of file CouExpr.hpp.

7.53.2.2 Couenne::CouExpr::CouExpr (const CouExpr & e) [inline]

Definition at line 28 of file CouExpr.hpp.

7.53.3 Member Function Documentation

7.53.3.1 CouExpr& Couenne::CouExpr::operator= (CouExpr & e) [inline]

Definition at line 32 of file CouExpr.hpp.

7.53.3.2 expression∗ Couenne::CouExpr::Expression ( ) const [inline]

Definition at line 37 of file CouExpr.hpp.

The documentation for this class was generated from the following file:

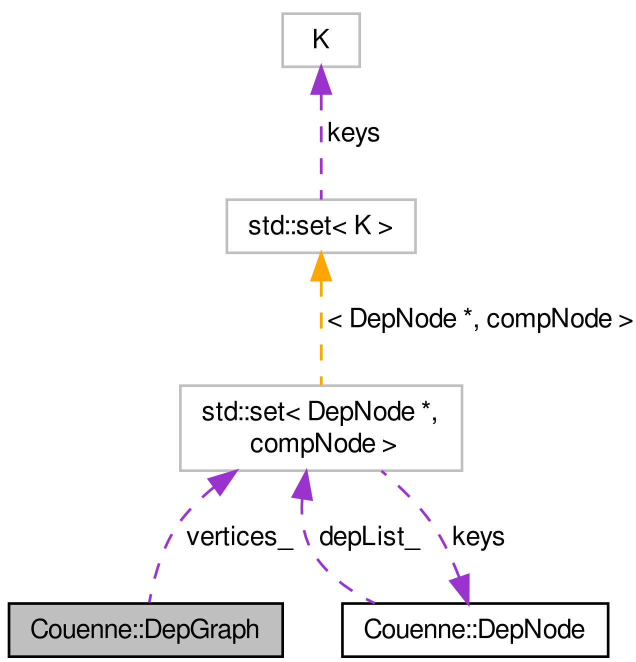
- /home/ted/COIN/trunk/Couenne/src/expression/CouExpr.hpp

7.54 Couenne::DepGraph Class Reference

Dependence graph.

`#include <CouenneDepGraph.hpp>`

Collaboration diagram for Couenne::DepGraph:



Public Member Functions

- DepGraph ()
  constructor
- ∼DepGraph ()
  destructor
- std::set< DepNode ∗, compNode > & Vertices ()
  return vertex set
- int & Counter ()
  node index counter
- void insert (exprVar ∗)
  insert new variable if new
- void insert (exprAux ∗)
  insert new auxiliary if new
- void erase (exprVar ∗)
  delete element
- bool depends (int, int, bool=false)
  does w depend on x?
- void createOrder ()
  assign numbering to all nodes of graph
- void print (bool descend=false)
  debugging procedure
- DepNode ∗ lookup (int index)
  search for node in vertex set
- bool checkCycles ()
  check for dependence cycles in graph
- void replaceIndex (int oldVar, int newVar)
  replace, throughout the whole graph, the index of a variable with another in the entire graph.

Protected Attributes

- std::set< DepNode ∗, compNode > vertices_
  set of variable nodes
- int counter_
  counter to assign numbering to all nodes

7.54.1 Detailed Description

Dependence graph.

Shows dependence of auxiliary variable on other (auxiliary and/or original) variables

Definition at line 115 of file CouenneDepGraph.hpp.

7.54.2 Constructor & Destructor Documentation

7.54.2.1 Couenne::DepGraph::DepGraph ( ) [inline]

constructor

Definition at line 128 of file CouenneDepGraph.hpp.

7.54.2.2 Couenne::DepGraph::∼DepGraph ( ) [inline]

destructor

Definition at line 131 of file CouenneDepGraph.hpp.

7.54.3 Member Function Documentation

7.54.3.1 std::set<DepNode ∗, compNode>& Couenne::DepGraph::Vertices ( ) [inline]

return vertex set

Definition at line 138 of file CouenneDepGraph.hpp.

7.54.3.2 int& Couenne::DepGraph::Counter ( ) [inline]

node index counter

Definition at line 142 of file CouenneDepGraph.hpp.

7.54.3.3 void Couenne::DepGraph::insert (exprVar ∗)

insert new variable if new

7.54.3.4 void Couenne::DepGraph::insert (exprAux ∗)

insert new auxiliary if new

7.54.3.5 void Couenne::DepGraph::erase (exprVar ∗)

delete element

7.54.3.6 bool Couenne::DepGraph::depends (int , int , bool = false)

does w depend on x?

7.54.3.7 void Couenne::DepGraph::createOrder ( )

assign numbering to all nodes of graph

7.54.3.8 void Couenne::DepGraph::print (bool *descend* = false)

debugging procedure

7.54.3.9 DepNode∗ Couenne::DepGraph::lookup (int *index*)

search for node in vertex set

7.54.3.10 bool Couenne::DepGraph::checkCycles ( )

check for dependence cycles in graph

7.54.3.11 void Couenne::DepGraph::replaceIndex (int *oldVar,* int *newVar*)

replace, throughout the whole graph, the index of a variable with another in the entire graph.

Used when redundant constraints w := x are discovered

7.54.4 Member Data Documentation

7.54.4.1 std::set<DepNode *, compNode> Couenne::DepGraph::vertices_ [protected]

set of variable nodes

Definition at line 120 of file CouenneDepGraph.hpp.

7.54.4.2 int Couenne::DepGraph::counter_ [protected]

counter to assign numbering to all nodes

Definition at line 123 of file CouenneDepGraph.hpp.

The documentation for this class was generated from the following file:

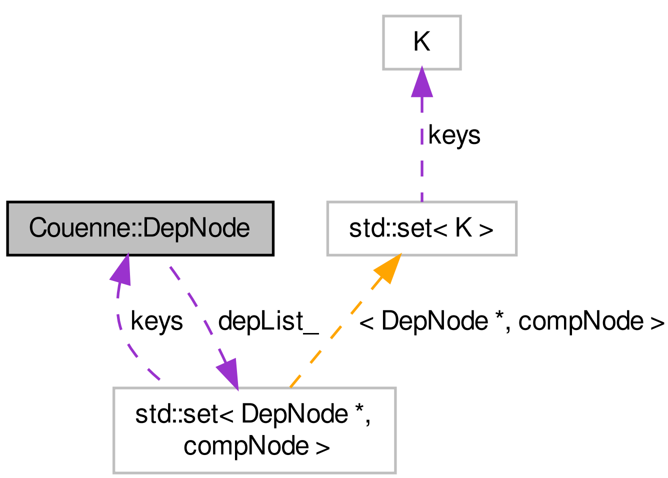
- /home/ted/COIN/trunk/Couenne/src/problem/depGraph/CouenneDepGraph.hpp

7.55 Couenne::DepNode Class Reference

vertex of a dependence graph.

`#include <CouenneDepGraph.hpp>`

Collaboration diagram for Couenne::DepNode:



Public Types

- enum dep_color { DEP_WHITE, DEP_GRAY, DEP_BLACK }

  color used in DFS for checking cycles

Public Member Functions

- DepNode (int ind)
  fictitious constructor: only fill in index (such object is used in find() and then discarded)
- ∼DepNode ()
  destructor
- int Index () const
  return index of this variable
- int Order () const
  return index of this variable
- std::set< DepNode ∗, compNode > ∗ DepList () const
  return all variables it depends on
- bool depends (int xi, bool=false, std::set< DepNode ∗, compNode > ∗already_visited=NULL) const
  does this variable depend on variable with index xi?
- void createOrder (DepGraph ∗)
  assign numbering to all nodes of graph
- void print (int=0, bool descend=false) const
  debugging procedure
- enum dep_color & color ()
  return or set color of a node
- std::set< DepNode ∗, compNode > ∗ depList ()
  index nodes on which this one depends (forward star in dependence graph)
- void replaceIndex (DepNode ∗oldVarNode, DepNode ∗newVarNode)
  replace the index of a variable with another in the entire graph.

Protected Attributes

- int index_
  index of variable associated with node
- std::set< DepNode ∗, compNode > ∗ depList_
  index nodes on which this one depends (forward star in dependence graph)
- int order_
  order in which this variable should be updated, evaluated, etc.
- enum dep_color color_
  color used in DFS for checking cycles

7.55.1 Detailed Description

vertex of a dependence graph.

Contains variable and its forward star (all variables it depends on)

Definition at line 33 of file CouenneDepGraph.hpp.

7.55.2 Member Enumeration Documentation

7.55.2.1 enum Couenne::DepNode::dep_color

color used in DFS for checking cycles

Enumerator:

DEP_WHITE

DEP_GRAY

DEP_BLACK

Definition at line 38 of file CouenneDepGraph.hpp.

7.55.3 Constructor & Destructor Documentation

7.55.3.1 Couenne::DepNode::DepNode (int *ind*) [inline]

fictitious constructor: only fill in index (such object is used in find() and then discarded)

Definition at line 59 of file CouenneDepGraph.hpp.

7.55.3.2 Couenne::DepNode::∼DepNode ( ) [inline]

destructor

Definition at line 66 of file CouenneDepGraph.hpp.

7.55.4 Member Function Documentation

7.55.4.1 int Couenne::DepNode::Index ( ) const [inline]

return index of this variable

Definition at line 70 of file CouenneDepGraph.hpp.

7.55.4.2 int Couenne::DepNode::Order ( ) const [inline]

return index of this variable

Definition at line 74 of file CouenneDepGraph.hpp.

7.55.4.3 std::set<DepNode *, compNode>* Couenne::DepNode::DepList ( ) const [inline]

return all variables it depends on

Definition at line 78 of file CouenneDepGraph.hpp.

7.55.4.4 bool Couenne::DepNode::depends (int *xi*, bool = false, std::set< DepNode *, compNode > * *already_visited* = NULL) const

does this variable depend on variable with index xi?

7.55.4.5 void Couenne::DepNode::createOrder (DepGraph *)

assign numbering to all nodes of graph

7.55.4.6 void Couenne::DepNode::print (int = 0, bool *descend* = false) const

debugging procedure

7.55.4.7 enum dep_color& Couenne::DepNode::color ( ) [inline]

return or set color of a node

Definition at line 92 of file CouenneDepGraph.hpp.

7.55.4.8 std::set<DepNode *, compNode>* Couenne::DepNode::depList ( ) [inline]

index nodes on which this one depends (forward star in dependence graph)

Definition at line 97 of file CouenneDepGraph.hpp.

7.55.4.9 void Couenne::DepNode::replaceIndex (DepNode * *oldVarNode*, DepNode * *newVarNode*)

replace the index of a variable with another in the entire graph.

Used when redundant constraints w := x are discovered

7.55.5 Member Data Documentation

7.55.5.1 int Couenne::DepNode::index_ [protected]

index of variable associated with node

Definition at line 43 of file CouenneDepGraph.hpp.

7.55.5.2 std::set<DepNode *, compNode>* Couenne::DepNode::depList_ [protected]

index nodes on which this one depends (forward star in dependence graph)

Definition at line 47 of file CouenneDepGraph.hpp.

7.55.5.3 int Couenne::DepNode::order_ [protected]

order in which this variable should be updated, evaluated, etc.

Definition at line 50 of file CouenneDepGraph.hpp.

7.55.5.4 enum dep_color Couenne::DepNode::color_ [protected]

color used in DFS for checking cycles

Definition at line 53 of file CouenneDepGraph.hpp.

The documentation for this class was generated from the following file:

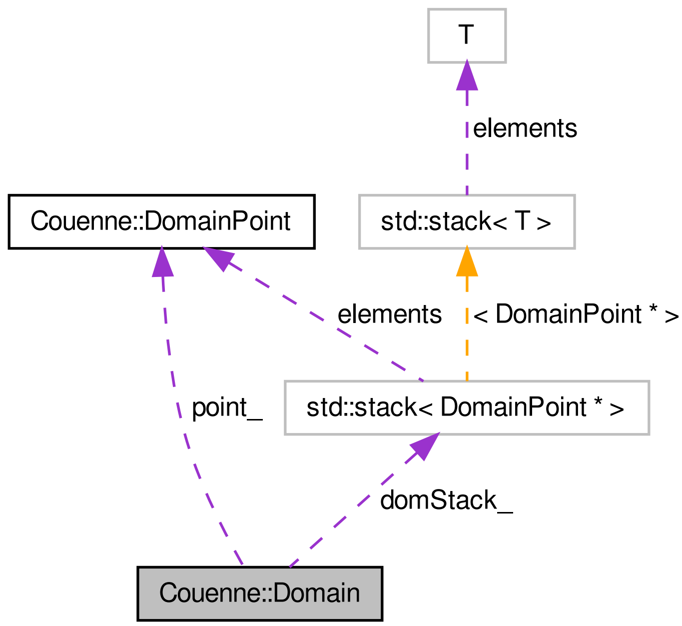
- /home/ted/COIN/trunk/Couenne/src/problem/depGraph/CouenneDepGraph.hpp

7.56 Couenne::Domain Class Reference

Define a dynamic point+bounds, with a way to save and restore previous points+bounds through a LIFO structure.

`#include <CouenneDomain.hpp>`

Collaboration diagram for Couenne::Domain:



Public Member Functions

- Domain ()
  basic constructor
- Domain (const Domain &src)
  copy constructor
- ∼Domain ()
  destructor
- void push (int dim, CouNumber ∗x, CouNumber ∗lb, CouNumber ∗ub, bool copy=true)
  save current point and start using another
- void push (int dim, const CouNumber ∗x, const CouNumber ∗lb, const CouNumber ∗ub, bool copy=true)
  save current point and start using another
- void push (const OsiSolverInterface ∗si, OsiCuts ∗cs=NULL, bool copy=true)
  save current point and start using another – retrieve information from solver interface and from previous column cuts
- void push (const DomainPoint &dp, bool copy=true)
  save current point and start using another
- void pop ()
  restore previous point
- DomainPoint ∗ current ()
  return current point
- CouNumber & x (register int index)

current variable
- CouNumber & lb (register int index)
  current lower bound
- CouNumber & ub (register int index)
  current upper bound
- CouNumber $*$ x ()
  return current variable vector
- CouNumber $*$ lb ()
  return current lower bound vector
- CouNumber $*$ ub ()
  return current upper bound vector

Protected Attributes

- DomainPoint $*$ point_
  current point
- std::stack$<$ DomainPoint $*$ $>$ domStack_
  stack of saved points

7.56.1 Detailed Description

Define a dynamic point+bounds, with a way to save and restore previous points+bounds through a LIFO structure.

Definition at line 104 of file CouenneDomain.hpp.

7.56.2 Constructor & Destructor Documentation

7.56.2.1 Couenne::Domain::Domain ( ) [inline]

basic constructor

Definition at line 114 of file CouenneDomain.hpp.

7.56.2.2 Couenne::Domain::Domain (const Domain & *src*) [inline]

copy constructor

Definition at line 117 of file CouenneDomain.hpp.

7.56.2.3 Couenne::Domain::∼Domain ( )

destructor

7.56.3 Member Function Documentation

7.56.3.1 void Couenne::Domain::push (int *dim*, CouNumber $*$ *x*, CouNumber $*$ *lb*, CouNumber $*$ *ub*, bool *copy* = true)

save current point and start using another

7.56.3.2 void Couenne::Domain::push (int *dim*, const CouNumber $*$ *x*, const CouNumber $*$ *lb*, const CouNumber $*$ *ub*, bool *copy* = true)

save current point and start using another

7.56.3.3 void Couenne::Domain::push (const OsiSolverInterface * *si*, OsiCuts * *cs* = NULL, bool *copy* = true)

save current point and start using another – retrieve information from solver interface and from previous column cuts

7.56.3.4 void Couenne::Domain::push (const DomainPoint & *dp*, bool *copy* = true)

save current point and start using another

7.56.3.5 void Couenne::Domain::pop ( )

restore previous point

7.56.3.6 DomainPoint* Couenne::Domain::current ( ) [inline]

return current point

Definition at line 154 of file CouenneDomain.hpp.

7.56.3.7 CouNumber& Couenne::Domain::x (register int *index*) [inline]

current variable

Definition at line 156 of file CouenneDomain.hpp.

7.56.3.8 CouNumber& Couenne::Domain::lb (register int *index*) [inline]

current lower bound

Definition at line 157 of file CouenneDomain.hpp.

7.56.3.9 CouNumber& Couenne::Domain::ub (register int *index*) [inline]

current upper bound

Definition at line 158 of file CouenneDomain.hpp.

7.56.3.10 CouNumber* Couenne::Domain::x ( ) [inline]

return current variable vector

Definition at line 160 of file CouenneDomain.hpp.

7.56.3.11 CouNumber* Couenne::Domain::lb ( ) [inline]

return current lower bound vector

Definition at line 161 of file CouenneDomain.hpp.

7.56.3.12 CouNumber* Couenne::Domain::ub ( ) [inline]

return current upper bound vector

Definition at line 162 of file CouenneDomain.hpp.

7.56.4 Member Data Documentation

7.56.4.1 DomainPoint* Couenne::Domain::point_ [protected]

current point

Definition at line 108 of file CouenneDomain.hpp.

7.56.4.2 std::stack<DomainPoint ∗> Couenne::Domain::domStack_ [protected]

stack of saved points

Definition at line 109 of file CouenneDomain.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/CouenneDomain.hpp

7.57 Couenne::DomainPoint Class Reference

Define a point in the solution space and the bounds around it.

`#include <CouenneDomain.hpp>`

Public Member Functions

- DomainPoint (int dim, CouNumber ∗x, CouNumber ∗lb, CouNumber ∗ub, bool copy=true)
  constructor
- DomainPoint (int dim=0, const CouNumber ∗x=NULL, const CouNumber ∗lb=NULL, const CouNumber ∗ub=NU-LL, bool copy=true)
  constructor
- ∼DomainPoint ()
  destructor
- DomainPoint (const DomainPoint &src)
  copy constructor
- void resize (int newdim)
  resize domain point (for extending into higher space)
- int size () const
  return current size
- int Dimension ()
  *return dimension_*
- CouNumber & x (register int index)
  return current variable
- CouNumber & lb (register int index)
  return current lower bound
- CouNumber & ub (register int index)
  return current upper bound
- CouNumber ∗ x ()
  return current variable vector
- CouNumber ∗ lb ()
  return current lower bound vector
- CouNumber ∗ ub ()
  return current upper bound vector
- DomainPoint & operator= (const DomainPoint &src)
  assignment operator
- bool & isNlp ()
  true if this point is the nlp solution

Protected Attributes

- int dimension_
  dimension of point
- CouNumber ∗ x_
  current value of variables
- CouNumber ∗ lb_
  lower bound
- CouNumber ∗ ub_
  upper bound
- bool copied_
  true if data has been copied (so we own it, and have to delete it upon destruction)
- bool isNlp_
  true if this point comes from an NLP solver (and is thus nlp feasible)

Friends

- class Domain

7.57.1 Detailed Description

Define a point in the solution space and the bounds around it.

Definition at line 30 of file CouenneDomain.hpp.

7.57.2 Constructor & Destructor Documentation

7.57.2.1 Couenne::DomainPoint::DomainPoint (int *dim*, CouNumber ∗ *x*, CouNumber ∗ *lb*, CouNumber ∗ *ub*, bool *copy* = `true`)

constructor

7.57.2.2 Couenne::DomainPoint::DomainPoint (int *dim* = `0`, const CouNumber ∗ *x* = `NULL`, const CouNumber ∗ *lb* = `NULL`, const CouNumber ∗ *ub* = `NULL`, bool *copy* = `true`)

constructor

7.57.2.3 Couenne::DomainPoint::∼DomainPoint ( ) `[inline]`

destructor

Definition at line 64 of file CouenneDomain.hpp.

7.57.2.4 Couenne::DomainPoint::DomainPoint (const DomainPoint & *src*)

copy constructor

7.57.3 Member Function Documentation

7.57.3.1 void Couenne::DomainPoint::resize (int *newdim*)

resize domain point (for extending into higher space)

7.57.3.2 int Couenne::DomainPoint::size ( ) const [inline]

return current size

Definition at line 79 of file CouenneDomain.hpp.

7.57.3.3 int Couenne::DomainPoint::Dimension ( ) [inline]

return dimension_

Definition at line 82 of file CouenneDomain.hpp.

7.57.3.4 CouNumber& Couenne::DomainPoint::x (register int *index*) [inline]

return current variable

Definition at line 84 of file CouenneDomain.hpp.

7.57.3.5 CouNumber& Couenne::DomainPoint::lb (register int *index*) [inline]

return current lower bound

Definition at line 85 of file CouenneDomain.hpp.

7.57.3.6 CouNumber& Couenne::DomainPoint::ub (register int *index*) [inline]

return current upper bound

Definition at line 86 of file CouenneDomain.hpp.

7.57.3.7 CouNumber* Couenne::DomainPoint::x ( ) [inline]

return current variable vector

Definition at line 88 of file CouenneDomain.hpp.

7.57.3.8 CouNumber* Couenne::DomainPoint::lb ( ) [inline]

return current lower bound vector

Definition at line 89 of file CouenneDomain.hpp.

7.57.3.9 CouNumber* Couenne::DomainPoint::ub ( ) [inline]

return current upper bound vector

Definition at line 90 of file CouenneDomain.hpp.

7.57.3.10 DomainPoint& Couenne::DomainPoint::operator= (const DomainPoint & *src*)

assignment operator

7.57.3.11 bool& Couenne::DomainPoint::isNlp ( ) [inline]

true if this point is the nlp solution

Definition at line 96 of file CouenneDomain.hpp.

7.57.4 Friends And Related Function Documentation

7.57.4.1 friend class Domain [friend]

Definition at line 32 of file CouenneDomain.hpp.

7.57.5 Member Data Documentation

7.57.5.1 int Couenne::DomainPoint::dimension_ [protected]

dimension of point

Definition at line 36 of file CouenneDomain.hpp.

7.57.5.2 CouNumber* Couenne::DomainPoint::x_ [protected]

current value of variables

Definition at line 38 of file CouenneDomain.hpp.

7.57.5.3 CouNumber* Couenne::DomainPoint::lb_ [protected]

lower bound

Definition at line 39 of file CouenneDomain.hpp.

7.57.5.4 CouNumber* Couenne::DomainPoint::ub_ [protected]

upper bound

Definition at line 40 of file CouenneDomain.hpp.

7.57.5.5 bool Couenne::DomainPoint::copied_ [protected]

true if data has been copied (so we own it, and have to delete it upon destruction)

Definition at line 42 of file CouenneDomain.hpp.

7.57.5.6 bool Couenne::DomainPoint::isNlp_ [protected]

true if this point comes from an NLP solver (and is thus nlp feasible)

Definition at line 45 of file CouenneDomain.hpp.

The documentation for this class was generated from the following file:

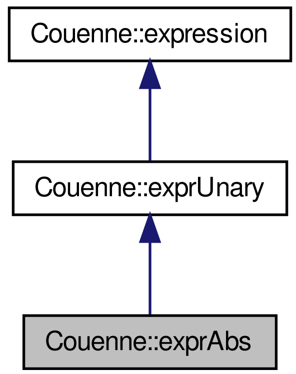
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneDomain.hpp

7.58 Couenne::exprAbs Class Reference

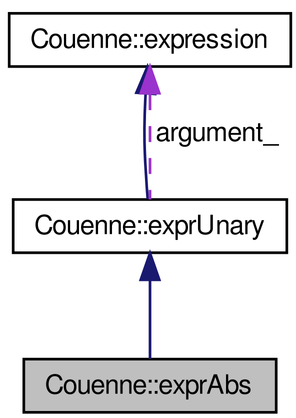
class for $|f(x)|$

#include <CouenneExprAbs.hpp>

Inheritance diagram for Couenne::exprAbs:



Collaboration diagram for Couenne::exprAbs:



Public Member Functions

- exprAbs (expression ∗al)

    Constructor.
- unary_function F ()

    The operator's function.
- expression ∗ clone (Domain ∗d=NULL) const

cloning method
- std::string printOp () const

  output
- CouNumber gradientNorm (const double ∗x)

  return l_2 norm of gradient at given point
- expression ∗ differentiate (int index)

  differentiation
- virtual void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate equality between ∗this and ∗w
- enum expr_type code ()

  code for comparisons
- bool isInteger ()

  is this expression integer?
- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX_EQ)

  implied bound processing
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  set up branching object by evaluating many branching points for each expression's arguments
- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

  closest feasible points in function in both directions
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

Additional Inherited Members

7.58.1 Detailed Description

class for $|f(x)|$

Definition at line 23 of file CouenneExprAbs.hpp.

7.58.2 Constructor & Destructor Documentation

7.58.2.1 Couenne::exprAbs::exprAbs (expression ∗ *al*) [inline]

Constructor.

Definition at line 28 of file CouenneExprAbs.hpp.

7.58.3 Member Function Documentation

7.58.3.1 unary_function Couenne::exprAbs::F ( ) [inline], [virtual]

The operator's function.

Reimplemented from Couenne::exprUnary.

Definition at line 32 of file CouenneExprAbs.hpp.

7.58.3.2 expression* Couenne::exprAbs::clone (Domain * *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 35 of file CouenneExprAbs.hpp.

7.58.3.3 std::string Couenne::exprAbs::printOp ( ) const [inline], [virtual]

output

Reimplemented from Couenne::exprUnary.

Definition at line 39 of file CouenneExprAbs.hpp.

7.58.3.4 CouNumber Couenne::exprAbs::gradientNorm (const double * *x*) [inline], [virtual]

return l_2 norm of gradient at given point

Reimplemented from Couenne::expression.

Definition at line 43 of file CouenneExprAbs.hpp.

7.58.3.5 expression* Couenne::exprAbs::differentiate (int *index*) [virtual]

differentiation

Reimplemented from Couenne::expression.

7.58.3.6 virtual void Couenne::exprAbs::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.58.3.7 virtual void Couenne::exprAbs::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.58.3.8 void Couenne::exprAbs::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between *this and *w

Reimplemented from Couenne::expression.

7.58.3.9 enum expr_type Couenne::exprAbs::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprUnary.

Definition at line 63 of file CouenneExprAbs.hpp.

7.58.3.10 bool Couenne::exprAbs::isInteger ( ) [inline], [virtual]

is this expression integer?

Reimplemented from Couenne::exprUnary.

Definition at line 66 of file CouenneExprAbs.hpp.

7.58.3.11 bool Couenne::exprAbs::impliedBound (int , CouNumber ∗ , CouNumber ∗ , t_chg_bounds ∗ , enum *auxSign* = expression::AUX_EQ) [virtual]

implied bound processing

Reimplemented from Couenne::expression.

7.58.3.12 virtual CouNumber Couenne::exprAbs::selectBranch (const CouenneObject ∗ *obj*, const OsiBranchingInformation ∗ *info*, expression ∗& *var*, double ∗& *brpts*, double ∗& *brDist*, int & *way*) [virtual]

set up branching object by evaluating many branching points for each expression's arguments

Reimplemented from Couenne::expression.

7.58.3.13 virtual void Couenne::exprAbs::closestFeasible (expression ∗ *varind*, expression ∗ *vardep*, CouNumber & *left*, CouNumber & *right*) const [virtual]

closest feasible points in function in both directions

Reimplemented from Couenne::expression.

7.58.3.14 virtual bool Couenne::exprAbs::isCuttable (CouenneProblem ∗ *problem*, int *index*) const [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

The documentation for this class was generated from the following file:

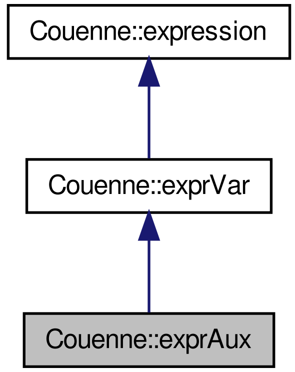
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprAbs.hpp

7.59 Couenne::exprAux Class Reference

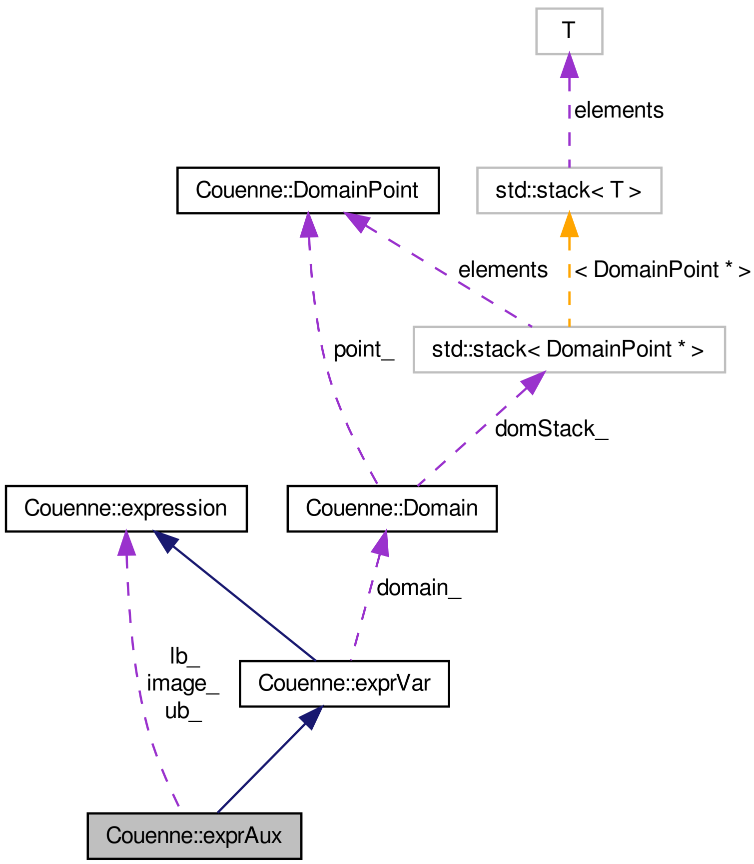
Auxiliary variable.

`#include <CouenneExprAux.hpp>`

Inheritance diagram for Couenne::exprAux:



Collaboration diagram for Couenne::exprAux:



Public Types

- enum intType { Unset = -1, Continuous, Integer }

  integrality type of an auxiliary variable: unset, continuous, integer

Public Member Functions

- enum nodeType Type () const

  Node type.
- exprAux (expression ∗, int, int, intType=Unset, Domain ∗=NULL, enum auxSign=expression::AUX_EQ)

  Constructor.
- exprAux (expression ∗, Domain ∗=NULL, enum auxSign=expression::AUX_EQ)

  Constructor to be used with standardize ([...], false)
- virtual ∼exprAux ()

  Destructor.

- exprAux (const exprAux &, Domain ∗d=NULL)

  Copy constructor.
- virtual exprVar ∗ clone (Domain ∗d=NULL) const

  Cloning method.
- expression ∗ Lb ()

  get lower bound expression
- expression ∗ Ub ()

  get upper bound expression
- virtual void print (std::ostream &=std::cout, bool=false) const

  Print expression.
- expression ∗ Image () const

  The expression associated with this auxiliary variable.
- void Image (expression ∗image)

  Sets expression associated with this auxiliary variable.
- CouNumber operator() ()

  Null function for evaluating the expression.
- int DepList (std::set< int > &deplist, enum dig_type type=ORIG_ONLY)

  fill in the set with all indices of variables appearing in the expression
- expression ∗ simplify ()

  simplify
- int Linearity ()

  Get a measure of "how linear" the expression is (see CouenneTypes.h)
- void crossBounds ()

  Get lower and upper bound of an expression (if any)
- void generateCuts (OsiCuts &, const CouenneCutGenerator ∗, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate cuts for expression associated with this auxiliary
- virtual int rank ()

  used in rank-based branching variable choice
- virtual bool isDefinedInteger ()

  is this expression defined as integer?
- virtual bool isInteger ()

  is this expression integer?
- virtual void setInteger (bool value)

  Set this variable as integer.
- void increaseMult ()

  Tell this variable appears once more.
- void decreaseMult ()

  Tell this variable appears once less (standardized within exprSum, for instance)
- void zeroMult ()

  Disable this auxiliary variable.
- int Multiplicity ()

  How many times this variable appears.
- void linkDomain (Domain ∗d)

  link this variable to a domain
- bool & top_level ()

  *return top_level_*

- CouenneObject ∗ properObject (CouenneCutGenerator ∗c, CouenneProblem ∗p, Bonmin::BabSetupBase ∗base, JnlstPtr jnlst)

  return proper object to handle expression associated with this variable (NULL if this is not an auxiliary)
- virtual enum auxSign sign () const

  return its sign in the definition constraint

Protected Attributes

- expression ∗ image_

  The expression associated with this auxiliary variable.
- expression ∗ lb_

  lower bound, a function of the associated expression and the bounds on the variables in the expression
- expression ∗ ub_

  upper bound, a function of the associated expression and the bounds on the variables in the expression
- int rank_

  used in rank-based branching variable choice: original variables have rank 1; auxiliary w=f(x) has rank r(w) = r(x)+1; finally, auxiliary w=f(x1,x2...,xk) has rank r(w) = 1+max{r(xi):i=1..k}.
- int multiplicity_

  number of appearances of this aux in the formulation.
- enum intType integer_

  is this variable integer?
- bool top_level_

  True if this variable replaces the lhs of a constraint, i.e., if it is a top level variable in the DAG of the problem.
- enum auxSign sign_

  "sign" of the defining constraint

7.59.1 Detailed Description

Auxiliary variable.

It is associated with an expression which depends, in general, on original and/or other auxiliary variables. It is used for AMPL's defined variables (aka common expressions) and to reformulate nonlinear constraints/objectives.

Definition at line 31 of file CouenneExprAux.hpp.

7.59.2 Member Enumeration Documentation

7.59.2.1 enum Couenne::exprAux::intType

integrality type of an auxiliary variable: unset, continuous, integer

Enumerator:

Unset

Continuous

Integer

Definition at line 36 of file CouenneExprAux.hpp.

7.59.3 Constructor & Destructor Documentation

7.59.3.1 Couenne::exprAux::exprAux (expression ∗ , int , int , intType = Unset, Domain ∗ = NULL, enum *auxSign* = expression::AUX_EQ)

Constructor.

7.59.3.2 Couenne::exprAux::exprAux (expression ∗ , Domain ∗ = NULL, enum *auxSign* = expression::AUX_EQ)

Constructor to be used with standardize ([...], false)

7.59.3.3 virtual Couenne::exprAux::∼exprAux ( ) [virtual]

Destructor.

7.59.3.4 Couenne::exprAux::exprAux (const exprAux & , Domain ∗ *d* = NULL)

Copy constructor.

7.59.4 Member Function Documentation

7.59.4.1 enum nodeType Couenne::exprAux::Type ( ) const [inline], [virtual]

Node type.

Reimplemented from Couenne::exprVar.

Definition at line 74 of file CouenneExprAux.hpp.

7.59.4.2 virtual exprVar∗ Couenne::exprAux::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::exprVar.

Definition at line 90 of file CouenneExprAux.hpp.

7.59.4.3 expression∗ Couenne::exprAux::Lb ( ) [inline], [virtual]

get lower bound expression

Reimplemented from Couenne::exprVar.

Definition at line 93 of file CouenneExprAux.hpp.

7.59.4.4 expression∗ Couenne::exprAux::Ub ( ) [inline], [virtual]

get upper bound expression

Reimplemented from Couenne::exprVar.

Definition at line 94 of file CouenneExprAux.hpp.

7.59.4.5 virtual void Couenne::exprAux::print (std::ostream & = std::cout, bool = false) const [virtual]

Print expression.

Reimplemented from Couenne::exprVar.

7.59.4.6 expression* Couenne::exprAux::Image ( ) const [inline], [virtual]

The expression associated with this auxiliary variable.

Reimplemented from Couenne::expression.

Definition at line 101 of file CouenneExprAux.hpp.

7.59.4.7 void Couenne::exprAux::Image (expression * *image*) [inline], [virtual]

Sets expression associated with this auxiliary variable.

Reimplemented from Couenne::expression.

Definition at line 105 of file CouenneExprAux.hpp.

7.59.4.8 CouNumber Couenne::exprAux::operator() ( ) [inline], [virtual]

Null function for evaluating the expression.

Reimplemented from Couenne::exprVar.

Definition at line 109 of file CouenneExprAux.hpp.

7.59.4.9 int Couenne::exprAux::DepList (std::set< int > & *deplist*, enum dig_type *type* = ORIG_ONLY) [virtual]

fill in the set with all indices of variables appearing in the expression

Reimplemented from Couenne::exprVar.

7.59.4.10 expression* Couenne::exprAux::simplify ( ) [virtual]

simplify

Reimplemented from Couenne::exprVar.

7.59.4.11 int Couenne::exprAux::Linearity ( ) [inline], [virtual]

Get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::exprVar.

Definition at line 121 of file CouenneExprAux.hpp.

7.59.4.12 void Couenne::exprAux::crossBounds ( ) [virtual]

Get lower and upper bound of an expression (if any)

set bounds depending on both branching rules and propagated bounds. To be used after standardization

Reimplemented from Couenne::exprVar.

7.59.4.13 void Couenne::exprAux::generateCuts (OsiCuts & , const CouenneCutGenerator * , t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate cuts for expression associated with this auxiliary

Reimplemented from Couenne::exprVar.

7.59.4.14 virtual int Couenne::exprAux::rank ( ) [inline], [virtual]

used in rank-based branching variable choice

Reimplemented from Couenne::exprVar.

Definition at line 140 of file CouenneExprAux.hpp.

7.59.4.15 virtual bool Couenne::exprAux::isDefinedInteger ( ) [inline], [virtual]

is this expression defined as integer?

Reimplemented from Couenne::exprVar.

Definition at line 144 of file CouenneExprAux.hpp.

7.59.4.16 virtual bool Couenne::exprAux::isInteger ( ) [inline], [virtual]

is this expression integer?

Reimplemented from Couenne::exprVar.

Definition at line 153 of file CouenneExprAux.hpp.

7.59.4.17 virtual void Couenne::exprAux::setInteger (bool *value*) [inline], [virtual]

Set this variable as integer.

Reimplemented from Couenne::exprVar.

Definition at line 165 of file CouenneExprAux.hpp.

7.59.4.18 void Couenne::exprAux::increaseMult ( ) [inline]

Tell this variable appears once more.

Definition at line 169 of file CouenneExprAux.hpp.

7.59.4.19 void Couenne::exprAux::decreaseMult ( ) [inline], [virtual]

Tell this variable appears once less (standardized within exprSum, for instance)

Reimplemented from Couenne::exprVar.

Definition at line 173 of file CouenneExprAux.hpp.

7.59.4.20 void Couenne::exprAux::zeroMult ( ) [inline], [virtual]

Disable this auxiliary variable.

Reimplemented from Couenne::exprVar.

Definition at line 176 of file CouenneExprAux.hpp.

7.59.4.21 int Couenne::exprAux::Multiplicity ( ) [inline], [virtual]

How many times this variable appears.

Reimplemented from Couenne::expression.

Definition at line 179 of file CouenneExprAux.hpp.

7.59.4.22 void Couenne::exprAux::linkDomain (Domain * *d*) [inline], [virtual]

link this variable to a domain

Reimplemented from Couenne::exprVar.

Definition at line 182 of file CouenneExprAux.hpp.

7.59.4.23 bool& Couenne::exprAux::top_level ( ) [inline]

return top_level_

Definition at line 189 of file CouenneExprAux.hpp.

7.59.4.24 CouenneObject* Couenne::exprAux::properObject (CouenneCutGenerator * *c*, CouenneProblem * *p*, Bonmin::BabSetupBase * *base*, JnlstPtr *jnlst*) [virtual]

return proper object to handle expression associated with this variable (NULL if this is not an auxiliary)

Reimplemented from Couenne::exprVar.

7.59.4.25 virtual enum auxSign Couenne::exprAux::sign ( ) const [inline], [virtual]

return its sign in the definition constraint

Reimplemented from Couenne::exprVar.

Definition at line 200 of file CouenneExprAux.hpp.

7.59.5 Member Data Documentation

7.59.5.1 expression* Couenne::exprAux::image_ [protected]

The expression associated with this auxiliary variable.

Definition at line 41 of file CouenneExprAux.hpp.

7.59.5.2 expression* Couenne::exprAux::lb_ [protected]

lower bound, a function of the associated expression and the bounds on the variables in the expression

Definition at line 45 of file CouenneExprAux.hpp.

7.59.5.3 expression* Couenne::exprAux::ub_ [protected]

upper bound, a function of the associated expression and the bounds on the variables in the expression

Definition at line 49 of file CouenneExprAux.hpp.

7.59.5.4 int Couenne::exprAux::rank_ [protected]

used in rank-based branching variable choice: original variables have rank 1; auxiliary w=f(x) has rank r(w) = r(x)+1; finally, auxiliary w=f(x1,x2...,xk) has rank r(w) = 1+max{r(xi):i=1..k}.

Definition at line 54 of file CouenneExprAux.hpp.

7.59.5.5 int Couenne::exprAux::multiplicity_ [protected]

number of appearances of this aux in the formulation.

The more times it occurs in the formulation, the more implication its branching has on other variables

Definition at line 59 of file CouenneExprAux.hpp.

7.59.5.6 enum intType Couenne::exprAux::integer_ [protected]

is this variable integer?

Definition at line 62 of file CouenneExprAux.hpp.

7.59.5.7 bool Couenne::exprAux::top_level_ [protected]

True if this variable replaces the lhs of a constraint, i.e., if it is a top level variable in the DAG of the problem.

Definition at line 66 of file CouenneExprAux.hpp.

7.59.5.8 enum auxSign Couenne::exprAux::sign_ [protected]

"sign" of the defining constraint

Definition at line 69 of file CouenneExprAux.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprAux.hpp

7.60 Couenne::exprBinProd Class Reference

class for $\prod_{i=1}^{n} f_i(x)$ with $f_i(x)$ all binary

`#include <CouenneExprBinProd.hpp>`

Public Member Functions

- exprBinProd (expression ∗∗, int)

  Constructor.
- exprBinProd (expression ∗, expression ∗)

  Constructor with two arguments.
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)

  differentiation
- expression ∗ simplify ()

  simplification
- virtual int Linearity ()

  get a measure of "how linear" the expression is:
- virtual void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)
- virtual exprAux ∗ standardize (CouenneProblem ∗p, bool addAux=true)

  reduce expression in standard form, creating additional aux variables (and constraints)
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate equality between ∗this and ∗w
- virtual enum expr_type code ()

  code for comparison
- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum Couenne::expression::auxSign=Couenne::expression::AUX_EQ)

  implied bound processing

- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

    set up branching object by evaluating many branching points for each expression's arguments
- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

    compute y^{lv} and y^{uv} for Violation Transfer algorithm

Protected Member Functions

- CouNumber balancedMul (const OsiBranchingInformation ∗info, int index, int wind)

    balanced strategy for branching point selection in products
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

    can this expression be further linearized or are we on its concave ("bad") side

7.60.1 Detailed Description

class for $\prod_{i=1}^{n} f_i(x)$ with $f_i(x)$ all binary

Definition at line 21 of file CouenneExprBinProd.hpp.

7.60.2 Constructor & Destructor Documentation

7.60.2.1 Couenne::exprBinProd::exprBinProd (expression ∗∗, int)

Constructor.

7.60.2.2 Couenne::exprBinProd::exprBinProd (expression ∗, expression ∗)

Constructor with two arguments.

7.60.3 Member Function Documentation

7.60.3.1 CouNumber Couenne::exprBinProd::gradientNorm (const double ∗ *x*)

return l-2 norm of gradient at given point

7.60.3.2 expression∗ Couenne::exprBinProd::differentiate (int *index*)

differentiation

7.60.3.3 expression∗ Couenne::exprBinProd::simplify ( )

simplification

7.60.3.4 virtual int Couenne::exprBinProd::Linearity ( ) [virtual]

get a measure of "how linear" the expression is:

7.60.3.5 virtual void Couenne::exprBinProd::getBounds (expression ∗&, expression ∗&) [virtual]

Get lower and upper bound of an expression (if any)

7.60.3.6 virtual void Couenne::exprBinProd::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

7.60.3.7 virtual exprAux* Couenne::exprBinProd::standardize (CouenneProblem * *p*, bool *addAux* = true) [virtual]

reduce expression in standard form, creating additional aux variables (and constraints)

7.60.3.8 void Couenne::exprBinProd::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY)

generate equality between *this and *w

7.60.3.9 virtual enum expr_type Couenne::exprBinProd::code ( ) [inline], [virtual]

code for comparison

Definition at line 61 of file CouenneExprBinProd.hpp.

7.60.3.10 bool Couenne::exprBinProd::impliedBound (int , CouNumber * , CouNumber * , t_chg_bounds * , enum Couenne::expression::auxSign = Couenne::expression::AUX_EQ)

implied bound processing

7.60.3.11 virtual CouNumber Couenne::exprBinProd::selectBranch (const CouenneObject * *obj*, const OsiBranchingInformation * *info*, expression *& *var*, double *& *brpts*, double *& *brDist*, int & *way*) [virtual]

set up branching object by evaluating many branching points for each expression's arguments

7.60.3.12 virtual void Couenne::exprBinProd::closestFeasible (expression * *varind*, expression * *vardep*, CouNumber & *left*, CouNumber & *right*) const [virtual]

compute y^{lv} and y^{uv} for Violation Transfer algorithm

7.60.3.13 CouNumber Couenne::exprBinProd::balancedMul (const OsiBranchingInformation * *info*, int *index*, int *wind*) [protected]

balanced strategy for branching point selection in products

7.60.3.14 virtual bool Couenne::exprBinProd::isCuttable (CouenneProblem * *problem*, int *index*) const [inline], [protected], [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Definition at line 89 of file CouenneExprBinProd.hpp.

The documentation for this class was generated from the following file:

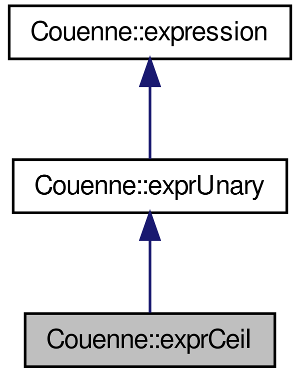
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprBinProd.hpp

7.61 Couenne::exprCeil Class Reference

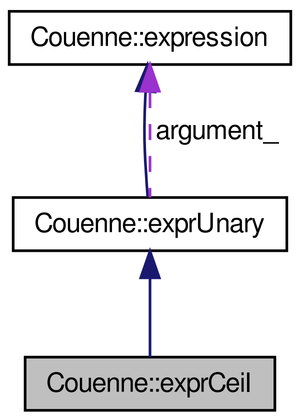
class ceiling, $\lceil f(x) \rceil$

`#include <CouenneExprCeil.hpp>`

Inheritance diagram for Couenne::exprCeil:



Collaboration diagram for Couenne::exprCeil:



Public Member Functions

- exprCeil (expression ∗arg)

    constructor, destructor
- expression ∗ clone (Domain ∗d=NULL) const

    cloning method
- unary_function F ()

the operator itself (e.g. sin, log...)
- std::string printOp () const

  print operator
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)

  obtain derivative of expression
- void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression.
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate equality between ∗this and ∗w
- virtual enum expr_type code ()

  code for comparisons
- bool impliedBound (int index, CouNumber ∗l, CouNumber ∗u, t_chg_bounds ∗chg, enum auxSign=expression::-AUX_EQ)

  implied bound processing
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  Set up branching object by evaluating many branching points for each expression's arguments.
- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

  closest feasible points in function in both directions
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side?

Additional Inherited Members

7.61.1 Detailed Description

class ceiling, $\lceil f(x) \rceil$

Definition at line 20 of file CouenneExprCeil.hpp.

7.61.2 Constructor & Destructor Documentation

7.61.2.1 Couenne::exprCeil::exprCeil (expression ∗ *arg*) [inline]

constructor, destructor

Definition at line 25 of file CouenneExprCeil.hpp.

7.61.3 Member Function Documentation

7.61.3.1 expression∗ Couenne::exprCeil::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 29 of file CouenneExprCeil.hpp.

7.61.3.2 unary_function Couenne::exprCeil::F ( ) [inline], [virtual]

the operator itself (e.g. sin, log...)

Reimplemented from Couenne::exprUnary.

Definition at line 33 of file CouenneExprCeil.hpp.

7.61.3.3 std::string Couenne::exprCeil::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprUnary.

Definition at line 37 of file CouenneExprCeil.hpp.

7.61.3.4 CouNumber Couenne::exprCeil::gradientNorm (const double * *x*) [inline], [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

Definition at line 41 of file CouenneExprCeil.hpp.

7.61.3.5 expression* Couenne::exprCeil::differentiate (int *index*) [virtual]

obtain derivative of expression

Reimplemented from Couenne::expression.

7.61.3.6 void Couenne::exprCeil::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.61.3.7 void Couenne::exprCeil::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression.

Reimplemented from Couenne::expression.

7.61.3.8 void Couenne::exprCeil::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between *this and *w

Reimplemented from Couenne::expression.

7.61.3.9 virtual enum expr_type Couenne::exprCeil::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprUnary.

Definition at line 63 of file CouenneExprCeil.hpp.

7.61.3.10 bool Couenne::exprCeil::impliedBound (int *index,* CouNumber ∗ *l,* CouNumber ∗ *u,* t_chg_bounds ∗ *chg,* enum *auxSign =* expression::AUX_EQ) [inline], [virtual]

implied bound processing

Reimplemented from Couenne::expression.

Definition at line 67 of file CouenneExprCeil.hpp.

7.61.3.11 virtual CouNumber Couenne::exprCeil::selectBranch (const CouenneObject ∗ *obj,* const OsiBranchingInformation ∗ *info,* expression ∗& *var,* double ∗& *brpts,* double ∗& *brDist,* int & *way*) [inline], [virtual]

Set up branching object by evaluating many branching points for each expression's arguments.

Reimplemented from Couenne::expression.

Definition at line 75 of file CouenneExprCeil.hpp.

7.61.3.12 virtual void Couenne::exprCeil::closestFeasible (expression ∗ *varind,* expression ∗ *vardep,* CouNumber & *left,* CouNumber & *right*) const [virtual]

closest feasible points in function in both directions

Reimplemented from Couenne::expression.

7.61.3.13 virtual bool Couenne::exprCeil::isCuttable (CouenneProblem ∗ *problem,* int *index*) const [inline], [virtual]

can this expression be further linearized or are we on its concave ("bad") side?

Reimplemented from Couenne::expression.

Definition at line 90 of file CouenneExprCeil.hpp.

The documentation for this class was generated from the following file:

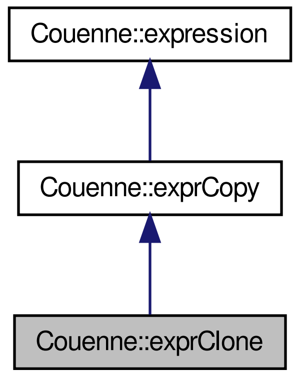
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprCeil.hpp

7.62 Couenne::exprClone Class Reference

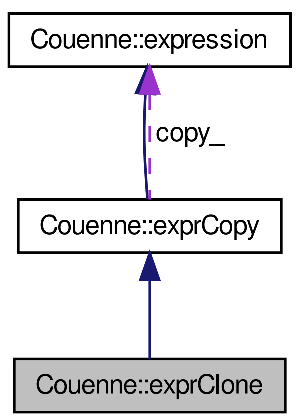
expression clone (points to another expression)

`#include <CouenneExprClone.hpp>`

Inheritance diagram for Couenne::exprClone:



Collaboration diagram for Couenne::exprClone:



Public Member Functions

- exprClone (expression ∗copy)

  Constructor.
- exprClone (const exprClone &e, Domain ∗d=NULL)

  copy constructor
- expression ∗ clone (Domain ∗d=NULL) const

cloning method
- virtual ~exprClone ()

  Destructor.
- virtual void print (std::ostream &out=std::cout, bool descend=false) const

  Printing.
- CouNumber Value () const

  value
- CouNumber operator() ()

  null function for evaluating the expression

Additional Inherited Members

7.62.1 Detailed Description

expression clone (points to another expression)

Definition at line 24 of file CouenneExprClone.hpp.

7.62.2 Constructor & Destructor Documentation

7.62.2.1 Couenne::exprClone::exprClone (expression ∗ *copy*) [inline]

Constructor.

Definition at line 29 of file CouenneExprClone.hpp.

7.62.2.2 Couenne::exprClone::exprClone (const exprClone & *e*, Domain ∗ *d* = NULL) [inline]

copy constructor

Definition at line 33 of file CouenneExprClone.hpp.

7.62.2.3 virtual Couenne::exprClone::~exprClone ( ) [inline], [virtual]

Destructor.

Definition at line 47 of file CouenneExprClone.hpp.

7.62.3 Member Function Documentation

7.62.3.1 expression∗ Couenne::exprClone::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::exprCopy.

Definition at line 38 of file CouenneExprClone.hpp.

7.62.3.2 virtual void Couenne::exprClone::print (std::ostream & *out* = std::cout, bool *descend* = false) const [virtual]

Printing.

Reimplemented from Couenne::exprCopy.

7.62.3.3 CouNumber Couenne::exprClone::Value ( ) const [inline], [virtual]

value

Reimplemented from Couenne::exprCopy.

Definition at line 58 of file CouenneExprClone.hpp.

7.62.3.4 CouNumber Couenne::exprClone::operator() ( ) [inline], [virtual]

null function for evaluating the expression

Reimplemented from Couenne::exprCopy.

Definition at line 62 of file CouenneExprClone.hpp.

The documentation for this class was generated from the following file:

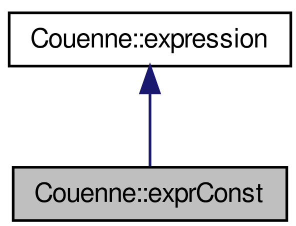
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprClone.hpp

7.63 Couenne::exprConst Class Reference

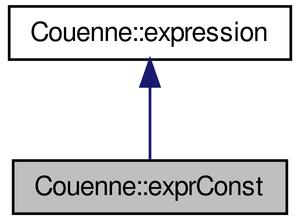
constant-type operator

`#include <CouenneExprConst.hpp>`

Inheritance diagram for Couenne::exprConst:



Collaboration diagram for Couenne::exprConst:



Public Member Functions

- enum nodeType Type () const

    node type
- CouNumber Value () const

    value of expression
- exprConst (CouNumber value)

    Constructor.
- exprConst (const exprConst &e, Domain ∗d=NULL)

    Copy constructor.
- virtual expression ∗ clone (Domain ∗d=NULL) const

    Cloning method.
- void print (std::ostream &out=std::cout, bool=false) const

    I/O.
- CouNumber operator() ()

    return constant's value
- expression ∗ differentiate (int)

    differentiation
- int dependsOn (int ∗ind, int n, enum dig_type type=STOP_AT_AUX)

    dependence on variable set
- int Linearity ()

    get a measure of "how linear" the expression is (see CouenneTypes.h)
- void getBounds (expression ∗&lower, expression ∗&upper)

    Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lower, CouNumber &upper)

    Get value of lower and upper bound of an expression (if any)
- void generateCuts (expression ∗, OsiCuts &, const CouenneCutGenerator ∗, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

    generate convexification cut for constraint w = this
- virtual enum expr_type code ()

    code for comparisons
- virtual bool isInteger ()

is this expression integer?

- virtual int rank ()

  used in rank-based branching variable choice

Additional Inherited Members

7.63.1 Detailed Description

constant-type operator

Definition at line 23 of file CouenneExprConst.hpp.

7.63.2 Constructor & Destructor Documentation

7.63.2.1 Couenne::exprConst::exprConst (CouNumber *value*) [inline]

Constructor.

Definition at line 41 of file CouenneExprConst.hpp.

7.63.2.2 Couenne::exprConst::exprConst (const exprConst & *e*, Domain * *d* = NULL) [inline]

Copy constructor.

Definition at line 45 of file CouenneExprConst.hpp.

7.63.3 Member Function Documentation

7.63.3.1 enum nodeType Couenne::exprConst::Type ( ) const [inline], [virtual]

node type

Reimplemented from Couenne::expression.

Definition at line 33 of file CouenneExprConst.hpp.

7.63.3.2 CouNumber Couenne::exprConst::Value ( ) const [inline], [virtual]

value of expression

Reimplemented from Couenne::expression.

Definition at line 37 of file CouenneExprConst.hpp.

7.63.3.3 virtual expression* Couenne::exprConst::clone (Domain * *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::expression.

Definition at line 49 of file CouenneExprConst.hpp.

7.63.3.4 void Couenne::exprConst::print (std::ostream & *out* = std::cout, bool = false) const [inline], [virtual]

I/O.

Reimplemented from Couenne::expression.

Definition at line 53 of file CouenneExprConst.hpp.

7.63.3.5 CouNumber Couenne::exprConst::operator() ( ) [inline], [virtual]

return constant's value

Implements Couenne::expression.

Definition at line 58 of file CouenneExprConst.hpp.

7.63.3.6 expression* Couenne::exprConst::differentiate (int) [inline], [virtual]

differentiation

Reimplemented from Couenne::expression.

Definition at line 62 of file CouenneExprConst.hpp.

7.63.3.7 int Couenne::exprConst::dependsOn (int * *ind*, int *n*, enum dig_type *type* = STOP_AT_AUX) [inline], [virtual]

dependence on variable set

Reimplemented from Couenne::expression.

Definition at line 66 of file CouenneExprConst.hpp.

7.63.3.8 int Couenne::exprConst::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::expression.

Definition at line 70 of file CouenneExprConst.hpp.

7.63.3.9 void Couenne::exprConst::getBounds (expression *& *lower*, expression *& *upper*) [inline], [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

Definition at line 74 of file CouenneExprConst.hpp.

7.63.3.10 void Couenne::exprConst::getBounds (CouNumber & *lower*, CouNumber & *upper*) [inline], [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

Definition at line 80 of file CouenneExprConst.hpp.

7.63.3.11 void Couenne::exprConst::generateCuts (expression * , OsiCuts & , const CouenneCutGenerator * , t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate convexification cut for constraint w = this

Reimplemented from Couenne::expression.

7.63.3.12 virtual enum expr_type Couenne::exprConst::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::expression.

Definition at line 91 of file CouenneExprConst.hpp.

7.63.3.13 virtual bool Couenne::exprConst::isInteger ( ) [inline], [virtual]

is this expression integer?

Reimplemented from Couenne::expression.

Definition at line 95 of file CouenneExprConst.hpp.

7.63.3.14 virtual int Couenne::exprConst::rank ( ) [inline], [virtual]

used in rank-based branching variable choice

Reimplemented from Couenne::expression.

Definition at line 99 of file CouenneExprConst.hpp.

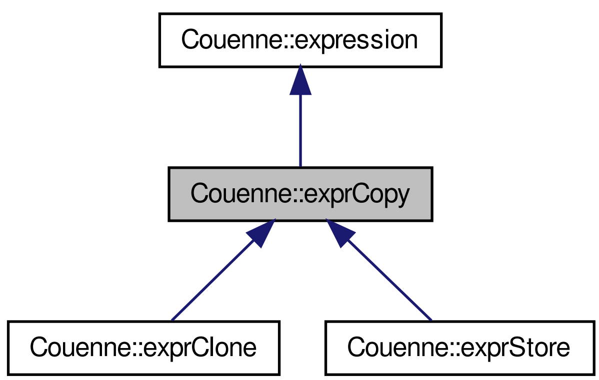
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprConst.hpp

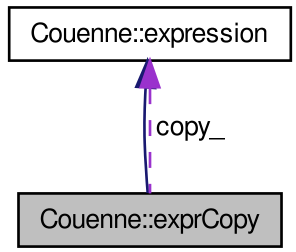
7.64 Couenne::exprCopy Class Reference

`#include <CouenneExprCopy.hpp>`

Inheritance diagram for Couenne::exprCopy:



Collaboration diagram for Couenne::exprCopy:



Public Member Functions

- enum nodeType Type () const

  node type
- exprCopy (expression ∗copy)

  Empty constructor - used in cloning method of exprClone.
- exprCopy (const exprCopy &e, Domain ∗d=NULL)

  Copy constructor.
- virtual ∼exprCopy ()

  Destructor – CAUTION: this is the only destructive destructor, exprClone and exprStore do not destroy anything.
- virtual expression ∗ clone (Domain ∗d=NULL) const

  Cloning method.
- const expression ∗ Original () const

  If this is an exprClone of a exprClone of an expr???, point to the original expr??? instead of an exprClone – improves computing efficiency.
- bool isaCopy () const

  return true if this is a copy of something, i.e.
- expression ∗ Copy () const

  return copy of this expression (only makes sense in exprCopy)
- expression ∗ Image () const

  return pointer to corresponding expression (for auxiliary variables only)
- int Index () const

  Get variable index in problem.
- int nArgs () const

  Return number of arguments (when applicable, that is, with N-ary functions)
- expression ∗∗ ArgList () const

  return arglist (when applicable, that is, with N-ary functions)
- void ArgList (expression ∗∗al)

  set arglist (used in deleting nodes without deleting children)
- expression ∗ Argument () const

  return argument (when applicable, i.e., with univariate functions)

- expression ∗∗ ArgPtr ()

  return pointer to argument (when applicable, i.e., with univariate functions)
- virtual void print (std::ostream &out=std::cout, bool descend=false) const

  I/O.
- virtual CouNumber Value () const

  value
- virtual CouNumber operator() ()

  null function for evaluating the expression
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)

  differentiation
- int DepList (std::set< int > &deplist, enum dig_type type=ORIG_ONLY)

  fill in the set with all indices of variables appearing in the expression
- expression ∗ simplify ()

  simplify expression (useful for derivatives)
- int Linearity ()

  get a measure of "how linear" the expression is (see CouenneTypes.h)
- bool isInteger ()

  is this expression integer?
- virtual bool isDefinedInteger ()

  is this expression DEFINED as integer?
- void getBounds (expression ∗&lower, expression ∗&upper)

  Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lower, CouNumber &upper)

  Get value of lower and upper bound of an expression (if any)
- exprAux ∗ standardize (CouenneProblem ∗p, bool addAux=true)

  Create standard formulation of this expression.
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗chg=NULL, int wind=-1, CouNumber lb=-COUENNE_INFINITY, CouNumber ub=COUENNE_INFINITY)

  generate convexification cut for constraint w = this
- enum expr_type code ()

  code for comparisons
- enum convexity convexity () const

  either CONVEX, CONCAVE, AFFINE, or NONCONVEX
- int compare (expression &e)

  compare this with other expression
- int rank ()

  used in rank-based branching variable choice
- bool impliedBound (int wind, CouNumber ∗l, CouNumber ∗u, t_chg_bounds ∗chg)

  implied bound processing
- int Multiplicity ()

  multiplicity of a variable: how many times this variable occurs in expressions throughout the problem
- CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  Set up branching object by evaluating many branching points for each expression's arguments.
- void replace (exprVar ∗, exprVar ∗)

replace occurrence of a variable with another variable
- void fillDepSet (std::set< DepNode ∗, compNode > ∗dep, DepGraph ∗g)

  fill in dependence structure
- void realign (const CouenneProblem ∗p)

  redirect variables to proper variable vector
- bool isBijective () const

  indicating if function is monotonically increasing
- CouNumber inverse (expression ∗vardep) const

  compute the inverse function
- void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

  closest feasible points in function in both directions
- bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

Protected Attributes

- expression ∗ copy_

  the expression this object is a (reference) copy of
- CouNumber value_

  saved value to be used by exprStore expressions

Additional Inherited Members

7.64.1 Detailed Description

Definition at line 25 of file CouenneExprCopy.hpp.

7.64.2 Constructor & Destructor Documentation

7.64.2.1 Couenne::exprCopy::exprCopy (**expression** ∗ *copy*) [inline]

Empty constructor - used in cloning method of exprClone.

Constructor

Definition at line 45 of file CouenneExprCopy.hpp.

7.64.2.2 Couenne::exprCopy::exprCopy (const **exprCopy** & *e*, **Domain** ∗ *d* = NULL)

Copy constructor.

7.64.2.3 virtual Couenne::exprCopy::∼exprCopy ( ) [inline], [virtual]

Destructor – CAUTION: this is the only destructive destructor, exprClone and exprStore do not destroy anything.

Definition at line 55 of file CouenneExprCopy.hpp.

7.64.3 Member Function Documentation

7.64.3.1 enum nodeType Couenne::exprCopy::Type ( ) const [inline], [virtual]

node type

Reimplemented from Couenne::expression.

Definition at line 38 of file CouenneExprCopy.hpp.

7.64.3.2 virtual expression∗ Couenne::exprCopy::clone (Domain ∗ d = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprStore, and Couenne::exprClone.

Definition at line 61 of file CouenneExprCopy.hpp.

7.64.3.3 const expression∗ Couenne::exprCopy::Original ( ) const [inline], [virtual]

If this is an exprClone of a exprClone of an expr???, point to the original expr??? instead of an exprClone – improves computing efficiency.

Reimplemented from Couenne::expression.

Definition at line 67 of file CouenneExprCopy.hpp.

7.64.3.4 bool Couenne::exprCopy::isaCopy ( ) const [inline], [virtual]

return true if this is a copy of something, i.e.

if it is an exprCopy or derivates

Reimplemented from Couenne::expression.

Definition at line 72 of file CouenneExprCopy.hpp.

7.64.3.5 expression∗ Couenne::exprCopy::Copy ( ) const [inline], [virtual]

return copy of this expression (only makes sense in exprCopy)

Reimplemented from Couenne::expression.

Definition at line 76 of file CouenneExprCopy.hpp.

7.64.3.6 expression∗ Couenne::exprCopy::Image ( ) const [inline], [virtual]

return pointer to corresponding expression (for auxiliary variables only)

Reimplemented from Couenne::expression.

Definition at line 80 of file CouenneExprCopy.hpp.

7.64.3.7 int Couenne::exprCopy::Index ( ) const [inline], [virtual]

Get variable index in problem.

Reimplemented from Couenne::expression.

Definition at line 84 of file CouenneExprCopy.hpp.

7.64.3.8 int Couenne::exprCopy::nArgs ( ) const [inline], [virtual]

Return number of arguments (when applicable, that is, with N-ary functions)

Reimplemented from Couenne::expression.

Definition at line 88 of file CouenneExprCopy.hpp.

7.64.3.9 expression** Couenne::exprCopy::ArgList ( ) const [inline], [virtual]

return arglist (when applicable, that is, with N-ary functions)

Reimplemented from Couenne::expression.

Definition at line 92 of file CouenneExprCopy.hpp.

7.64.3.10 void Couenne::exprCopy::ArgList (expression ** *al*) [inline], [virtual]

set arglist (used in deleting nodes without deleting children)

Reimplemented from Couenne::expression.

Definition at line 96 of file CouenneExprCopy.hpp.

7.64.3.11 expression* Couenne::exprCopy::Argument ( ) const [inline], [virtual]

return argument (when applicable, i.e., with univariate functions)

Reimplemented from Couenne::expression.

Definition at line 100 of file CouenneExprCopy.hpp.

7.64.3.12 expression** Couenne::exprCopy::ArgPtr ( ) [inline], [virtual]

return pointer to argument (when applicable, i.e., with univariate functions)

Reimplemented from Couenne::expression.

Definition at line 104 of file CouenneExprCopy.hpp.

7.64.3.13 virtual void Couenne::exprCopy::print (std::ostream & *out* = std::cout, bool *descend* = false) const [virtual]

I/O.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprClone, and Couenne::exprStore.

7.64.3.14 virtual CouNumber Couenne::exprCopy::Value ( ) const [inline], [virtual]

value

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprClone.

Definition at line 112 of file CouenneExprCopy.hpp.

7.64.3.15 virtual CouNumber Couenne::exprCopy::operator() ( ) [inline], [virtual]

null function for evaluating the expression

Implements Couenne::expression.

Reimplemented in Couenne::exprClone, and Couenne::exprStore.

Definition at line 116 of file CouenneExprCopy.hpp.

7.64.3.16 CouNumber Couenne::exprCopy::gradientNorm (const double * *x*) [inline], [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

Definition at line 122 of file CouenneExprCopy.hpp.

7.64.3.17 expression* Couenne::exprCopy::differentiate (int *index*) [inline], [virtual]

differentiation

Reimplemented from Couenne::expression.

Definition at line 126 of file CouenneExprCopy.hpp.

7.64.3.18 int Couenne::exprCopy::DepList (std::set< int > & *deplist*, enum dig_type *type* = ORIG_ONLY) [inline], [virtual]

fill in the set with all indices of variables appearing in the expression

Reimplemented from Couenne::expression.

Definition at line 131 of file CouenneExprCopy.hpp.

7.64.3.19 expression* Couenne::exprCopy::simplify ( ) [inline], [virtual]

simplify expression (useful for derivatives)

Reimplemented from Couenne::expression.

Definition at line 136 of file CouenneExprCopy.hpp.

7.64.3.20 int Couenne::exprCopy::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::expression.

Definition at line 140 of file CouenneExprCopy.hpp.

7.64.3.21 bool Couenne::exprCopy::isInteger ( ) [inline], [virtual]

is this expression integer?

Reimplemented from Couenne::expression.

Definition at line 143 of file CouenneExprCopy.hpp.

7.64.3.22 virtual bool Couenne::exprCopy::isDefinedInteger ( ) [inline], [virtual]

is this expression DEFINED as integer?

Reimplemented from Couenne::expression.

Definition at line 147 of file CouenneExprCopy.hpp.

7.64.3.23 void Couenne::exprCopy::getBounds (expression *& *lower*, expression *& *upper*) [inline], [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

Definition at line 151 of file CouenneExprCopy.hpp.

7.64.3.24 void Couenne::exprCopy::getBounds (CouNumber & *lower*, CouNumber & *upper*) [inline], [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

Definition at line 155 of file CouenneExprCopy.hpp.

7.64.3.25 exprAux* Couenne::exprCopy::standardize (CouenneProblem * *p*, bool *addAux* = true) [inline], [virtual]

Create standard formulation of this expression.

Reimplemented from Couenne::expression.

Definition at line 160 of file CouenneExprCopy.hpp.

7.64.3.26 void Couenne::exprCopy::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * *chg* = NULL, int *wind* = -1, CouNumber *lb* = -COUENNE_INFINITY, CouNumber *ub* = COUENNE_INFINITY) [inline], [virtual]

generate convexification cut for constraint w = this

Reimplemented from Couenne::expression.

Definition at line 164 of file CouenneExprCopy.hpp.

7.64.3.27 enum expr_type Couenne::exprCopy::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::expression.

Definition at line 173 of file CouenneExprCopy.hpp.

7.64.3.28 enum convexity Couenne::exprCopy::convexity ( ) const [inline], [virtual]

either CONVEX, CONCAVE, AFFINE, or NONCONVEX

Reimplemented from Couenne::expression.

Definition at line 177 of file CouenneExprCopy.hpp.

7.64.3.29 int Couenne::exprCopy::compare (expression & *e*) [inline], [virtual]

compare this with other expression

Reimplemented from Couenne::expression.

Definition at line 181 of file CouenneExprCopy.hpp.

7.64.3.30 int Couenne::exprCopy::rank ( ) [inline], [virtual]

used in rank-based branching variable choice

Reimplemented from Couenne::expression.

Definition at line 185 of file CouenneExprCopy.hpp.

7.64.3.31 bool Couenne::exprCopy::impliedBound (int *wind*, CouNumber ∗ *l*, CouNumber ∗ *u*, t_chg_bounds ∗ *chg*) [inline]

implied bound processing

Definition at line 189 of file CouenneExprCopy.hpp.

7.64.3.32 int Couenne::exprCopy::Multiplicity ( ) [inline], [virtual]

multiplicity of a variable: how many times this variable occurs in expressions throughout the problem

Reimplemented from Couenne::expression.

Definition at line 194 of file CouenneExprCopy.hpp.

7.64.3.33 CouNumber Couenne::exprCopy::selectBranch (const CouenneObject ∗ *obj*, const OsiBranchingInformation ∗ *info*, expression ∗& *var*, double ∗& *brpts*, double ∗& *brDist*, int & *way*) [inline], [virtual]

Set up branching object by evaluating many branching points for each expression's arguments.

Return estimated improvement in objective function

Reimplemented from Couenne::expression.

Definition at line 199 of file CouenneExprCopy.hpp.

7.64.3.34 void Couenne::exprCopy::replace (exprVar ∗ , exprVar ∗) [virtual]

replace occurrence of a variable with another variable

Reimplemented from Couenne::expression.

7.64.3.35 void Couenne::exprCopy::fillDepSet (std::set< DepNode ∗, compNode > ∗ *dep*, DepGraph ∗ *g*) [inline], [virtual]

fill in dependence structure

Reimplemented from Couenne::expression.

Definition at line 213 of file CouenneExprCopy.hpp.

7.64.3.36 void Couenne::exprCopy::realign (const CouenneProblem ∗ *p*) [virtual]

redirect variables to proper variable vector

Reimplemented from Couenne::expression.

7.64.3.37 bool Couenne::exprCopy::isBijective ( ) const [inline], [virtual]

indicating if function is monotonically increasing

Reimplemented from Couenne::expression.

Definition at line 221 of file CouenneExprCopy.hpp.

7.64.3.38 CouNumber Couenne::exprCopy::inverse (expression ∗ *vardep*) const [inline], [virtual]

compute the inverse function

Reimplemented from Couenne::expression.

Definition at line 225 of file CouenneExprCopy.hpp.

7.64.3.39 void Couenne::exprCopy::closestFeasible (expression * *varind*, expression * *vardep*, CouNumber & *left*, CouNumber & *right*) const [inline], [virtual]

closest feasible points in function in both directions

Reimplemented from Couenne::expression.

Definition at line 229 of file CouenneExprCopy.hpp.

7.64.3.40 bool Couenne::exprCopy::isCuttable (CouenneProblem * *problem*, int *index*) const [inline], [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

Definition at line 235 of file CouenneExprCopy.hpp.

7.64.4 Member Data Documentation

7.64.4.1 expression* Couenne::exprCopy::copy_ [protected]

the expression this object is a (reference) copy of

Definition at line 30 of file CouenneExprCopy.hpp.

7.64.4.2 CouNumber Couenne::exprCopy::value_ [protected]

saved value to be used by exprStore expressions

Definition at line 33 of file CouenneExprCopy.hpp.

The documentation for this class was generated from the following file:

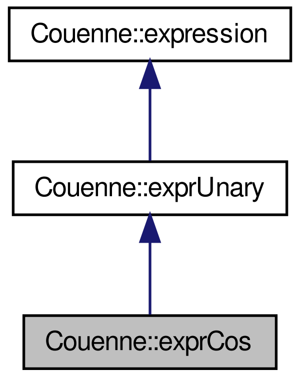
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprCopy.hpp

7.65 Couenne::exprCos Class Reference

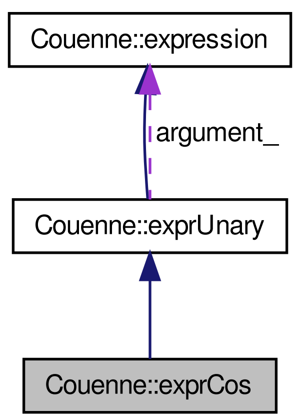
class cosine, $\cos f(x)$

```
#include <CouenneExprCos.hpp>
```

Inheritance diagram for Couenne::exprCos:



Collaboration diagram for Couenne::exprCos:



Public Member Functions

- exprCos (expression ∗al)

  constructor, destructor
- expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- unary_function F ()

the operator itself (e.g. sin, log...)

- std::string printOp () const

  print operator
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)

  obtain derivative of expression
- void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression.
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate equality between ∗this and ∗w
- virtual enum expr_type code ()

  code for comparisons
- bool impliedBound (int index, CouNumber ∗l, CouNumber ∗u, t_chg_bounds ∗chg, enum auxSign=expression::AUX_EQ)

  implied bound processing
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  Set up branching object by evaluating many branching points for each expression's arguments.
- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

  closest feasible points in function in both directions
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

Additional Inherited Members

7.65.1 Detailed Description

class cosine, $\cos f(x)$

Definition at line 20 of file CouenneExprCos.hpp.

7.65.2 Constructor & Destructor Documentation

7.65.2.1 Couenne::exprCos::exprCos (expression ∗ *al*) [inline]

constructor, destructor

Definition at line 25 of file CouenneExprCos.hpp.

7.65.3 Member Function Documentation

7.65.3.1 expression∗ Couenne::exprCos::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 29 of file CouenneExprCos.hpp.

7.65.3.2 unary_function Couenne::exprCos::F ( ) [inline], [virtual]

the operator itself (e.g. sin, log...)

Reimplemented from Couenne::exprUnary.

Definition at line 33 of file CouenneExprCos.hpp.

7.65.3.3 std::string Couenne::exprCos::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprUnary.

Definition at line 37 of file CouenneExprCos.hpp.

7.65.3.4 CouNumber Couenne::exprCos::gradientNorm (const double * *x*) [inline], [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

Definition at line 41 of file CouenneExprCos.hpp.

7.65.3.5 expression* Couenne::exprCos::differentiate (int *index*) [virtual]

obtain derivative of expression

Reimplemented from Couenne::expression.

7.65.3.6 void Couenne::exprCos::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.65.3.7 void Couenne::exprCos::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression.

Reimplemented from Couenne::expression.

7.65.3.8 void Couenne::exprCos::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between *this and *w

Reimplemented from Couenne::expression.

7.65.3.9 virtual enum expr_type Couenne::exprCos::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprUnary.

Definition at line 63 of file CouenneExprCos.hpp.

7.65.3.10 bool Couenne::exprCos::impliedBound (int *index*, CouNumber ∗ *l*, CouNumber ∗ *u*, t_chg_bounds ∗ *chg*, enum *auxSign* = expression::AUX_EQ) [inline], [virtual]

implied bound processing

Reimplemented from Couenne::expression.

Definition at line 67 of file CouenneExprCos.hpp.

7.65.3.11 virtual CouNumber Couenne::exprCos::selectBranch (const CouenneObject ∗ *obj*, const OsiBranchingInformation ∗ *info*, expression ∗& *var*, double ∗& *brpts*, double ∗& *brDist*, int & *way*) [inline], [virtual]

Set up branching object by evaluating many branching points for each expression's arguments.

Reimplemented from Couenne::expression.

Definition at line 84 of file CouenneExprCos.hpp.

7.65.3.12 virtual void Couenne::exprCos::closestFeasible (expression ∗ *varind*, expression ∗ *vardep*, CouNumber & *left*, CouNumber & *right*) const [virtual]

closest feasible points in function in both directions

Reimplemented from Couenne::expression.

7.65.3.13 virtual bool Couenne::exprCos::isCuttable (CouenneProblem ∗ *problem*, int *index*) const [inline], [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

Definition at line 99 of file CouenneExprCos.hpp.

The documentation for this class was generated from the following file:

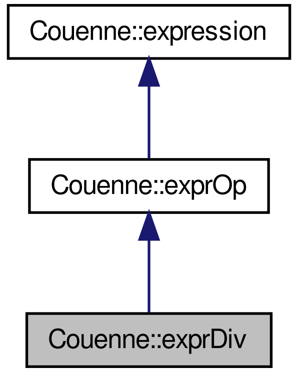
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprCos.hpp

7.66 Couenne::exprDiv Class Reference

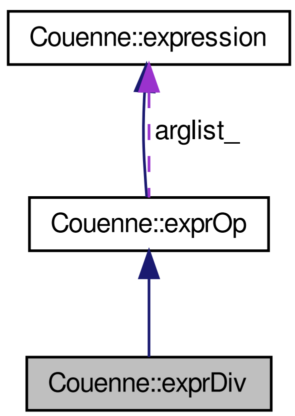
class for divisions, $\frac{f(x)}{g(x)}$

`#include <CouenneExprDiv.hpp>`

Inheritance diagram for Couenne::exprDiv:



Collaboration diagram for Couenne::exprDiv:



Public Member Functions

- exprDiv (expression ∗∗al, int n=2)

  Constructor.
- exprDiv (expression ∗arg0, expression ∗arg1)

  Constructor with two arguments given explicitly.
- expression ∗ clone (Domain ∗d=NULL) const

Cloning method.

- std::string printOp () const

  Print operator.

- CouNumber operator() ()

  Function for the evaluation of the expression.

- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point

- expression ∗ differentiate (int index)

  Differentiation.

- expression ∗ simplify ()

  Simplification.

- int Linearity ()

  Get a measure of "how linear" the expression is (see CouenneTypes.h)

- void getBounds (expression ∗&lb, expression ∗&ub)

  Get lower and upper bound of an expression (if any)

- void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)

- exprAux ∗ standardize (CouenneProblem ∗p, bool addAux=true)

  Reduce expression in standard form, creating additional aux variables (and constraints)

- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  Generate equality between ∗this and ∗w.

- virtual enum expr_type code ()

  Code for comparisons.

- bool isInteger ()

  is this expression integer?

- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX_EQ)

  Implied bound processing.

- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  Set up branching object by evaluating many branching points for each expression's arguments.

- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

  compute y^{lv} and y^{uv} for Violation Transfer algorithm

- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

Additional Inherited Members

7.66.1 Detailed Description

class for divisions, $\frac{f(x)}{g(x)}$

Definition at line 24 of file CouenneExprDiv.hpp.

7.66.2 Constructor & Destructor Documentation

7.66.2.1 Couenne::exprDiv::exprDiv (expression ** *al*, int *n* = 2) [inline]

Constructor.

Definition at line 29 of file CouenneExprDiv.hpp.

7.66.2.2 Couenne::exprDiv::exprDiv (expression * *arg0*, expression * *arg1*) [inline]

Constructor with two arguments given explicitly.

Definition at line 33 of file CouenneExprDiv.hpp.

7.66.3 Member Function Documentation

7.66.3.1 expression* Couenne::exprDiv::clone (Domain * *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::expression.

Definition at line 37 of file CouenneExprDiv.hpp.

7.66.3.2 std::string Couenne::exprDiv::printOp ( ) const [inline], [virtual]

Print operator.

Reimplemented from Couenne::exprOp.

Definition at line 41 of file CouenneExprDiv.hpp.

7.66.3.3 CouNumber Couenne::exprDiv::operator() ( ) [inline], [virtual]

Function for the evaluation of the expression.

Compute division.

Implements Couenne::expression.

Definition at line 115 of file CouenneExprDiv.hpp.

7.66.3.4 CouNumber Couenne::exprDiv::gradientNorm (const double * *x*) [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

7.66.3.5 expression* Couenne::exprDiv::differentiate (int *index*) [virtual]

Differentiation.

Reimplemented from Couenne::expression.

7.66.3.6 expression* Couenne::exprDiv::simplify ( ) [virtual]

Simplification.

Reimplemented from Couenne::exprOp.

7.66.3.7 int Couenne::exprDiv::Linearity ( ) [inline], [virtual]

Get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::exprOp.

Definition at line 57 of file CouenneExprDiv.hpp.

7.66.3.8 void Couenne::exprDiv::getBounds (expression ∗& *lb*, expression ∗& *ub*) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.66.3.9 void Couenne::exprDiv::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.66.3.10 exprAux∗ Couenne::exprDiv::standardize (CouenneProblem ∗ *p*, bool *addAux* = true) [virtual]

Reduce expression in standard form, creating additional aux variables (and constraints)

Reimplemented from Couenne::exprOp.

7.66.3.11 void Couenne::exprDiv::generateCuts (expression ∗ *w*, OsiCuts & *cs*, const CouenneCutGenerator ∗ *cg*, t_chg_bounds ∗ = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

Generate equality between ∗this and ∗w.

Reimplemented from Couenne::expression.

7.66.3.12 virtual enum expr_type Couenne::exprDiv::code ( ) [inline], [virtual]

Code for comparisons.

Reimplemented from Couenne::exprOp.

Definition at line 82 of file CouenneExprDiv.hpp.

7.66.3.13 bool Couenne::exprDiv::isInteger ( ) [virtual]

is this expression integer?

Reimplemented from Couenne::exprOp.

7.66.3.14 bool Couenne::exprDiv::impliedBound (int , CouNumber ∗ , CouNumber ∗ , t_chg_bounds ∗ , enum *auxSign* = expression::AUX_EQ) [virtual]

Implied bound processing.

Reimplemented from Couenne::expression.

7.66.3.15 virtual CouNumber Couenne::exprDiv::selectBranch (const CouenneObject ∗ *obj*, const OsiBranchingInformation ∗ *info*, expression ∗& *var*, double ∗& *brpts*, double ∗& *brDist*, int & *way*) [virtual]

Set up branching object by evaluating many branching points for each expression's arguments.

Reimplemented from Couenne::expression.

7.66.3.16 virtual void Couenne::exprDiv::closestFeasible (expression * varind, expression * vardep, CouNumber & left, CouNumber & right) const [virtual]

compute y^{lv} and y^{uv} for Violation Transfer algorithm

Reimplemented from Couenne::expression.

7.66.3.17 virtual bool Couenne::exprDiv::isCuttable (CouenneProblem * problem, int index) const [inline], [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

Definition at line 108 of file CouenneExprDiv.hpp.

The documentation for this class was generated from the following file:

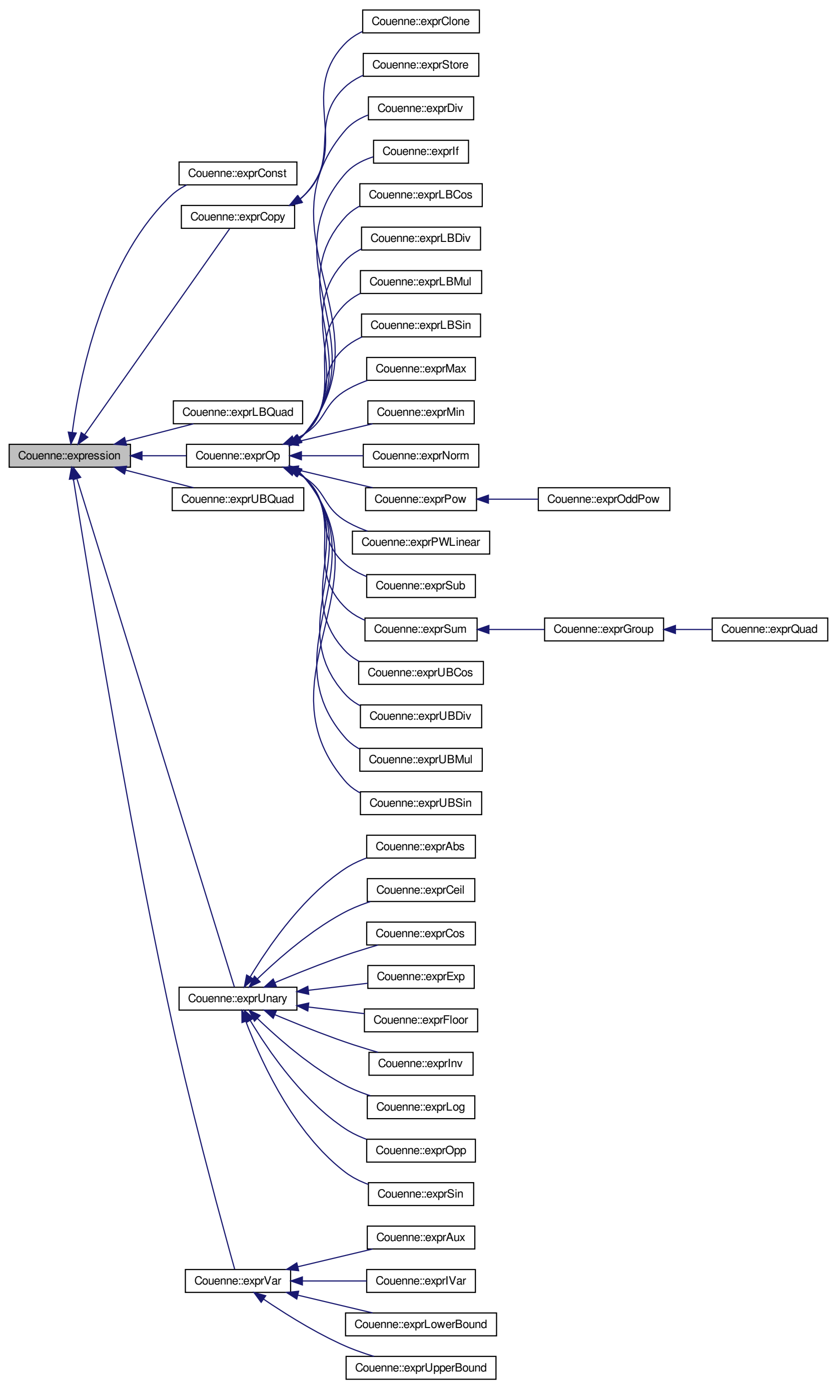
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprDiv.hpp

7.67 Couenne::expression Class Reference

Expression base class.

`#include <CouenneExpression.hpp>`

Inheritance diagram for Couenne::expression:



Public Types

- enum auxSign { AUX_UNDEF = -2, AUX_LEQ = -1, AUX_EQ, AUX_GEQ }

  "sign" of the constraint defining an auxiliary.

Public Member Functions

- expression ()

  Constructor.
- expression (const expression &e, Domain ∗d=NULL)

  Copy constructor.
- virtual ∼expression ()

  Destructor.
- virtual expression ∗ clone (Domain ∗d=NULL) const

  Cloning method.
- virtual int Index () const

  Return index of variable (only valid for exprVar and exprAux)
- virtual int nArgs () const

  return number of arguments (when applicable, that is, with N-ary functions)
- virtual expression ∗∗ ArgList () const

  return arglist (when applicable, that is, with N-ary functions)
- virtual void ArgList (expression ∗∗al)

  set arglist (used in deleting nodes without deleting children)
- virtual expression ∗ Argument () const

  return argument (when applicable, i.e., with univariate functions)
- virtual expression ∗∗ ArgPtr ()

  return pointer to argument (when applicable, i.e., with univariate functions)
- virtual enum nodeType Type () const

  node type
- virtual expression ∗ Image () const

  return pointer to corresponding expression (for auxiliary variables only)
- virtual void Image (expression ∗image)

  set expression associated with this auxiliary variable (for compatibility with exprAux)
- virtual CouNumber Value () const

  value (empty)
- virtual const expression ∗ Original () const

  If this is an exprClone of a exprClone of an expr???, point to the original expr??? instead of an exprClone – improve computing efficiency.
- virtual void print (std::ostream &s=std::cout, bool=false) const

  print expression to iostream
- virtual CouNumber operator() ()=0

  null function for evaluating the expression
- virtual CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- virtual expression ∗ differentiate (int)

  differentiation
- virtual int dependsOn (int ∗ind, int n, enum dig_type type=STOP_AT_AUX)

  dependence on variable set: return cardinality of subset of the set of indices in first argument which occur in expression.
- int dependsOn (int singleton, enum dig_type type=STOP_AT_AUX)

  version with one index only
- virtual int DepList (std::set< int > &deplist, enum dig_type type=ORIG_ONLY)

  fill std::set with indices of variables on which this expression depends.
- virtual expression ∗ simplify ()

simplify expression (useful for derivatives)
- virtual int Linearity ()

  get a measure of "how linear" the expression is (see CouenneTypes.h)
- virtual bool isDefinedInteger ()

  is this expression defined as an integer?
- virtual bool isInteger ()

  is this expression integer?
- virtual void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &, CouNumber &)

  Get lower and upper bound of an expression (if any) – real values.
- virtual exprAux ∗ standardize (CouenneProblem ∗p, bool addAux=true)

  Create standard form of this expression, by:
- virtual void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗chg=N-ULL, int wind=-1, CouNumber lb=-COUENNE_INFINITY, CouNumber ub=COUENNE_INFINITY)

  generate convexification cut for constraint w = this
- virtual enum expr_type code ()

  return integer for comparing expressions (used to recognize common expression)
- virtual enum convexity convexity () const

  either CONVEX, CONCAVE, AFFINE, or NONCONVEX
- virtual int compare (expression &)

  compare expressions
- virtual int compare (exprCopy &)

  compare copies of expressions
- virtual int rank ()

  used in rank-based branching variable choice: original variables have rank 1; auxiliary w=f(x) has rank r(w) = r(x)+1; finally, auxiliary w=f(x1,x2...,xk) has rank r(w) = 1+max{r(xi):i=1..k}.
- virtual bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX-_EQ)

  does a backward implied bound processing on every expression, including exprSums although already done by Clp (useful when repeated within Couenne).
- virtual int Multiplicity ()

  multiplicity of a variable
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  set up branching object by evaluating many branching points for each expression's arguments.
- virtual void replace (exprVar ∗, exprVar ∗)

  replace expression with another
- virtual void fillDepSet (std::set< DepNode ∗, compNode > ∗, DepGraph ∗)

  update dependence set with index of variables on which this expression depends
- virtual void linkDomain (Domain ∗d)

  empty function to update domain pointer
- virtual void realign (const CouenneProblem ∗p)

  empty function to redirect variables to proper variable vector
- virtual bool isBijective () const

  indicating if function is monotonically increasing
- virtual CouNumber inverse (expression ∗vardep) const

  compute the inverse function

- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

    closest feasible points in function in both directions
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

    can this expression be further linearized or are we on its concave ("bad") side
- virtual bool isaCopy () const

    return true if this is a copy of something (i.e. an exprCopy)
- virtual expression ∗ Copy () const

    return copy of this expression (only makes sense in exprCopy)

7.67.1 Detailed Description

Expression base class.

An empty expression class with no type or operator() from which all other expression classes (for constants, variables, and operators) are derived.

Definition at line 48 of file CouenneExpression.hpp.

7.67.2 Member Enumeration Documentation

7.67.2.1 enum Couenne::expression::auxSign

"sign" of the constraint defining an auxiliary.

If the auxiliary is defined as $w \leq f(x)$, then it is LEQ. It is EQ and GEQ, respectively, if it is defined with $=$ and $\geq$.

Enumerator:

AUX_UNDEF

AUX_LEQ

AUX_EQ

AUX_GEQ

Definition at line 55 of file CouenneExpression.hpp.

7.67.3 Constructor & Destructor Documentation

7.67.3.1 Couenne::expression::expression ( ) [inline]

Constructor.

Definition at line 58 of file CouenneExpression.hpp.

7.67.3.2 Couenne::expression::expression (const expression & *e*, Domain ∗ *d* = NULL) [inline]

Copy constructor.

Pass pointer to variable vector when generating new problem, whose set of variables is equivalent but may be changed or whose value is independent.

Definition at line 63 of file CouenneExpression.hpp.

7.67.3.3 virtual Couenne::expression::∼expression ( ) [inline], [virtual]

Destructor.

Definition at line 66 of file CouenneExpression.hpp.

7.67.4 Member Function Documentation

7.67.4.1 virtual expression∗ Couenne::expression::clone (Domain ∗ d = NULL) const [inline], [virtual]

Cloning method.

Reimplemented in Couenne::exprUpperBound, Couenne::exprUBMul, Couenne::exprQuad, Couenne::exprUBDiv, Couenne::exprUBCos, Couenne::exprUBSin, Couenne::exprAux, Couenne::exprUBQuad, Couenne::exprVar, Couenne::exprCopy, Couenne::exprGroup, Couenne::exprSin, Couenne::exprLowerBound, Couenne::exprStore, Couenne::exprConst, Couenne::exprLBMul, Couenne::exprPow, Couenne::exprLBDiv, Couenne::exprMin, Couenne::exprInv, Couenne::exprLBQuad, Couenne::exprLBCos, Couenne::exprLBSin, Couenne::exprClone, Couenne::exprIVar, Couenne::exprMax, Couenne::exprDiv, Couenne::exprOpp, Couenne::exprSum, Couenne::exprAbs, Couenne::exprOddPow, Couenne::exprSub, Couenne::exprExp, Couenne::exprLog, Couenne::exprCeil, Couenne::exprCos, and Couenne::exprFloor.

Definition at line 69 of file CouenneExpression.hpp.

7.67.4.2 virtual int Couenne::expression::Index ( ) const [inline], [virtual]

Return index of variable (only valid for exprVar and exprAux)

Reimplemented in Couenne::exprCopy, and Couenne::exprVar.

Definition at line 73 of file CouenneExpression.hpp.

7.67.4.3 virtual int Couenne::expression::nArgs ( ) const [inline], [virtual]

return number of arguments (when applicable, that is, with N-ary functions)

Reimplemented in Couenne::exprCopy, Couenne::exprOp, and Couenne::exprUnary.

Definition at line 77 of file CouenneExpression.hpp.

7.67.4.4 virtual expression∗∗ Couenne::expression::ArgList ( ) const [inline], [virtual]

return arglist (when applicable, that is, with N-ary functions)

Reimplemented in Couenne::exprCopy, and Couenne::exprOp.

Definition at line 81 of file CouenneExpression.hpp.

7.67.4.5 virtual void Couenne::expression::ArgList (expression ∗∗ al) [inline], [virtual]

set arglist (used in deleting nodes without deleting children)

Reimplemented in Couenne::exprCopy, and Couenne::exprOp.

Definition at line 85 of file CouenneExpression.hpp.

7.67.4.6 virtual expression∗ Couenne::expression::Argument ( ) const [inline], [virtual]

return argument (when applicable, i.e., with univariate functions)

Reimplemented in Couenne::exprCopy, and Couenne::exprUnary.

Definition at line 88 of file CouenneExpression.hpp.

7.67.4.7 virtual expression** Couenne::expression::ArgPtr ( ) [inline], [virtual]

return pointer to argument (when applicable, i.e., with univariate functions)

Reimplemented in Couenne::exprCopy, and Couenne::exprUnary.

Definition at line 92 of file CouenneExpression.hpp.

7.67.4.8 virtual enum nodeType Couenne::expression::Type ( ) const [inline], [virtual]

node type

Reimplemented in Couenne::exprUpperBound, Couenne::exprAux, Couenne::exprVar, Couenne::exprLowerBound, Couenne::exprUnary, Couenne::exprOp, Couenne::exprCopy, and Couenne::exprConst.

Definition at line 96 of file CouenneExpression.hpp.

7.67.4.9 virtual expression* Couenne::expression::Image ( ) const [inline], [virtual]

return pointer to corresponding expression (for auxiliary variables only)

Reimplemented in Couenne::exprAux, and Couenne::exprCopy.

Definition at line 100 of file CouenneExpression.hpp.

7.67.4.10 virtual void Couenne::expression::Image (expression * *image*) [inline], [virtual]

set expression associated with this auxiliary variable (for compatibility with exprAux)

Reimplemented in Couenne::exprAux.

Definition at line 105 of file CouenneExpression.hpp.

7.67.4.11 virtual CouNumber Couenne::expression::Value ( ) const [inline], [virtual]

value (empty)

Reimplemented in Couenne::exprCopy, Couenne::exprClone, and Couenne::exprConst.

Definition at line 108 of file CouenneExpression.hpp.

7.67.4.12 virtual const expression* Couenne::expression::Original ( ) const [inline], [virtual]

If this is an exprClone of a exprClone of an expr???, point to the original expr??? instead of an exprClone – improve computing efficiency.

Only overloaded for exprClones/exprCopy, of course.

Reimplemented in Couenne::exprCopy.

Definition at line 114 of file CouenneExpression.hpp.

7.67.4.13 virtual void Couenne::expression::print (std::ostream & *s* = std::cout, bool = false) const [inline], [virtual]

print expression to iostream

descend into auxiliaries' image?

Reimplemented in Couenne::exprUpperBound, Couenne::exprCopy, Couenne::exprQuad, Couenne::exprAux, Couenne::exprUBQuad, Couenne::exprVar, Couenne::exprOp, Couenne::exprUnary, Couenne::exprGroup, Couenne::exprLowerBound, Couenne::exprClone, Couenne::exprConst, Couenne::exprLBQuad, Couenne::exprInv, Couenne::exprStore, Couenne::exprOpp, and Couenne::exprIVar.

Definition at line 118 of file CouenneExpression.hpp.

7.67.4.14 virtual CouNumber Couenne::expression::operator() ( ) [pure virtual]

null function for evaluating the expression

Implemented in Couenne::exprCopy, Couenne::exprUpperBound, Couenne::exprAux, Couenne::exprQuad, Couenne::exprUBMul, Couenne::exprUBDiv, Couenne::exprUBCos, Couenne::exprUBSin, Couenne::exprVar, Couenne::exprUBQuad, Couenne::exprUnary, Couenne::exprGroup, Couenne::exprLowerBound, Couenne::exprClone, Couenne::exprConst, Couenne::exprStore, Couenne::exprMin, Couenne::exprPow, Couenne::exprLBMul, Couenne::exprLBDiv, Couenne::exprMax, Couenne::exprLBQuad, Couenne::exprDiv, Couenne::exprLBCos, Couenne::exprLBSin, Couenne::exprSum, Couenne::exprOddPow, and Couenne::exprSub.

7.67.4.15 virtual CouNumber Couenne::expression::gradientNorm (const double * *x*) [inline], [virtual]

return l-2 norm of gradient at given point

Reimplemented in Couenne::exprCopy, Couenne::exprQuad, Couenne::exprVar, Couenne::exprGroup, Couenne::exprSin, Couenne::exprPow, Couenne::exprInv, Couenne::exprOpp, Couenne::exprDiv, Couenne::exprAbs, Couenne::exprExp, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, and Couenne::exprLog.

Definition at line 126 of file CouenneExpression.hpp.

7.67.4.16 virtual expression* Couenne::expression::differentiate (int) [virtual]

differentiation

Reimplemented in Couenne::exprCopy, Couenne::exprUpperBound, Couenne::exprQuad, Couenne::exprVar, Couenne::exprGroup, Couenne::exprSin, Couenne::exprLowerBound, Couenne::exprConst, Couenne::exprPow, Couenne::exprMin, Couenne::exprInv, Couenne::exprMax, Couenne::exprOpp, Couenne::exprDiv, Couenne::exprAbs, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, Couenne::exprSum, Couenne::exprExp, Couenne::exprSub, and Couenne::exprLog.

7.67.4.17 virtual int Couenne::expression::dependsOn (int * *ind*, int *n*, enum dig_type *type* = STOP_AT_AUX) [virtual]

dependence on variable set: return cardinality of subset of the set of indices in first argument which occur in expression.

Reimplemented in Couenne::exprUpperBound, Couenne::exprLowerBound, and Couenne::exprConst.

7.67.4.18 int Couenne::expression::dependsOn (int *singleton*, enum dig_type *type* = STOP_AT_AUX) [inline]

version with one index only

Definition at line 137 of file CouenneExpression.hpp.

7.67.4.19 virtual int Couenne::expression::DepList (std::set< int > & *deplist*, enum dig_type *type* = ORIG_ONLY) [inline], [virtual]

fill std::set with indices of variables on which this expression depends.

Also deal with expressions that have no variable pointers (exprGroup, exprQuad)

Reimplemented in Couenne::exprQuad, Couenne::exprCopy, Couenne::exprAux, Couenne::exprVar, Couenne::exprOp, Couenne::exprUnary, and Couenne::exprGroup.

Definition at line 143 of file CouenneExpression.hpp.

7.67.4.20 virtual expression* Couenne::expression::simplify ( ) [inline], [virtual]

simplify expression (useful for derivatives)

Reimplemented in Couenne::exprCopy, Couenne::exprVar, Couenne::exprAux, Couenne::exprQuad, Couenne::exprOp, Couenne::exprUnary, Couenne::exprGroup, Couenne::exprMin, Couenne::exprPow, Couenne::exprMax, Couenne::exprOpp, Couenne::exprDiv, Couenne::exprSum, and Couenne::exprSub.

Definition at line 148 of file CouenneExpression.hpp.

7.67.4.21 virtual int Couenne::expression::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented in Couenne::exprCopy, Couenne::exprUpperBound, Couenne::exprVar, Couenne::exprAux, Couenne::exprQuad, Couenne::exprOp, Couenne::exprUnary, Couenne::exprGroup, Couenne::exprLowerBound, Couenne::exprConst, Couenne::exprMin, Couenne::exprPow, Couenne::exprMax, Couenne::exprInv, Couenne::exprOpp, Couenne::exprDiv, Couenne::exprSum, and Couenne::exprSub.

Definition at line 152 of file CouenneExpression.hpp.

7.67.4.22 virtual bool Couenne::expression::isDefinedInteger ( ) [inline], [virtual]

is this expression defined as an integer?

Reimplemented in Couenne::exprCopy, Couenne::exprAux, Couenne::exprVar, and Couenne::exprIVar.

Definition at line 156 of file CouenneExpression.hpp.

7.67.4.23 virtual bool Couenne::expression::isInteger ( ) [inline], [virtual]

is this expression integer?

Reimplemented in Couenne::exprQuad, Couenne::exprAux, Couenne::exprCopy, Couenne::exprVar, Couenne::exprOp, Couenne::exprGroup, Couenne::exprUnary, Couenne::exprConst, Couenne::exprDiv, Couenne::exprOpp, Couenne::exprPow, Couenne::exprAbs, and Couenne::exprIVar.

Definition at line 160 of file CouenneExpression.hpp.

7.67.4.24 virtual void Couenne::expression::getBounds (expression *&, expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented in Couenne::exprCopy, Couenne::exprVar, Couenne::exprQuad, Couenne::exprGroup, Couenne::exprSin, Couenne::exprConst, Couenne::exprPow, Couenne::exprMin, Couenne::exprInv, Couenne::exprDiv, Couenne::exprMax, Couenne::exprOpp, Couenne::exprSub, Couenne::exprSum, Couenne::exprAbs, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, Couenne::exprExp, Couenne::exprLog, and Couenne::exprOddPow.

7.67.4.25 virtual void Couenne::expression::getBounds (CouNumber &, CouNumber &) [virtual]

Get lower and upper bound of an expression (if any) – real values.

Reimplemented in Couenne::exprCopy, Couenne::exprVar, Couenne::exprQuad, Couenne::exprGroup, Couenne::exprConst, Couenne::exprSin, Couenne::exprPow, Couenne::exprInv, Couenne::exprDiv, Couenne::exprOpp, Couenne::exprSub, Couenne::exprSum, Couenne::exprAbs, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, Couenne::exprExp, Couenne::exprLog, and Couenne::exprOddPow.

7.67.4.26 virtual exprAux* Couenne::expression::standardize (CouenneProblem * *p*, bool *addAux* = true) [inline], [virtual]

Create standard form of this expression, by:

- creating auxiliary w variables and corresponding expressions
- returning linear counterpart as new constraint (to replace current one)

For the base exprOp class we only do the first part (for argument list components only), and the calling class (Sum, Sub, Mul, Pow, and the like) will do the part for its own object

addAux is true if a new auxiliary variable should be added associated with the standardized expression

Reimplemented in Couenne::exprCopy, Couenne::exprOp, Couenne::exprUnary, Couenne::exprOpp, Couenne::exprPow, Couenne::exprMin, Couenne::exprDiv, Couenne::exprMax, Couenne::exprSub, Couenne::exprSum, and Couenne::exprOddPow.

Definition at line 181 of file CouenneExpression.hpp.

7.67.4.27 virtual void Couenne::expression::generateCuts (**expression** ∗ *w*, **OsiCuts** & *cs*, const **CouenneCutGenerator** ∗ *cg*, **t_chg_bounds** ∗ *chg* = NULL, int *wind* = -1, **CouNumber** *lb* = -**COUENNE_INFINITY**, **CouNumber** *ub* = **COUENNE_INFINITY**) [inline], [virtual]

generate convexification cut for constraint w = this

Reimplemented in Couenne::exprCopy, Couenne::exprVar, Couenne::exprQuad, Couenne::exprGroup, Couenne::exprConst, Couenne::exprPow, Couenne::exprSin, Couenne::exprMin, Couenne::exprDiv, Couenne::exprMax, Couenne::exprInv, Couenne::exprSub, Couenne::exprOpp, Couenne::exprSum, Couenne::exprAbs, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, Couenne::exprOddPow, Couenne::exprExp, and Couenne::exprLog.

Definition at line 185 of file CouenneExpression.hpp.

7.67.4.28 virtual enum **expr_type** Couenne::expression::code ( ) [inline], [virtual]

return integer for comparing expressions (used to recognize common expression)

Reimplemented in Couenne::exprQuad, Couenne::exprCopy, Couenne::exprVar, Couenne::exprUpperBound, Couenne::exprOp, Couenne::exprGroup, Couenne::exprUnary, Couenne::exprPow, Couenne::exprConst, Couenne::exprSin, Couenne::exprMin, Couenne::exprDiv, Couenne::exprLowerBound, Couenne::exprMax, Couenne::exprInv, Couenne::exprSub, Couenne::exprOpp, Couenne::exprSum, Couenne::exprOddPow, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, Couenne::exprAbs, Couenne::exprExp, and Couenne::exprLog.

Definition at line 193 of file CouenneExpression.hpp.

7.67.4.29 virtual enum **convexity** Couenne::expression::convexity ( ) const [inline], [virtual]

either CONVEX, CONCAVE, AFFINE, or NONCONVEX

Reimplemented in Couenne::exprVar, and Couenne::exprCopy.

Definition at line 197 of file CouenneExpression.hpp.

7.67.4.30 virtual int Couenne::expression::compare (**expression** &) [virtual]

compare expressions

Reimplemented in Couenne::exprCopy.

7.67.4.31 virtual int Couenne::expression::compare (**exprCopy** &) [virtual]

compare copies of expressions

7.67.4.32 virtual int Couenne::expression::rank ( ) [inline], [virtual]

used in rank-based branching variable choice: original variables have rank 1; auxiliary w=f(x) has rank r(w) = r(x)+1; finally, auxiliary w=f(x1,x2...,xk) has rank r(w) = 1+max{r(xi):i=1..k}.

Reimplemented in Couenne::exprQuad, Couenne::exprCopy, Couenne::exprVar, Couenne::exprAux, Couenne::exprOp, Couenne::exprUnary, Couenne::exprGroup, and Couenne::exprConst.

Definition at line 209 of file CouenneExpression.hpp.

7.67.4.33 virtual bool Couenne::expression::impliedBound (int, CouNumber *, CouNumber *, t_chg_bounds *, enum *auxSign* = expression::AUX_EQ) [inline], [virtual]

does a backward implied bound processing on every expression, including exprSums although already done by Clp (useful when repeated within Couenne).

Parameters are the index of the (auxiliary) variable in question and the current lower/upper bound. The method returns true if there has been a change on any bound on the variables on which the expression depends.

Reimplemented in Couenne::exprQuad, Couenne::exprVar, Couenne::exprPow, Couenne::exprSum, Couenne::exprSin, Couenne::exprDiv, Couenne::exprOpp, Couenne::exprInv, Couenne::exprSub, Couenne::exprOddPow, Couenne::exprAbs, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, Couenne::exprExp, and Couenne::exprLog.

Definition at line 218 of file CouenneExpression.hpp.

7.67.4.34 virtual int Couenne::expression::Multiplicity ( ) [inline], [virtual]

multiplicity of a variable

Reimplemented in Couenne::exprCopy, and Couenne::exprAux.

Definition at line 222 of file CouenneExpression.hpp.

7.67.4.35 virtual CouNumber Couenne::expression::selectBranch (const CouenneObject * *obj*, const OsiBranchingInformation * *info*, expression *& *var*, double *& *brpts*, double *& *brDist*, int & *way*) [inline], [virtual]

set up branching object by evaluating many branching points for each expression's arguments.

Return estimated improvement in objective function

Reimplemented in Couenne::exprQuad, Couenne::exprCopy, Couenne::exprSin, Couenne::exprPow, Couenne::exprDiv, Couenne::exprInv, Couenne::exprCos, Couenne::exprCeil, Couenne::exprFloor, Couenne::exprOddPow, Couenne::exprAbs, Couenne::exprExp, and Couenne::exprLog.

Definition at line 228 of file CouenneExpression.hpp.

7.67.4.36 virtual void Couenne::expression::replace (exprVar *, exprVar *) [inline], [virtual]

replace expression with another

Reimplemented in Couenne::exprQuad, Couenne::exprCopy, Couenne::exprOp, Couenne::exprUnary, and Couenne::exprGroup.

Definition at line 238 of file CouenneExpression.hpp.

7.67.4.37 virtual void Couenne::expression::fillDepSet (std::set< DepNode *, compNode > *, DepGraph *) [inline], [virtual]

update dependence set with index of variables on which this expression depends

Reimplemented in Couenne::exprQuad, Couenne::exprCopy, Couenne::exprVar, Couenne::exprOp, Couenne::exprUnary, and Couenne::exprGroup.

Definition at line 242 of file CouenneExpression.hpp.

7.67.4.38 virtual void Couenne::expression::linkDomain (Domain * *d*) [inline], [virtual]

empty function to update domain pointer

Reimplemented in Couenne::exprVar, and Couenne::exprAux.

Definition at line 245 of file CouenneExpression.hpp.

7.67.4.39 virtual void Couenne::expression::realign (const CouenneProblem * p) [inline], [virtual]

empty function to redirect variables to proper variable vector

Reimplemented in Couenne::exprQuad, Couenne::exprCopy, Couenne::exprOp, Couenne::exprUnary, and Couenne::exprGroup.

Definition at line 248 of file CouenneExpression.hpp.

7.67.4.40 virtual bool Couenne::expression::isBijective ( ) const [inline], [virtual]

indicating if function is monotonically increasing

Reimplemented in Couenne::exprCopy, Couenne::exprInv, Couenne::exprExp, and Couenne::exprLog.

Definition at line 251 of file CouenneExpression.hpp.

7.67.4.41 virtual CouNumber Couenne::expression::inverse (expression * vardep) const [inline], [virtual]

compute the inverse function

Reimplemented in Couenne::exprCopy, Couenne::exprInv, Couenne::exprExp, and Couenne::exprLog.

Definition at line 255 of file CouenneExpression.hpp.

7.67.4.42 virtual void Couenne::expression::closestFeasible (expression * varind, expression * vardep, CouNumber & left, CouNumber & right) const [virtual]

closest feasible points in function in both directions

Reimplemented in Couenne::exprQuad, Couenne::exprCopy, Couenne::exprSin, Couenne::exprPow, Couenne::exprDiv, Couenne::exprCos, Couenne::exprCeil, Couenne::exprFloor, and Couenne::exprAbs.

7.67.4.43 virtual bool Couenne::expression::isCuttable (CouenneProblem * problem, int index) const [inline], [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented in Couenne::exprQuad, Couenne::exprCopy, Couenne::exprSin, Couenne::exprPow, Couenne::exprDiv, Couenne::exprInv, Couenne::exprCos, Couenne::exprCeil, Couenne::exprFloor, Couenne::exprAbs, Couenne::exprExp, Couenne::exprLog, and Couenne::exprOddPow.

Definition at line 264 of file CouenneExpression.hpp.

7.67.4.44 virtual bool Couenne::expression::isaCopy ( ) const [inline], [virtual]

return true if this is a copy of something (i.e. an exprCopy)

Reimplemented in Couenne::exprCopy.

Definition at line 268 of file CouenneExpression.hpp.

7.67.4.45 virtual expression* Couenne::expression::Copy ( ) const [inline], [virtual]

return copy of this expression (only makes sense in exprCopy)

Reimplemented in Couenne::exprCopy.

Definition at line 272 of file CouenneExpression.hpp.

The documentation for this class was generated from the following file:

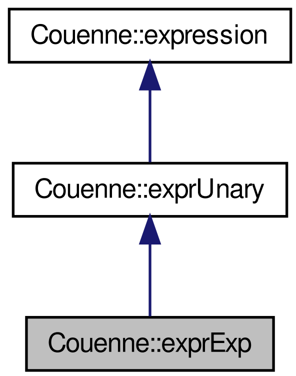
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExpression.hpp

7.68 Couenne::exprExp Class Reference

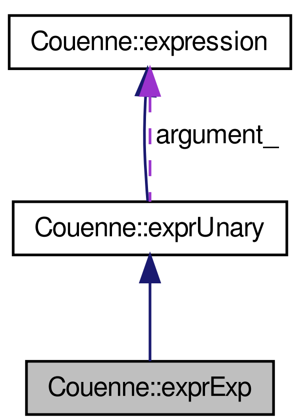
class for the exponential, $e^{f(x)}$

`#include <CouenneExprExp.hpp>`

Inheritance diagram for Couenne::exprExp:



Collaboration diagram for Couenne::exprExp:



Public Member Functions

- exprExp (expression ∗al)
  Constructor.
- expression ∗ clone (Domain ∗d=NULL) const
  Cloning method.
- unary_function F ()
  The operator's function.
- std::string printOp () const
  Print operator.
- CouNumber gradientNorm (const double ∗x)
  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)
  Differentiation.
- void getBounds (expression ∗&, expression ∗&)
  Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &lb, CouNumber &ub)
  Get expression of lower and upper bound of an expression (if any)
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)
  Generate convexification cuts for this expression.
- virtual enum expr_type code ()
  Code for comparisons.
- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX_EQ)
  Implied bound processing.
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)
  Set up branching object by evaluating many branching points for each expression's arguments.
- virtual bool isBijective () const
  return true if bijective
- virtual CouNumber inverse (expression ∗vardep) const
  inverse of exponential
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const
  can this expression be further linearized or are we on its concave ("bad") side

Additional Inherited Members

7.68.1 Detailed Description

class for the exponential, $e^{f(x)}$

Definition at line 22 of file CouenneExprExp.hpp.

7.68.2 Constructor & Destructor Documentation

7.68.2.1 Couenne::exprExp::exprExp (expression ∗ *al*) [inline]

Constructor.

Definition at line 27 of file CouenneExprExp.hpp.

7.68.3 Member Function Documentation

7.68.3.1 expression* Couenne::exprExp::clone (Domain * d = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::expression.

Definition at line 31 of file CouenneExprExp.hpp.

7.68.3.2 unary_function Couenne::exprExp::F ( ) [inline], [virtual]

The operator's function.

Reimplemented from Couenne::exprUnary.

Definition at line 35 of file CouenneExprExp.hpp.

7.68.3.3 std::string Couenne::exprExp::printOp ( ) const [inline], [virtual]

Print operator.

Reimplemented from Couenne::exprUnary.

Definition at line 38 of file CouenneExprExp.hpp.

7.68.3.4 CouNumber Couenne::exprExp::gradientNorm (const double * x) [inline], [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

Definition at line 42 of file CouenneExprExp.hpp.

7.68.3.5 expression* Couenne::exprExp::differentiate (int index) [virtual]

Differentiation.

Reimplemented from Couenne::expression.

7.68.3.6 void Couenne::exprExp::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.68.3.7 virtual void Couenne::exprExp::getBounds (CouNumber & lb, CouNumber & ub) [virtual]

Get expression of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.68.3.8 void Couenne::exprExp::generateCuts (expression * w, OsiCuts & cs, const CouenneCutGenerator * cg, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

Generate convexification cuts for this expression.

Reimplemented from Couenne::expression.

7.68.3.9 virtual enum expr_type Couenne::exprExp::code ( ) [inline], [virtual]

Code for comparisons.

Reimplemented from Couenne::exprUnary.

Definition at line 62 of file CouenneExprExp.hpp.

7.68.3.10 bool Couenne::exprExp::impliedBound (int , CouNumber ∗ , CouNumber ∗ , t_chg_bounds ∗ , enum *auxSign* = expression::AUX_EQ) [virtual]

Implied bound processing.

Reimplemented from Couenne::expression.

7.68.3.11 virtual CouNumber Couenne::exprExp::selectBranch (const CouenneObject ∗ *obj*, const OsiBranchingInformation ∗ *info*, expression ∗& *var*, double ∗& *brpts*, double ∗& *brDist*, int & *way*) [virtual]

Set up branching object by evaluating many branching points for each expression's arguments.

Reimplemented from Couenne::expression.

7.68.3.12 virtual bool Couenne::exprExp::isBijective ( ) const [inline], [virtual]

return true if bijective

Reimplemented from Couenne::expression.

Definition at line 78 of file CouenneExprExp.hpp.

7.68.3.13 virtual CouNumber Couenne::exprExp::inverse (expression ∗ *vardep*) const [inline], [virtual]

inverse of exponential

Reimplemented from Couenne::expression.

Definition at line 81 of file CouenneExprExp.hpp.

7.68.3.14 virtual bool Couenne::exprExp::isCuttable (CouenneProblem ∗ *problem*, int *index*) const [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

The documentation for this class was generated from the following file:

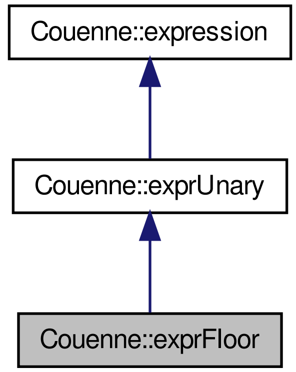
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprExp.hpp

7.69 Couenne::exprFloor Class Reference

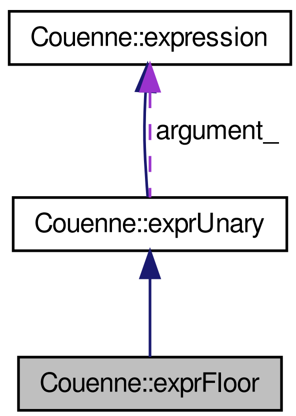
class floor, $\lfloor f(x) \rfloor$

```
#include <CouenneExprFloor.hpp>
```

Inheritance diagram for Couenne::exprFloor:



Collaboration diagram for Couenne::exprFloor:



Public Member Functions

- exprFloor (expression ∗arg)

    constructor, destructor
- expression ∗ clone (Domain ∗d=NULL) const

    cloning method
- unary_function F ()

the operator itself (e.g. sin, log...)
- std::string printOp () const

  print operator
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)

  obtain derivative of expression
- void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression.
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate equality between ∗this and ∗w
- virtual enum expr_type code ()

  code for comparisons
- bool impliedBound (int index, CouNumber ∗l, CouNumber ∗u, t_chg_bounds ∗chg, enum auxSign=expression::AUX_EQ)

  implied bound processing
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  Set up branching object by evaluating many branching points for each expression's arguments.
- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

  closest feasible points in function in both directions
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side?

Additional Inherited Members

7.69.1 Detailed Description

class floor, $\lfloor f(x) \rfloor$

Definition at line 20 of file CouenneExprFloor.hpp.

7.69.2 Constructor & Destructor Documentation

7.69.2.1 Couenne::exprFloor::exprFloor (expression ∗ *arg*) [inline]

constructor, destructor

Definition at line 25 of file CouenneExprFloor.hpp.

7.69.3 Member Function Documentation

7.69.3.1 expression∗ Couenne::exprFloor::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 29 of file CouenneExprFloor.hpp.

7.69.3.2 unary_function Couenne::exprFloor::F ( ) [inline], [virtual]

the operator itself (e.g. sin, log...)

Reimplemented from Couenne::exprUnary.

Definition at line 33 of file CouenneExprFloor.hpp.

7.69.3.3 std::string Couenne::exprFloor::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprUnary.

Definition at line 37 of file CouenneExprFloor.hpp.

7.69.3.4 CouNumber Couenne::exprFloor::gradientNorm (const double * *x*) [inline], [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

Definition at line 41 of file CouenneExprFloor.hpp.

7.69.3.5 expression* Couenne::exprFloor::differentiate (int *index*) [virtual]

obtain derivative of expression

Reimplemented from Couenne::expression.

7.69.3.6 void Couenne::exprFloor::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.69.3.7 void Couenne::exprFloor::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression.

Reimplemented from Couenne::expression.

7.69.3.8 void Couenne::exprFloor::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between *this and *w

Reimplemented from Couenne::expression.

7.69.3.9 virtual enum expr_type Couenne::exprFloor::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprUnary.

Definition at line 63 of file CouenneExprFloor.hpp.

7.69.3.10 bool Couenne::exprFloor::impliedBound (int *index,* CouNumber ∗ *l,* CouNumber ∗ *u,* t_chg_bounds ∗ *chg,* enum *auxSign =* expression::AUX_EQ) [inline], [virtual]

implied bound processing

Reimplemented from Couenne::expression.

Definition at line 67 of file CouenneExprFloor.hpp.

7.69.3.11 virtual CouNumber Couenne::exprFloor::selectBranch (const CouenneObject ∗ *obj,* const OsiBranchingInformation ∗ *info,* expression ∗& *var,* double ∗& *brpts,* double ∗& *brDist,* int & *way*) [inline], [virtual]

Set up branching object by evaluating many branching points for each expression's arguments.

Reimplemented from Couenne::expression.

Definition at line 75 of file CouenneExprFloor.hpp.

7.69.3.12 virtual void Couenne::exprFloor::closestFeasible (expression ∗ *varind,* expression ∗ *vardep,* CouNumber & *left,* CouNumber & *right*) const [virtual]

closest feasible points in function in both directions

Reimplemented from Couenne::expression.

7.69.3.13 virtual bool Couenne::exprFloor::isCuttable (CouenneProblem ∗ *problem,* int *index*) const [inline], [virtual]

can this expression be further linearized or are we on its concave ("bad") side?

Reimplemented from Couenne::expression.

Definition at line 90 of file CouenneExprFloor.hpp.

The documentation for this class was generated from the following file:

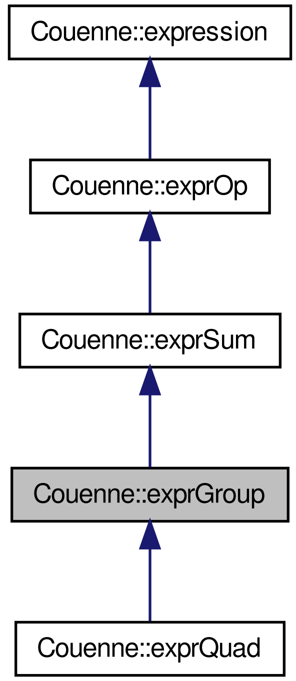
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprFloor.hpp

7.70 Couenne::exprGroup Class Reference

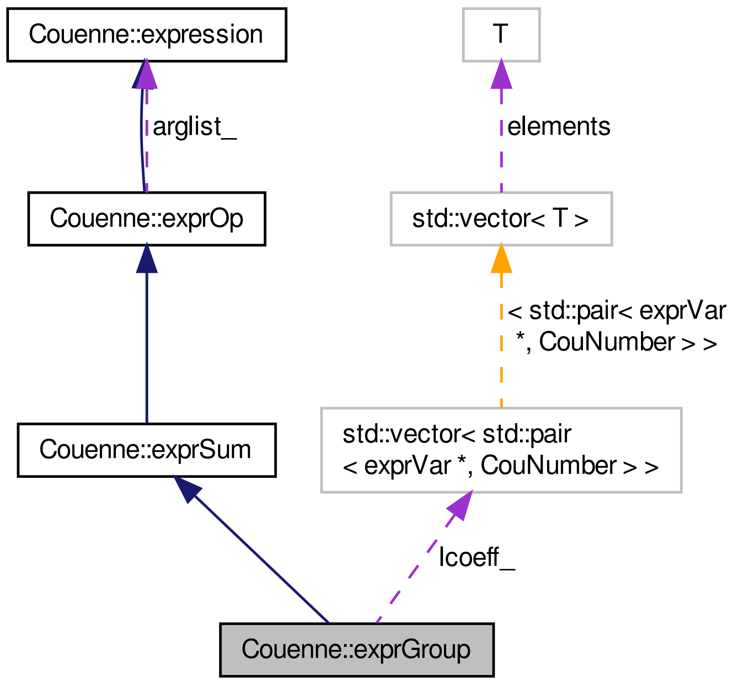
class Group, with constant, linear and nonlinear terms: $a_0 + \sum_{i=1}^{n} a_i x_i$

```
#include <CouenneExprGroup.hpp>
```

Inheritance diagram for Couenne::exprGroup:



Collaboration diagram for Couenne::exprGroup:



Public Types

- typedef std::vector< std::pair
  < exprVar ∗, CouNumber > > lincoeff

Public Member Functions

- exprGroup (CouNumber, lincoeff &, expression ∗∗=NULL, int=0)

  Constructor.
- exprGroup (const exprGroup &src, Domain ∗d=NULL)

  Copy constructor.
- virtual ∼exprGroup ()

  Destructor – needed to clear bounds.
- virtual expression ∗ clone (Domain ∗d=NULL) const

  Cloning method.
- CouNumber getc0 ()

  return constant term
- lincoeff & lcoeff () const

  return linear term coefficients

- virtual void print (std::ostream &=std::cout, bool=false) const
  Print expression to iostream.
- virtual CouNumber operator() ()
  function for the evaluation of the expression
- virtual CouNumber gradientNorm (const double ∗x)
  return l-2 norm of gradient at given point
- virtual int DepList (std::set< int > &deplist, enum dig_type type=ORIG_ONLY)
  fill in the set with all indices of variables appearing in the expression
- virtual expression ∗ differentiate (int index)
  differentiation
- virtual expression ∗ simplify ()
  simplification
- virtual int Linearity ()
  get a measure of "how linear" the expression is:
- virtual void getBounds (expression ∗&, expression ∗&)
  Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &, CouNumber &)
  Get lower and upper bound of an expression (if any)
- virtual void generateCuts (expression ∗, OsiCuts &, const CouenneCutGenerator ∗, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)
  special version for linear constraints
- virtual int compare (exprGroup &)
  only compare with people of the same kind
- virtual enum expr_type code ()
  code for comparisons
- virtual bool isInteger ()
  is this expression integer?
- virtual int rank ()
  used in rank-based branching variable choice
- virtual void fillDepSet (std::set< DepNode ∗, compNode > ∗, DepGraph ∗)
  update dependence set with index of this variable
- virtual void replace (exprVar ∗x, exprVar ∗w)
  replace variable x with new (aux) w
- virtual void realign (const CouenneProblem ∗p)
  redirect variables to proper variable vector

Static Public Member Functions

- static expression ∗ genExprGroup (CouNumber, lincoeff &, expression ∗∗=NULL, int=0)
  Generalized (static) constructor: check parameters and return a constant, a single variable, or a real exprGroup.

Protected Attributes

- lincoeff lcoeff_
  coefficients and indices of the linear term
- CouNumber c0_
  constant term

Additional Inherited Members

7.70.1 Detailed Description

class Group, with constant, linear and nonlinear terms: $a_0 + \sum_{i=1}^{n} a_i x_i$

Definition at line 25 of file CouenneExprGroup.hpp.

7.70.2 Member Typedef Documentation

7.70.2.1 typedef std::vector<std::pair <exprVar *, CouNumber> > Couenne::exprGroup::lincoeff

Definition at line 29 of file CouenneExprGroup.hpp.

7.70.3 Constructor & Destructor Documentation

7.70.3.1 Couenne::exprGroup::exprGroup (CouNumber , lincoeff & , expression ** = NULL, int = 0)

Constructor.

7.70.3.2 Couenne::exprGroup::exprGroup (const exprGroup & *src*, Domain * *d* = NULL)

Copy constructor.

7.70.3.3 virtual Couenne::exprGroup::∼exprGroup ( ) [virtual]

Destructor – needed to clear bounds.

7.70.4 Member Function Documentation

7.70.4.1 static expression* Couenne::exprGroup::genExprGroup (CouNumber , lincoeff & , expression ** = NULL, int = 0) [static]

Generalized (static) constructor: check parameters and return a constant, a single variable, or a real exprGroup.

7.70.4.2 virtual expression* Couenne::exprGroup::clone (Domain * *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::exprSum.

Reimplemented in Couenne::exprQuad.

Definition at line 58 of file CouenneExprGroup.hpp.

7.70.4.3 CouNumber Couenne::exprGroup::getc0 ( ) [inline]

return constant term

Definition at line 62 of file CouenneExprGroup.hpp.

7.70.4.4 lincoeff& Couenne::exprGroup::lcoeff ( ) const [inline]

return linear term coefficients

Definition at line 63 of file CouenneExprGroup.hpp.

7.70.4.5 virtual void Couenne::exprGroup::print (std::ostream & = std::cout, bool = false) const [virtual]

Print expression to iostream.

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad.

7.70.4.6 CouNumber Couenne::exprGroup::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute sum of linear and nonlinear terms

Reimplemented from Couenne::exprSum.

Reimplemented in Couenne::exprQuad.

Definition at line 127 of file CouenneExprGroup.hpp.

7.70.4.7 virtual CouNumber Couenne::exprGroup::gradientNorm (const double * *x*) [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad.

7.70.4.8 virtual int Couenne::exprGroup::DepList (std::set< int > & *deplist*, enum dig_type *type* = ORIG_ONLY) [virtual]

fill in the set with all indices of variables appearing in the expression

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad.

7.70.4.9 virtual expression* Couenne::exprGroup::differentiate (int *index*) [virtual]

differentiation

Reimplemented from Couenne::exprSum.

Reimplemented in Couenne::exprQuad.

7.70.4.10 virtual expression* Couenne::exprGroup::simplify ( ) [virtual]

simplification

Reimplemented from Couenne::exprSum.

Reimplemented in Couenne::exprQuad.

7.70.4.11 virtual int Couenne::exprGroup::Linearity ( ) [virtual]

get a measure of "how linear" the expression is:

Reimplemented from Couenne::exprSum.

Reimplemented in Couenne::exprQuad.

7.70.4.12 virtual void Couenne::exprGroup::getBounds (expression *&, expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::exprSum.

Reimplemented in Couenne::exprQuad.

7.70.4.13 virtual void Couenne::exprGroup::getBounds (CouNumber & , CouNumber &) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::exprSum.

Reimplemented in Couenne::exprQuad.

7.70.4.14 virtual void Couenne::exprGroup::generateCuts (expression * , OsiCuts & , const CouenneCutGenerator * , t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

special version for linear constraints

Reimplemented from Couenne::exprSum.

Reimplemented in Couenne::exprQuad.

7.70.4.15 virtual int Couenne::exprGroup::compare (exprGroup &) [virtual]

only compare with people of the same kind

7.70.4.16 virtual enum expr_type Couenne::exprGroup::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprSum.

Reimplemented in Couenne::exprQuad.

Definition at line 106 of file CouenneExprGroup.hpp.

7.70.4.17 virtual bool Couenne::exprGroup::isInteger ( ) [virtual]

is this expression integer?

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad.

7.70.4.18 virtual int Couenne::exprGroup::rank ( ) [virtual]

used in rank-based branching variable choice

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad.

7.70.4.19 virtual void Couenne::exprGroup::fillDepSet (std::set< DepNode *, compNode > * , DepGraph *) [virtual]

update dependence set with index of this variable

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad.

7.70.4.20 virtual void Couenne::exprGroup::replace (exprVar * x, exprVar * w) [virtual]

replace variable x with new (aux) w

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad.

7.70.4.21 virtual void Couenne::exprGroup::realign (const CouenneProblem * p) [virtual]

redirect variables to proper variable vector

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad.

7.70.5 Member Data Documentation

7.70.5.1 lincoeff Couenne::exprGroup::lcoeff_ [mutable], [protected]

coefficients and indices of the linear term

Definition at line 33 of file CouenneExprGroup.hpp.

7.70.5.2 CouNumber Couenne::exprGroup::c0_ [protected]

constant term

Definition at line 34 of file CouenneExprGroup.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprGroup.hpp

7.71 Couenne::ExprHess Class Reference

expression matrices.

`#include <CouenneExprHess.hpp>`

Public Member Functions

- ExprHess ()
- ExprHess (CouenneProblem *)
- ExprHess (const ExprHess &)
- ExprHess & operator= (const ExprHess &)
- ExprHess * clone ()
- ~ExprHess ()
- int nnz ()
- int * iRow ()
- int * jCol ()
- int * numL ()
- int ** lamI ()
- expression *** expr ()

7.71.1 Detailed Description

expression matrices.

Used to evaluate the Hessian of the Lagrangian function at an optimal solution of the NLP

Definition at line 21 of file CouenneExprHess.hpp.

7.71.2 Constructor & Destructor Documentation

7.71.2.1 Couenne::ExprHess::ExprHess ( )

7.71.2.2 Couenne::ExprHess::ExprHess (CouenneProblem *)

7.71.2.3 Couenne::ExprHess::ExprHess (const ExprHess &)

7.71.2.4 Couenne::ExprHess::~ExprHess ( )

7.71.3 Member Function Documentation

7.71.3.1 ExprHess& Couenne::ExprHess::operator= (const ExprHess &)

7.71.3.2 ExprHess* Couenne::ExprHess::clone ( )

7.71.3.3 int Couenne::ExprHess::nnz ( ) [inline]

Definition at line 63 of file CouenneExprHess.hpp.

7.71.3.4 int* Couenne::ExprHess::iRow ( ) [inline]

Definition at line 64 of file CouenneExprHess.hpp.

7.71.3.5 int* Couenne::ExprHess::jCol ( ) [inline]

Definition at line 65 of file CouenneExprHess.hpp.

7.71.3.6 int* Couenne::ExprHess::numL ( ) [inline]

Definition at line 66 of file CouenneExprHess.hpp.

7.71.3.7 int** Couenne::ExprHess::lamI ( ) [inline]

Definition at line 67 of file CouenneExprHess.hpp.

7.71.3.8 expression*** Couenne::ExprHess::expr ( ) [inline]

Definition at line 69 of file CouenneExprHess.hpp.

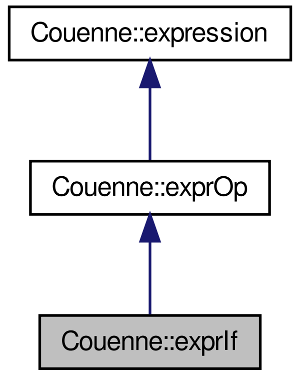
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/partial/CouenneExprHess.hpp

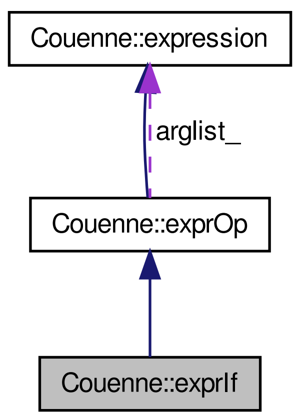
7.72 Couenne::exprIf Class Reference

```
#include <CouenneExprIf.hpp>
```

Inheritance diagram for Couenne::exprIf:



Collaboration diagram for Couenne::exprIf:



Additional Inherited Members

7.72.1 Detailed Description

Definition at line 18 of file CouenneExprIf.hpp.

The documentation for this class was generated from the following file:

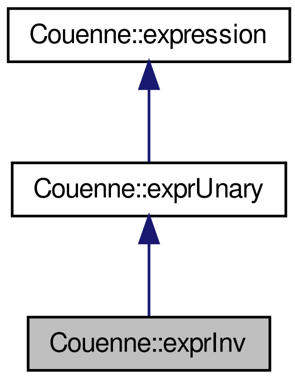
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprIf.hpp

7.73 Couenne::exprInv Class Reference

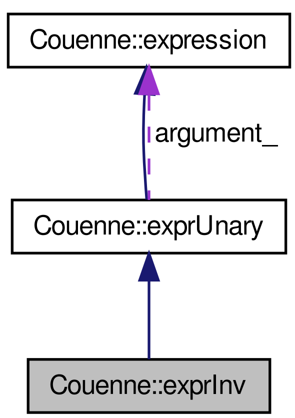
class inverse: $1/f(x)$

`#include <CouenneExprInv.hpp>`

Inheritance diagram for Couenne::exprInv:



Collaboration diagram for Couenne::exprInv:



Public Member Functions

- exprInv (expression *al)

  Constructors, destructor.
- expression * clone (Domain *d=NULL) const

  cloning method
- unary_function F ()

  the operator's function
- virtual void print (std::ostream &out=std::cout, bool=false) const

  output "1/argument"
- CouNumber gradientNorm (const double *x)

  return l-2 norm of gradient at given point
- expression * differentiate (int index)

  differentiation
- virtual int Linearity ()

  get a measure of "how linear" the expression is (see CouenneTypes.h)
- void getBounds (expression *&, expression *&)

  Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)
- void generateCuts (expression *w, OsiCuts &cs, const CouenneCutGenerator *cg, t_chg_bounds *=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  *generate equality between *this and *w*
- virtual enum expr_type code ()

  code for comparisons
- bool impliedBound (int, CouNumber *, CouNumber *, t_chg_bounds *, enum auxSign=expression::AUX_EQ)

  implied bound processing
- virtual CouNumber selectBranch (const CouenneObject *obj, const OsiBranchingInformation *info, expression *&var, double *&brpts, double *&brDist, int &way)

  set up branching object by evaluating many branching points for each expression's arguments
- virtual bool isBijective () const

  return true if bijective
- virtual CouNumber inverse (expression *vardep) const

  return inverse of y=f(x)=1/x, i.e., x=1/y
- virtual bool isCuttable (CouenneProblem *problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

Additional Inherited Members

7.73.1 Detailed Description

class inverse: $1/f(x)$

Definition at line 35 of file CouenneExprInv.hpp.

7.73.2 Constructor & Destructor Documentation

7.73.2.1 Couenne::exprInv::exprInv (expression ∗ *al*) [inline]

Constructors, destructor.

Definition at line 40 of file CouenneExprInv.hpp.

7.73.3 Member Function Documentation

7.73.3.1 expression∗ Couenne::exprInv::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 44 of file CouenneExprInv.hpp.

7.73.3.2 unary_function Couenne::exprInv::F ( ) [inline], [virtual]

the operator's function

Reimplemented from Couenne::exprUnary.

Definition at line 48 of file CouenneExprInv.hpp.

7.73.3.3 virtual void Couenne::exprInv::print (std::ostream & *out* = std::cout, bool = false) const [virtual]

output "1/argument"

Reimplemented from Couenne::exprUnary.

7.73.3.4 CouNumber Couenne::exprInv::gradientNorm (const double ∗ *x*) [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

7.73.3.5 expression∗ Couenne::exprInv::differentiate (int *index*) [virtual]

differentiation

Reimplemented from Couenne::expression.

7.73.3.6 virtual int Couenne::exprInv::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::exprUnary.

Definition at line 60 of file CouenneExprInv.hpp.

7.73.3.7 void Couenne::exprInv::getBounds (expression ∗& , expression ∗&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.73.3.8 void Couenne::exprInv::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.73.3.9 void Couenne::exprInv::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between *this and *w

Reimplemented from Couenne::expression.

7.73.3.10 virtual enum expr_type Couenne::exprInv::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprUnary.

Definition at line 79 of file CouenneExprInv.hpp.

7.73.3.11 bool Couenne::exprInv::impliedBound (int , CouNumber * , CouNumber * , t_chg_bounds * , enum *auxSign* = expression::AUX_EQ) [virtual]

implied bound processing

Reimplemented from Couenne::expression.

7.73.3.12 virtual CouNumber Couenne::exprInv::selectBranch (const CouenneObject * *obj*, const OsiBranchingInformation * *info*, expression *& *var*, double *& *brpts*, double *& *brDist*, int & *way*) [virtual]

set up branching object by evaluating many branching points for each expression's arguments

Reimplemented from Couenne::expression.

7.73.3.13 virtual bool Couenne::exprInv::isBijective ( ) const [inline], [virtual]

return true if bijective

Reimplemented from Couenne::expression.

Definition at line 95 of file CouenneExprInv.hpp.

7.73.3.14 virtual CouNumber Couenne::exprInv::inverse (expression * *vardep*) const [inline], [virtual]

return inverse of y=f(x)=1/x, i.e., x=1/y

Reimplemented from Couenne::expression.

Definition at line 98 of file CouenneExprInv.hpp.

7.73.3.15 virtual bool Couenne::exprInv::isCuttable (CouenneProblem * *problem*, int *index*) const [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

The documentation for this class was generated from the following file:

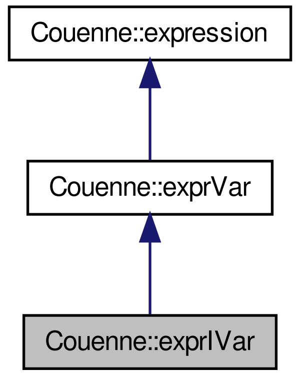
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprInv.hpp

7.74 Couenne::exprIVar Class Reference

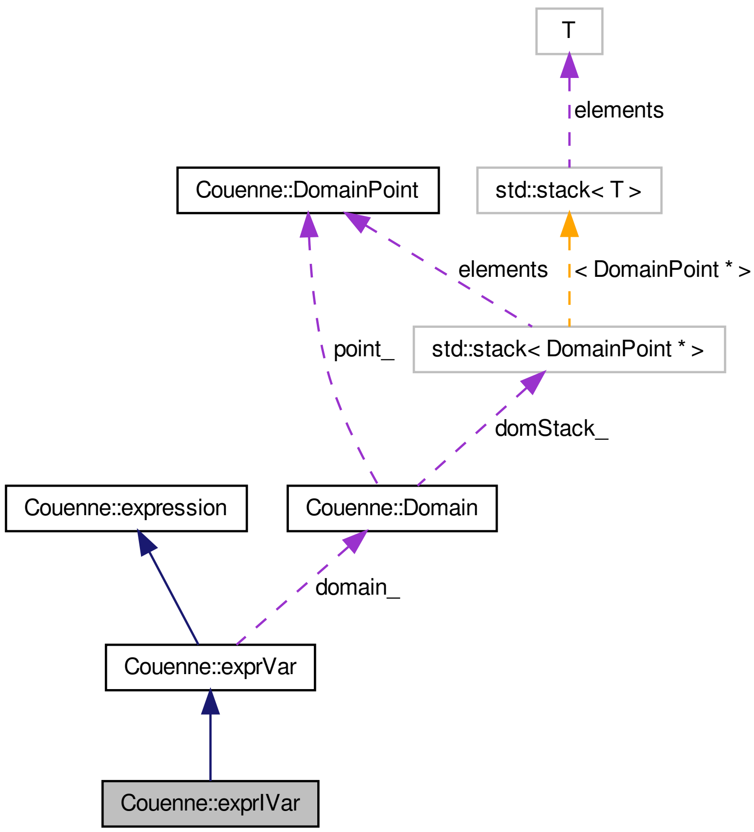
variable-type operator.

`#include <CouenneExprIVar.hpp>`

Inheritance diagram for Couenne::exprIVar:



Collaboration diagram for Couenne::exprIVar:



Public Member Functions

- exprIVar (int varIndex, Domain ∗d=NULL)

  Constructor.
- exprIVar (const exprIVar &e, Domain ∗d=NULL)

  Copy constructor – must go.
- virtual exprVar ∗ clone (Domain ∗d=NULL) const

  Cloning method.
- virtual void print (std::ostream &out=std::cout, bool=false) const

  Print.
- virtual bool isDefinedInteger ()

  is this expression defined as an integer?
- virtual bool isInteger ()

  Is this expression integer?

Additional Inherited Members

7.74.1 Detailed Description

variable-type operator.

All variables of the expression must be objects of this class

Definition at line 25 of file CouenneExprIVar.hpp.

7.74.2 Constructor & Destructor Documentation

7.74.2.1 Couenne::exprIVar::exprIVar (int *varIndex*, Domain ∗ *d* = NULL) [inline]

Constructor.

Definition at line 30 of file CouenneExprIVar.hpp.

7.74.2.2 Couenne::exprIVar::exprIVar (const exprIVar & *e*, Domain ∗ *d* = NULL) [inline]

Copy constructor – must go.

Definition at line 34 of file CouenneExprIVar.hpp.

7.74.3 Member Function Documentation

7.74.3.1 virtual exprVar∗ Couenne::exprIVar::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::exprVar.

Definition at line 38 of file CouenneExprIVar.hpp.

7.74.3.2 virtual void Couenne::exprIVar::print (std::ostream & *out* = std::cout, bool = false) const [inline], [virtual]

Print.

Reimplemented from Couenne::exprVar.

Definition at line 42 of file CouenneExprIVar.hpp.

7.74.3.3 virtual bool Couenne::exprIVar::isDefinedInteger ( ) [inline], [virtual]

is this expression defined as an integer?

Reimplemented from Couenne::exprVar.

Definition at line 46 of file CouenneExprIVar.hpp.

7.74.3.4 virtual bool Couenne::exprIVar::isInteger ( ) [inline], [virtual]

Is this expression integer?

Reimplemented from Couenne::exprVar.

Definition at line 50 of file CouenneExprIVar.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprIVar.hpp

7.75 Couenne::ExprJac Class Reference

Jacobian of the problem (computed through Couenne expression classes).

`#include <CouenneExprJac.hpp>`

Public Member Functions

- ExprJac ()
- ExprJac (CouenneProblem ∗)
- ∼ExprJac ()
- ExprJac (const ExprJac &)
- ExprJac ∗ clone ()
- ExprJac & operator= (const ExprJac &)
- int nnz () const
- int ∗ iRow () const
- int ∗ jCol () const
- expression ∗∗ expr () const
- int nRows () const

7.75.1 Detailed Description

Jacobian of the problem (computed through Couenne expression classes).

Definition at line 21 of file CouenneExprJac.hpp.

7.75.2 Constructor & Destructor Documentation

7.75.2.1 Couenne::ExprJac::ExprJac ( )

7.75.2.2 Couenne::ExprJac::ExprJac (CouenneProblem ∗)

7.75.2.3 Couenne::ExprJac::∼ExprJac ( )

7.75.2.4 Couenne::ExprJac::ExprJac (const ExprJac &)

7.75.3 Member Function Documentation

7.75.3.1 ExprJac∗ Couenne::ExprJac::clone ( )

7.75.3.2 ExprJac& Couenne::ExprJac::operator= (const ExprJac &)

7.75.3.3 int Couenne::ExprJac::nnz ( ) const [inline]

Definition at line 43 of file CouenneExprJac.hpp.

7.75.3.4 int∗ Couenne::ExprJac::iRow ( ) const [inline]

Definition at line 44 of file CouenneExprJac.hpp.

7.75.3.5 int* Couenne::ExprJac::jCol ( ) const [inline]

Definition at line 45 of file CouenneExprJac.hpp.

7.75.3.6 expression** Couenne::ExprJac::expr ( ) const [inline]

Definition at line 47 of file CouenneExprJac.hpp.

7.75.3.7 int Couenne::ExprJac::nRows ( ) const [inline]

Definition at line 49 of file CouenneExprJac.hpp.

The documentation for this class was generated from the following file:

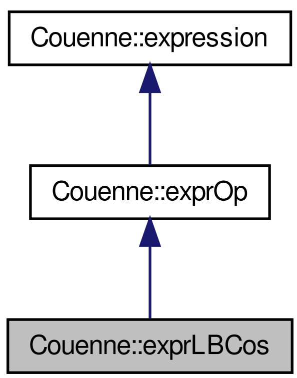
- /home/ted/COIN/trunk/Couenne/src/expression/partial/CouenneExprJac.hpp

7.76 Couenne::exprLBCos Class Reference

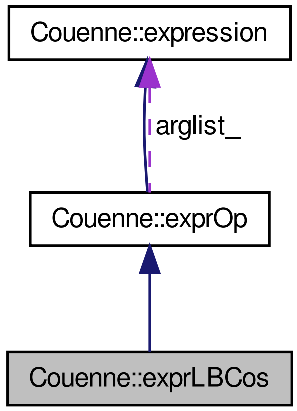
class to compute lower bound of a cosine based on the bounds of its arguments

`#include <CouenneExprBCos.hpp>`

Inheritance diagram for Couenne::exprLBCos:



Collaboration diagram for Couenne::exprLBCos:



Public Member Functions

- exprLBCos (expression ∗lb, expression ∗ub)

  Constructors, destructor.
- expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- CouNumber operator() ()

  function for the evaluation of the expression
- enum pos printPos () const

  print position (PRE, INSIDE, POST)
- std::string printOp () const

  print operator

Additional Inherited Members

7.76.1 Detailed Description

class to compute lower bound of a cosine based on the bounds of its arguments

Definition at line 27 of file CouenneExprBCos.hpp.

7.76.2 Constructor & Destructor Documentation

7.76.2.1 Couenne::exprLBCos::exprLBCos (**expression** ∗ *lb*, **expression** ∗ *ub*) [inline]

Constructors, destructor.

Definition at line 32 of file CouenneExprBCos.hpp.

7.76.3 Member Function Documentation

7.76.3.1 expression∗ Couenne::exprLBCos::clone (Domain ∗ d = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 39 of file CouenneExprBCos.hpp.

7.76.3.2 CouNumber Couenne::exprLBCos::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute sum

Implements Couenne::expression.

Definition at line 58 of file CouenneExprBCos.hpp.

7.76.3.3 enum pos Couenne::exprLBCos::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Reimplemented from Couenne::exprOp.

Definition at line 47 of file CouenneExprBCos.hpp.

7.76.3.4 std::string Couenne::exprLBCos::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 51 of file CouenneExprBCos.hpp.

The documentation for this class was generated from the following file:

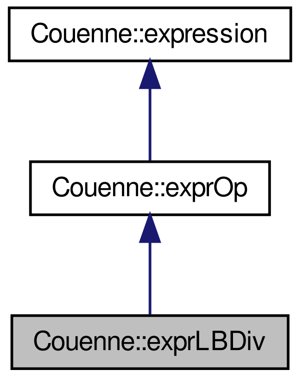
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBCos.hpp

7.77 Couenne::exprLBDiv Class Reference

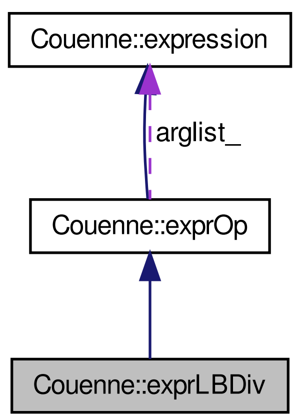
class to compute lower bound of a fraction based on the bounds of both numerator and denominator

`#include <CouenneExprBDiv.hpp>`

Inheritance diagram for Couenne::exprLBDiv:



Collaboration diagram for Couenne::exprLBDiv:



Public Member Functions

- exprLBDiv (expression ∗∗al, int n)

  Constructors, destructor.
- expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- CouNumber operator() ()

function for the evaluation of the expression
- enum pos printPos () const

  print position (PRE, INSIDE, POST)
- std::string printOp () const

  print operator

Additional Inherited Members

7.77.1 Detailed Description

class to compute lower bound of a fraction based on the bounds of both numerator and denominator

Definition at line 37 of file CouenneExprBDiv.hpp.

7.77.2 Constructor & Destructor Documentation

7.77.2.1 Couenne::exprLBDiv::exprLBDiv (expression ** *al,* int *n*) [inline]

Constructors, destructor.

Definition at line 42 of file CouenneExprBDiv.hpp.

7.77.3 Member Function Documentation

7.77.3.1 expression* Couenne::exprLBDiv::clone (Domain * *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 46 of file CouenneExprBDiv.hpp.

7.77.3.2 CouNumber Couenne::exprLBDiv::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute sum

Implements Couenne::expression.

Definition at line 64 of file CouenneExprBDiv.hpp.

7.77.3.3 enum pos Couenne::exprLBDiv::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Reimplemented from Couenne::exprOp.

Definition at line 53 of file CouenneExprBDiv.hpp.

7.77.3.4 std::string Couenne::exprLBDiv::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 57 of file CouenneExprBDiv.hpp.

The documentation for this class was generated from the following file:

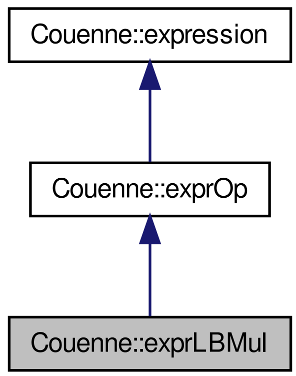
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBDiv.hpp

7.78 Couenne::exprLBMul Class Reference

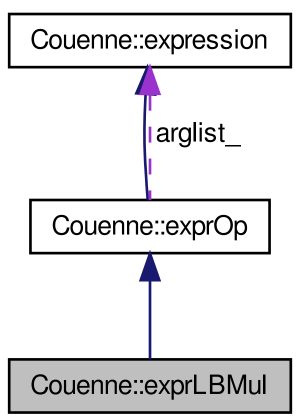
class to compute lower bound of a product based on the bounds of both factors

`#include <CouenneExprBMul.hpp>`

Inheritance diagram for Couenne::exprLBMul:



Collaboration diagram for Couenne::exprLBMul:



Public Member Functions

- exprLBMul (expression **al, int n)

  Constructors, destructor.
- expression * clone (Domain *d=NULL) const

  cloning method
- CouNumber operator() ()

  function for the evaluation of the expression
- enum pos printPos () const

  print position (PRE, INSIDE, POST)
- std::string printOp () const

  print operator

Additional Inherited Members

7.78.1 Detailed Description

class to compute lower bound of a product based on the bounds of both factors

Definition at line 40 of file CouenneExprBMul.hpp.

7.78.2 Constructor & Destructor Documentation

7.78.2.1 Couenne::exprLBMul::exprLBMul (expression ** *al*, int *n*) [inline]

Constructors, destructor.

Definition at line 45 of file CouenneExprBMul.hpp.

7.78.3 Member Function Documentation

7.78.3.1 expression* Couenne::exprLBMul::clone (Domain * *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 49 of file CouenneExprBMul.hpp.

7.78.3.2 CouNumber Couenne::exprLBMul::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute sum

Implements Couenne::expression.

Definition at line 67 of file CouenneExprBMul.hpp.

7.78.3.3 enum pos Couenne::exprLBMul::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Reimplemented from Couenne::exprOp.

Definition at line 56 of file CouenneExprBMul.hpp.

7.78.3.4 std::string Couenne::exprLBMul::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 60 of file CouenneExprBMul.hpp.

The documentation for this class was generated from the following file:

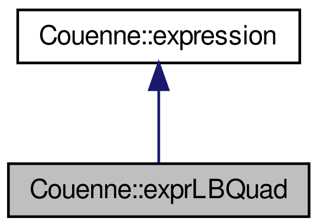
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBMul.hpp

7.79 Couenne::exprLBQuad Class Reference

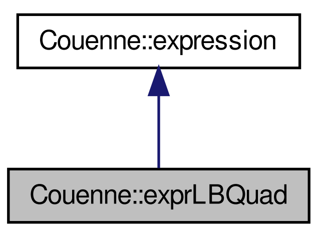
class to compute lower bound of a fraction based on the bounds of both numerator and denominator

`#include <CouenneExprBQuad.hpp>`

Inheritance diagram for Couenne::exprLBQuad:



Collaboration diagram for Couenne::exprLBQuad:



Public Member Functions

- exprLBQuad (exprQuad ∗ref)

Constructor.
- exprLBQuad (const exprLBQuad &src, Domain ∗d=NULL)

  copy constructor
- ∼exprLBQuad ()

  destructor
- expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- CouNumber operator() ()

  function for the evaluation of the expression
- virtual void print (std::ostream &s=std::cout, bool descend=false) const

  I/O.

Additional Inherited Members

7.79.1 Detailed Description

class to compute lower bound of a fraction based on the bounds of both numerator and denominator

Definition at line 22 of file CouenneExprBQuad.hpp.

7.79.2 Constructor & Destructor Documentation

7.79.2.1 Couenne::exprLBQuad::exprLBQuad (exprQuad ∗ *ref*) [inline]

Constructor.

Definition at line 29 of file CouenneExprBQuad.hpp.

7.79.2.2 Couenne::exprLBQuad::exprLBQuad (const exprLBQuad & *src*, Domain ∗ *d* = NULL) [inline]

copy constructor

Definition at line 33 of file CouenneExprBQuad.hpp.

7.79.2.3 Couenne::exprLBQuad::∼exprLBQuad ( ) [inline]

destructor

Definition at line 39 of file CouenneExprBQuad.hpp.

7.79.3 Member Function Documentation

7.79.3.1 expression∗ Couenne::exprLBQuad::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 42 of file CouenneExprBQuad.hpp.

7.79.3.2 CouNumber Couenne::exprLBQuad::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

Implements Couenne::expression.

Definition at line 46 of file CouenneExprBQuad.hpp.

7.79.3.3 virtual void Couenne::exprLBQuad::print (std::ostream & *s* = std::cout, bool *descend* = false) const [inline], [virtual]

I/O.

Reimplemented from Couenne::expression.

Definition at line 50 of file CouenneExprBQuad.hpp.

The documentation for this class was generated from the following file:

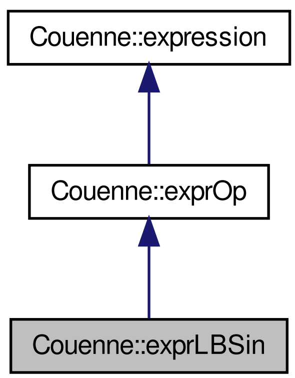
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBQuad.hpp

7.80 Couenne::exprLBSin Class Reference

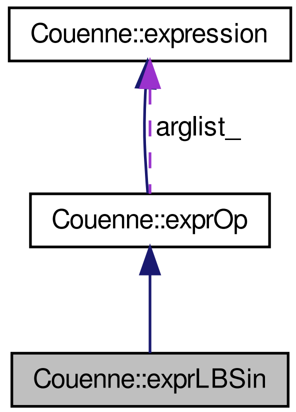
class to compute lower bound of a sine based on the bounds on its arguments

`#include <CouenneExprBSin.hpp>`

Inheritance diagram for Couenne::exprLBSin:



Collaboration diagram for Couenne::exprLBSin:



Public Member Functions

- exprLBSin (expression ∗lb, expression ∗ub)
  Constructors, destructor.
- expression ∗ clone (Domain ∗d=NULL) const
  cloning method
- CouNumber operator() ()
  function for the evaluation of the expression
- enum pos printPos () const
  print position (PRE, INSIDE, POST)
- std::string printOp () const
  print operator

Additional Inherited Members

7.80.1 Detailed Description

class to compute lower bound of a sine based on the bounds on its arguments

Definition at line 27 of file CouenneExprBSin.hpp.

7.80.2 Constructor & Destructor Documentation

7.80.2.1 Couenne::exprLBSin::exprLBSin (expression ∗ *lb*, expression ∗ *ub*) [inline]

Constructors, destructor.

Definition at line 32 of file CouenneExprBSin.hpp.

7.80.3 Member Function Documentation

7.80.3.1 expression∗ Couenne::exprLBSin::clone (Domain ∗ d = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 39 of file CouenneExprBSin.hpp.

7.80.3.2 CouNumber Couenne::exprLBSin::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute sum

Implements Couenne::expression.

Definition at line 58 of file CouenneExprBSin.hpp.

7.80.3.3 enum pos Couenne::exprLBSin::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Reimplemented from Couenne::exprOp.

Definition at line 47 of file CouenneExprBSin.hpp.

7.80.3.4 std::string Couenne::exprLBSin::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 51 of file CouenneExprBSin.hpp.

The documentation for this class was generated from the following file:

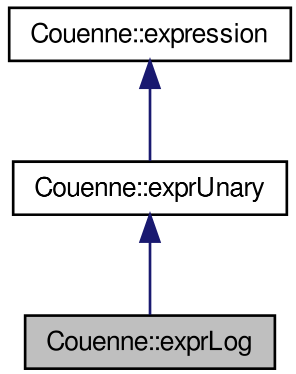
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBSin.hpp

7.81 Couenne::exprLog Class Reference

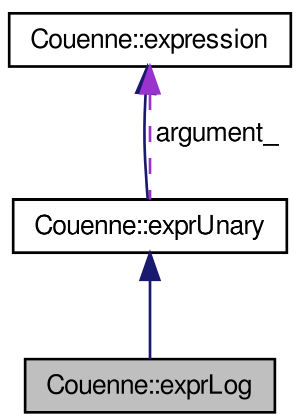
class logarithm, $\log f(x)$

```
#include <CouenneExprLog.hpp>
```

Inheritance diagram for Couenne::exprLog:



Collaboration diagram for Couenne::exprLog:



Public Member Functions

- exprLog (expression ∗al)

    Constructors, destructor.
- expression ∗ clone (Domain ∗d=NULL) const

    cloning method
- unary_function F ()

the operator's function
- std::string printOp () const

  print operator
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)

  differentiation
- void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate equality between ∗this and ∗w
- virtual enum expr_type code ()

  code for comparisons
- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX_EQ)

  implied bound processing
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  set up branching object by evaluating many branching points for each expression's arguments
- virtual bool isBijective () const

  return true if feasible
- virtual CouNumber inverse (expression ∗vardep) const

  inverse of this operator
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

Additional Inherited Members

7.81.1 Detailed Description

class logarithm, $\log f(x)$

Definition at line 21 of file CouenneExprLog.hpp.

7.81.2 Constructor & Destructor Documentation

7.81.2.1 Couenne::exprLog::exprLog (expression ∗ *al*) [inline]

Constructors, destructor.

Definition at line 26 of file CouenneExprLog.hpp.

7.81.3 Member Function Documentation

7.81.3.1 expression* Couenne::exprLog::clone (Domain * d = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 30 of file CouenneExprLog.hpp.

7.81.3.2 unary_function Couenne::exprLog::F ( ) [inline], [virtual]

the operator's function

Reimplemented from Couenne::exprUnary.

Definition at line 34 of file CouenneExprLog.hpp.

7.81.3.3 std::string Couenne::exprLog::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprUnary.

Definition at line 37 of file CouenneExprLog.hpp.

7.81.3.4 CouNumber Couenne::exprLog::gradientNorm (const double * x) [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

7.81.3.5 expression* Couenne::exprLog::differentiate (int index) [virtual]

differentiation

Reimplemented from Couenne::expression.

7.81.3.6 void Couenne::exprLog::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.81.3.7 void Couenne::exprLog::getBounds (CouNumber & lb, CouNumber & ub) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.81.3.8 void Couenne::exprLog::generateCuts (expression * w, OsiCuts & cs, const CouenneCutGenerator * cg, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between *this and *w

Reimplemented from Couenne::expression.

7.81.3.9 virtual enum expr_type Couenne::exprLog::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprUnary.

Definition at line 60 of file CouenneExprLog.hpp.

7.81.3.10 bool Couenne::exprLog::impliedBound (int , CouNumber ∗ , CouNumber ∗ , t_chg_bounds ∗ , enum *auxSign* = expression::AUX_EQ) [virtual]

implied bound processing

Reimplemented from Couenne::expression.

7.81.3.11 virtual CouNumber Couenne::exprLog::selectBranch (const CouenneObject ∗ *obj*, const OsiBranchingInformation ∗ *info*, expression ∗& *var*, double ∗& *brpts*, double ∗& *brDist*, int & *way*) [virtual]

set up branching object by evaluating many branching points for each expression's arguments

Reimplemented from Couenne::expression.

7.81.3.12 virtual bool Couenne::exprLog::isBijective ( ) const [inline], [virtual]

return true if feasible

Reimplemented from Couenne::expression.

Definition at line 77 of file CouenneExprLog.hpp.

7.81.3.13 virtual CouNumber Couenne::exprLog::inverse (expression ∗ *vardep*) const [inline], [virtual]

inverse of this operator

Reimplemented from Couenne::expression.

Definition at line 80 of file CouenneExprLog.hpp.

7.81.3.14 virtual bool Couenne::exprLog::isCuttable (CouenneProblem ∗ *problem*, int *index*) const [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

The documentation for this class was generated from the following file:

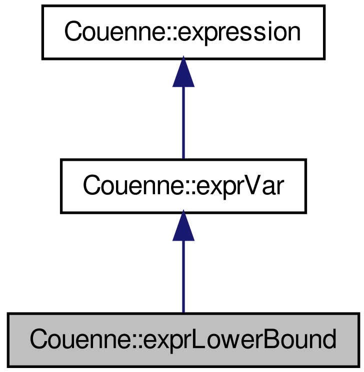
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprLog.hpp

7.82 Couenne::exprLowerBound Class Reference

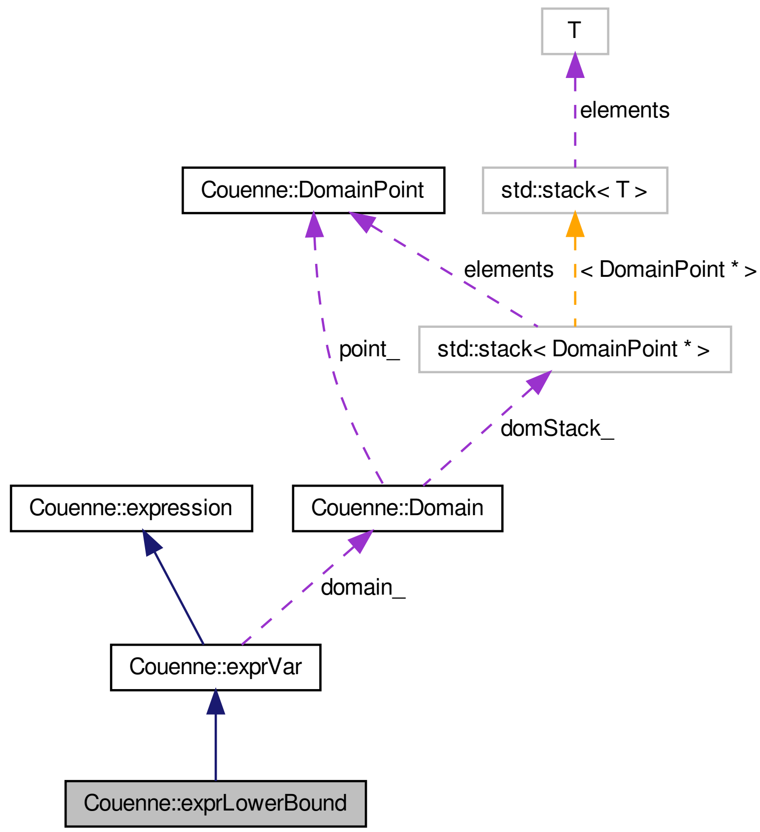
These are bound expression classes.

`#include <CouenneExprBound.hpp>`

Inheritance diagram for Couenne::exprLowerBound:



Collaboration diagram for Couenne::exprLowerBound:



Public Member Functions

- enum nodeType Type () const

    Node type.
- exprLowerBound (int varIndex, Domain ∗d=NULL)

    Constructor.
- exprLowerBound (const exprLowerBound &src, Domain ∗d=NULL)

    Copy constructor.
- exprLowerBound ∗ clone (Domain ∗d=NULL) const

    cloning method
- void print (std::ostream &out=std::cout, bool=false) const

    Print to iostream.
- CouNumber operator() ()

    return the value of the variable
- expression ∗ differentiate (int)

    differentiation

- int dependsOn (int *, int, enum dig_type type=STOP_AT_AUX)

  dependence on variable set
- virtual int Linearity ()

  get a measure of "how linear" the expression is:
- virtual enum expr_type code ()

  code for comparisons

Additional Inherited Members

7.82.1 Detailed Description

These are bound expression classes.

They are used in the parametric convexification part to obtain lower/upper bounds of an expression as a function of the expression itself.

For example, the lower and upper bounds to expression (x1 - exp (x2)) are (l1 - exp (u2)) and (u1 - exp (l2)), respectively, where l1 (l2) is the lower bound of x1 (x2) and u1 (u2) is the upper bound of x1 (x2).

A lower/upper bound of an expression is a function of all bounds in the expression and is known only when all variables bounds are known. lower bound

Definition at line 38 of file CouenneExprBound.hpp.

7.82.2 Constructor & Destructor Documentation

7.82.2.1 Couenne::exprLowerBound::exprLowerBound (int *varIndex*, Domain * *d* = NULL) [inline]

Constructor.

Definition at line 47 of file CouenneExprBound.hpp.

7.82.2.2 Couenne::exprLowerBound::exprLowerBound (const exprLowerBound & *src*, Domain * *d* = NULL) [inline]

Copy constructor.

Definition at line 51 of file CouenneExprBound.hpp.

7.82.3 Member Function Documentation

7.82.3.1 enum nodeType Couenne::exprLowerBound::Type ( ) const [inline], [virtual]

Node type.

Reimplemented from Couenne::exprVar.

Definition at line 43 of file CouenneExprBound.hpp.

7.82.3.2 exprLowerBound* Couenne::exprLowerBound::clone (Domain * *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::exprVar.

Definition at line 55 of file CouenneExprBound.hpp.

7.82.3.3 void Couenne::exprLowerBound::print (std::ostream & *out* = std::cout, bool = false) const [inline], [virtual]

Print to iostream.

Reimplemented from Couenne::exprVar.

Definition at line 59 of file CouenneExprBound.hpp.

7.82.3.4 CouNumber Couenne::exprLowerBound::operator() ( ) [inline], [virtual]

return the value of the variable

Reimplemented from Couenne::exprVar.

Definition at line 64 of file CouenneExprBound.hpp.

7.82.3.5 expression* Couenne::exprLowerBound::differentiate (int) [inline], [virtual]

differentiation

Reimplemented from Couenne::exprVar.

Definition at line 68 of file CouenneExprBound.hpp.

7.82.3.6 int Couenne::exprLowerBound::dependsOn (int *, int , enum dig_type *type* = STOP_AT_AUX) [inline], [virtual]

dependence on variable set

Reimplemented from Couenne::expression.

Definition at line 72 of file CouenneExprBound.hpp.

7.82.3.7 virtual int Couenne::exprLowerBound::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is:

Reimplemented from Couenne::exprVar.

Definition at line 76 of file CouenneExprBound.hpp.

7.82.3.8 virtual enum expr_type Couenne::exprLowerBound::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprVar.

Definition at line 80 of file CouenneExprBound.hpp.

The documentation for this class was generated from the following file:

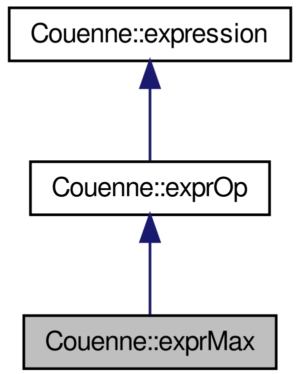
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprBound.hpp

7.83 Couenne::exprMax Class Reference

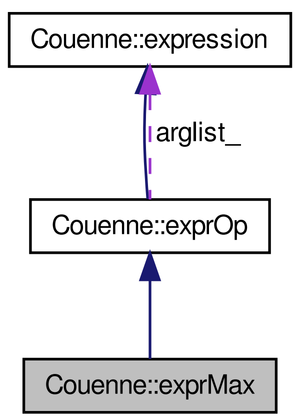
class for maxima

`#include <CouenneExprMax.hpp>`

Inheritance diagram for Couenne::exprMax:



Collaboration diagram for Couenne::exprMax:



Public Member Functions

- exprMax (expression ∗∗al, int n)

  Constructor.
- exprMax (expression ∗el0, expression ∗el1)

  Constructor with only two arguments.
- exprMax ∗ clone (Domain ∗d=NULL) const

cloning method

- std::string printOp () const

  print operator
- enum pos printPos () const

  print position
- CouNumber operator() ()

  function for the evaluation of the expression
- expression * differentiate (int)

  differentiation
- expression * simplify ()

  simplification
- virtual int Linearity ()

  get a measure of "how linear" the expression is (see CouenneTypes.h)
- void getBounds (expression *&, expression *&)

  Get lower and upper bound of an expression (if any)
- virtual exprAux * standardize (CouenneProblem *, bool addAux=true)

  reduce expression in standard form, creating additional aux variables (and constraints)
- void generateCuts (expression *w, OsiCuts &cs, const CouenneCutGenerator *cg, t_chg_bounds *=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  *generate equality between *this and *w*
- virtual enum expr_type code ()

  code for comparisons

Additional Inherited Members

7.83.1 Detailed Description

class for maxima

Definition at line 22 of file CouenneExprMax.hpp.

7.83.2 Constructor & Destructor Documentation

7.83.2.1 Couenne::exprMax::exprMax (expression ** *al*, int *n*) [inline]

Constructor.

Definition at line 27 of file CouenneExprMax.hpp.

7.83.2.2 Couenne::exprMax::exprMax (expression * *el0*, expression * *el1*) [inline]

Constructor with only two arguments.

Definition at line 31 of file CouenneExprMax.hpp.

7.83.3 Member Function Documentation

7.83.3.1 exprMax* Couenne::exprMax::clone (Domain * *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 38 of file CouenneExprMax.hpp.

7.83.3.2 std::string Couenne::exprMax::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 42 of file CouenneExprMax.hpp.

7.83.3.3 enum pos Couenne::exprMax::printPos ( ) const [inline], [virtual]

print position

Reimplemented from Couenne::exprOp.

Definition at line 46 of file CouenneExprMax.hpp.

7.83.3.4 CouNumber Couenne::exprMax::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute maximum

Implements Couenne::expression.

Definition at line 87 of file CouenneExprMax.hpp.

7.83.3.5 expression* Couenne::exprMax::differentiate (int) [inline], [virtual]

differentiation

Reimplemented from Couenne::expression.

Definition at line 53 of file CouenneExprMax.hpp.

7.83.3.6 expression* Couenne::exprMax::simplify ( ) [inline], [virtual]

simplification

Reimplemented from Couenne::exprOp.

Definition at line 57 of file CouenneExprMax.hpp.

7.83.3.7 virtual int Couenne::exprMax::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::exprOp.

Definition at line 61 of file CouenneExprMax.hpp.

7.83.3.8 void Couenne::exprMax::getBounds (expression *&, expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.83.3.9 virtual exprAux* Couenne::exprMax::standardize (CouenneProblem *, bool *addAux* = true) [inline], [virtual]

reduce expression in standard form, creating additional aux variables (and constraints)

Reimplemented from Couenne::exprOp.

Definition at line 69 of file CouenneExprMax.hpp.

7.83.3.10 void Couenne::exprMax::generateCuts (expression * w, OsiCuts & cs, const CouenneCutGenerator * cg, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between *this and *w

Reimplemented from Couenne::expression.

7.83.3.11 virtual enum expr_type Couenne::exprMax::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprOp.

Definition at line 80 of file CouenneExprMax.hpp.

The documentation for this class was generated from the following file:

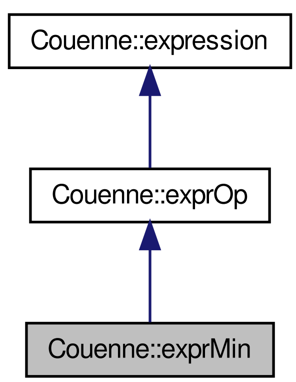
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprMax.hpp

7.84 Couenne::exprMin Class Reference

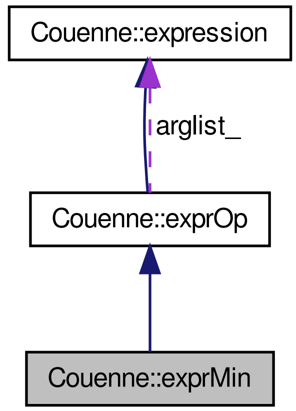
class for minima

`#include <CouenneExprMin.hpp>`

Inheritance diagram for Couenne::exprMin:



Collaboration diagram for Couenne::exprMin:



Public Member Functions

- exprMin (expression ∗∗al, int n)

    Constructor.
- exprMin (expression ∗el0, expression ∗el1)

    Constructor with only two arguments.
- exprMin ∗ clone (Domain ∗d=NULL) const

    Cloning method.
- std::string printOp () const

    Print operator.
- enum pos printPos () const

    Print operator.
- CouNumber operator() ()

    Function for the evaluation of the expression.
- expression ∗ differentiate (int)

    Differentiation.
- expression ∗ simplify ()

    Simplification.
- virtual int Linearity ()

    get a measure of "how linear" the expression is (see CouenneTypes.h)
- void getBounds (expression ∗&, expression ∗&)

    Get lower and upper bound of an expression (if any)
- virtual exprAux ∗ standardize (CouenneProblem ∗, bool addAux=true)

    Reduce expression in standard form, creating additional aux variables (and constraints)
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

    Generate equality between ∗this and ∗w.

- virtual enum expr_type code ()

  Code for comparisons.

Additional Inherited Members

7.84.1 Detailed Description

class for minima

Definition at line 29 of file CouenneExprMin.hpp.

7.84.2 Constructor & Destructor Documentation

7.84.2.1 Couenne::exprMin::exprMin (expression ** *al*, int *n*) [inline]

Constructor.

Definition at line 34 of file CouenneExprMin.hpp.

7.84.2.2 Couenne::exprMin::exprMin (expression * *el0*, expression * *el1*) [inline]

Constructor with only two arguments.

Definition at line 38 of file CouenneExprMin.hpp.

7.84.3 Member Function Documentation

7.84.3.1 exprMin* Couenne::exprMin::clone (Domain * *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::expression.

Definition at line 45 of file CouenneExprMin.hpp.

7.84.3.2 std::string Couenne::exprMin::printOp ( ) const [inline], [virtual]

Print operator.

Reimplemented from Couenne::exprOp.

Definition at line 49 of file CouenneExprMin.hpp.

7.84.3.3 enum pos Couenne::exprMin::printPos ( ) const [inline], [virtual]

Print operator.

Reimplemented from Couenne::exprOp.

Definition at line 53 of file CouenneExprMin.hpp.

7.84.3.4 CouNumber Couenne::exprMin::operator() ( ) [inline], [virtual]

Function for the evaluation of the expression.

Compute minimum.

Implements Couenne::expression.

Definition at line 94 of file CouenneExprMin.hpp.

7.84.3.5 expression∗ Couenne::exprMin::differentiate (int) [inline], [virtual]

Differentiation.

Reimplemented from Couenne::expression.

Definition at line 60 of file CouenneExprMin.hpp.

7.84.3.6 expression∗ Couenne::exprMin::simplify ( ) [inline], [virtual]

Simplification.

Reimplemented from Couenne::exprOp.

Definition at line 64 of file CouenneExprMin.hpp.

7.84.3.7 virtual int Couenne::exprMin::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::exprOp.

Definition at line 68 of file CouenneExprMin.hpp.

7.84.3.8 void Couenne::exprMin::getBounds (expression ∗& , expression ∗&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.84.3.9 virtual exprAux∗ Couenne::exprMin::standardize (CouenneProblem ∗ , bool *addAux* = true) [inline], [virtual]

Reduce expression in standard form, creating additional aux variables (and constraints)

Reimplemented from Couenne::exprOp.

Definition at line 76 of file CouenneExprMin.hpp.

7.84.3.10 void Couenne::exprMin::generateCuts (expression ∗ *w*, OsiCuts & *cs*, const CouenneCutGenerator ∗ *cg*, t_chg_bounds ∗ = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

Generate equality between ∗this and ∗w.

Reimplemented from Couenne::expression.

7.84.3.11 virtual enum expr_type Couenne::exprMin::code ( ) [inline], [virtual]

Code for comparisons.

Reimplemented from Couenne::exprOp.

Definition at line 87 of file CouenneExprMin.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprMin.hpp

7.85 Couenne::exprMultiLin Class Reference

another class for multiplications, $\prod_{i=1}^{n} f_i(x)$

`#include <CouenneExprMultiLin.hpp>`

Public Member Functions

- exprMultiLin (expression ∗∗, int)

  Constructor.
- exprMultiLin (expression ∗, expression ∗)

  Constructor with two arguments.
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)

  differentiation
- expression ∗ simplify ()

  simplification
- virtual int Linearity ()

  get a measure of "how linear" the expression is:
- virtual void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)
- virtual exprAux ∗ standardize (CouenneProblem ∗p, bool addAux=true)

  reduce expression in standard form, creating additional aux variables (and constraints)
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate equality between ∗this and ∗w
- virtual enum expr_type code ()

  code for comparison
- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum Couenne::expression::auxSign=Couenne::expression::AUX_EQ)

  implied bound processing
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  set up branching object by evaluating many branching points for each expression's arguments
- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

  compute y^{lv} and y^{uv} for Violation Transfer algorithm

Protected Member Functions

- int impliedBoundMul (CouNumber wl, CouNumber wu, std::vector< CouNumber > &xl, std::vector< CouNumber > &xu, std::vector< std::pair< int, CouNumber > > &nl, std::vector< std::pair< int, CouNumber > > &nu)

  inferring bounds on factors of a product
- CouNumber balancedMul (const OsiBranchingInformation ∗info, int index, int wind)

  balanced strategy for branching point selection in products
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

7.85.1 Detailed Description

another class for multiplications, $\prod_{i=1}^{n} f_i(x)$

Definition at line 21 of file CouenneExprMultiLin.hpp.

7.85.2 Constructor & Destructor Documentation

7.85.2.1 Couenne::exprMultiLin::exprMultiLin (expression ∗∗ , int)

Constructor.

7.85.2.2 Couenne::exprMultiLin::exprMultiLin (expression ∗ , expression ∗)

Constructor with two arguments.

7.85.3 Member Function Documentation

7.85.3.1 CouNumber Couenne::exprMultiLin::gradientNorm (const double ∗ *x*)

return l-2 norm of gradient at given point

7.85.3.2 expression∗ Couenne::exprMultiLin::differentiate (int *index*)

differentiation

7.85.3.3 expression∗ Couenne::exprMultiLin::simplify ( )

simplification

7.85.3.4 virtual int Couenne::exprMultiLin::Linearity ( ) [virtual]

get a measure of "how linear" the expression is:

7.85.3.5 virtual void Couenne::exprMultiLin::getBounds (expression ∗& , expression ∗&) [virtual]

Get lower and upper bound of an expression (if any)

7.85.3.6 virtual void Couenne::exprMultiLin::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

7.85.3.7 virtual exprAux∗ Couenne::exprMultiLin::standardize (CouenneProblem ∗ *p*, bool *addAux* = true) [virtual]

reduce expression in standard form, creating additional aux variables (and constraints)

7.85.3.8 void Couenne::exprMultiLin::generateCuts (expression ∗ *w*, OsiCuts & *cs*, const CouenneCutGenerator ∗ *cg*, t_chg_bounds ∗ = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY)

generate equality between ∗this and ∗w

7.85.3.9 virtual enum expr_type Couenne::exprMultiLin::code ( ) [inline], [virtual]

code for comparison

Definition at line 61 of file CouenneExprMultiLin.hpp.

7.85.3.10 bool Couenne::exprMultiLin::impliedBound (int , CouNumber ∗ , CouNumber ∗ , t_chg_bounds ∗ , enum Couenne::expression::auxSign = Couenne::expression::AUX_EQ)

implied bound processing

7.85.3.11 virtual CouNumber Couenne::exprMultiLin::selectBranch (const CouenneObject ∗ *obj*, const OsiBranchingInformation ∗ *info*, expression ∗& *var*, double ∗& *brpts*, double ∗& *brDist*, int & *way*) [virtual]

set up branching object by evaluating many branching points for each expression's arguments

7.85.3.12 virtual void Couenne::exprMultiLin::closestFeasible (expression ∗ *varind*, expression ∗ *vardep*, CouNumber & *left*, CouNumber & *right*) const [virtual]

compute y^{lv} and y^{uv} for Violation Transfer algorithm

7.85.3.13 int Couenne::exprMultiLin::impliedBoundMul (CouNumber *wl*, CouNumber *wu*, std::vector< CouNumber > & *xl*, std::vector< CouNumber > & *xu*, std::vector< std::pair< int, CouNumber > > & *nl*, std::vector< std::pair< int, CouNumber > > & *nu*) [protected]

inferring bounds on factors of a product

7.85.3.14 CouNumber Couenne::exprMultiLin::balancedMul (const OsiBranchingInformation ∗ *info*, int *index*, int *wind*) [protected]

balanced strategy for branching point selection in products

7.85.3.15 virtual bool Couenne::exprMultiLin::isCuttable (CouenneProblem ∗ *problem*, int *index*) const [inline], [protected], [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Definition at line 97 of file CouenneExprMultiLin.hpp.

The documentation for this class was generated from the following file:

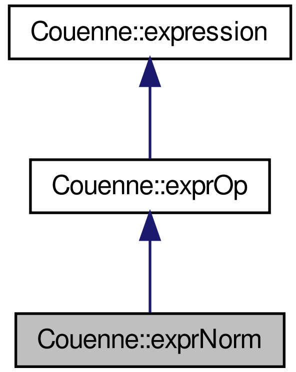
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprMultiLin.hpp

7.86 Couenne::exprNorm Class Reference

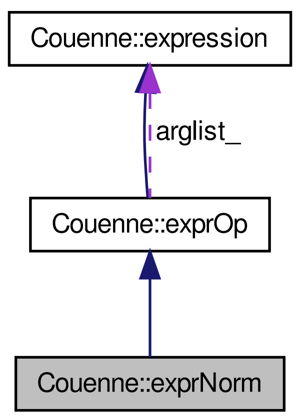
Class for p-norms, $||f(x)||_p = (\sum_{i=1}^{n} f_i(x)^p)^{\frac{1}{p}}$.

`#include <CouenneExprNorm.hpp>`

Inheritance diagram for Couenne::exprNorm:



Collaboration diagram for Couenne::exprNorm:



Additional Inherited Members

7.86.1 Detailed Description

Class for p-norms, $||f(x)||_p = (\sum_{i=1}^{n} f_i(x)^p)^{\frac{1}{p}}$.

Definition at line 20 of file CouenneExprNorm.hpp.

The documentation for this class was generated from the following file:

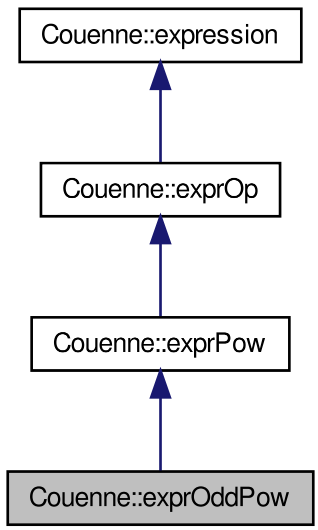
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprNorm.hpp

7.87 Couenne::exprOddPow Class Reference

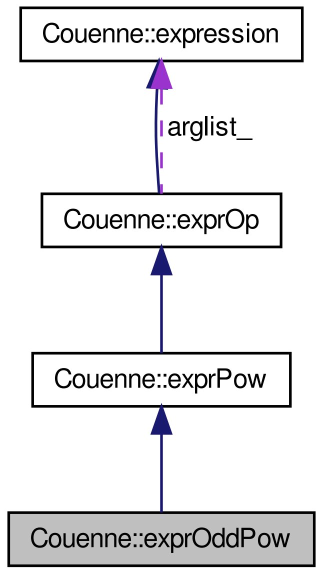
Power of an expression (binary operator), $f(x)^k$ with k constant.

`#include <CouenneExprOddPow.hpp>`

Inheritance diagram for Couenne::exprOddPow:



Collaboration diagram for Couenne::exprOddPow:



Public Member Functions

- exprOddPow (expression ∗∗al, int n=2)

    Constructor.
- exprOddPow (expression ∗arg0, expression ∗arg1)

    Constructor with only two arguments.
- expression ∗ clone (Domain ∗d=NULL) const

    cloning method
- std::string printOp () const

    print operator
- CouNumber operator() ()

    function for the evaluation of the expression
- void getBounds (expression ∗&, expression ∗&)

    Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lb, CouNumber &ub)

    Get value of lower and upper bound of an expression (if any)
- exprAux ∗ standardize (CouenneProblem ∗p, bool addAux=true)

    reduce expression in standard form, creating additional aux variables (and constraints)
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

    generate equality between ∗this and ∗w
- expression ∗ getFixVar ()

return an index to the variable's argument that is better fixed in a branching rule for solving a nonconvexity gap

- virtual enum expr_type code ()

  code for comparison
- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX_EQ)

  implied bound processing
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  set up branching object by evaluating many branching points for each expression's arguments
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

Additional Inherited Members

7.87.1 Detailed Description

Power of an expression (binary operator), $f(x)^k$ with k constant.

Definition at line 22 of file CouenneExprOddPow.hpp.

7.87.2 Constructor & Destructor Documentation

7.87.2.1 Couenne::exprOddPow::exprOddPow (expression ∗∗ *al*, int *n* = 2) [inline]

Constructor.

Definition at line 27 of file CouenneExprOddPow.hpp.

7.87.2.2 Couenne::exprOddPow::exprOddPow (expression ∗ *arg0*, expression ∗ *arg1*) [inline]

Constructor with only two arguments.

Definition at line 31 of file CouenneExprOddPow.hpp.

7.87.3 Member Function Documentation

7.87.3.1 expression∗ Couenne::exprOddPow::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::exprPow.

Definition at line 35 of file CouenneExprOddPow.hpp.

7.87.3.2 std::string Couenne::exprOddPow::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprPow.

Definition at line 39 of file CouenneExprOddPow.hpp.

7.87.3.3 CouNumber Couenne::exprOddPow::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute power

Reimplemented from Couenne::exprPow.

Definition at line 90 of file CouenneExprOddPow.hpp.

7.87.3.4 void Couenne::exprOddPow::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::exprPow.

7.87.3.5 void Couenne::exprOddPow::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::exprPow.

7.87.3.6 exprAux* Couenne::exprOddPow::standardize (CouenneProblem * *p*, bool *addAux* = true) [virtual]

reduce expression in standard form, creating additional aux variables (and constraints)

Reimplemented from Couenne::exprPow.

7.87.3.7 void Couenne::exprOddPow::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between *this and *w

Reimplemented from Couenne::exprPow.

7.87.3.8 expression* Couenne::exprOddPow::getFixVar ( ) [inline], [virtual]

return an index to the variable's argument that is better fixed in a branching rule for solving a nonconvexity gap

Reimplemented from Couenne::exprPow.

Definition at line 64 of file CouenneExprOddPow.hpp.

7.87.3.9 virtual enum expr_type Couenne::exprOddPow::code ( ) [inline], [virtual]

code for comparison

Reimplemented from Couenne::exprPow.

Definition at line 68 of file CouenneExprOddPow.hpp.

7.87.3.10 bool Couenne::exprOddPow::impliedBound (int , CouNumber * , CouNumber * , t_chg_bounds * , enum *auxSign* = expression::AUX_EQ) [virtual]

implied bound processing

Reimplemented from Couenne::exprPow.

7.87.3.11 virtual CouNumber Couenne::exprOddPow::selectBranch (const CouenneObject * *obj*, const OsiBranchingInformation * *info*, expression *& *var*, double *& *brpts*, double *& *brDist*, int & *way*) [virtual]

set up branching object by evaluating many branching points for each expression's arguments

Reimplemented from Couenne::exprPow.

7.87.3.12 virtual bool Couenne::exprOddPow::isCuttable (CouenneProblem * problem, int index) const [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::exprPow.

The documentation for this class was generated from the following file:

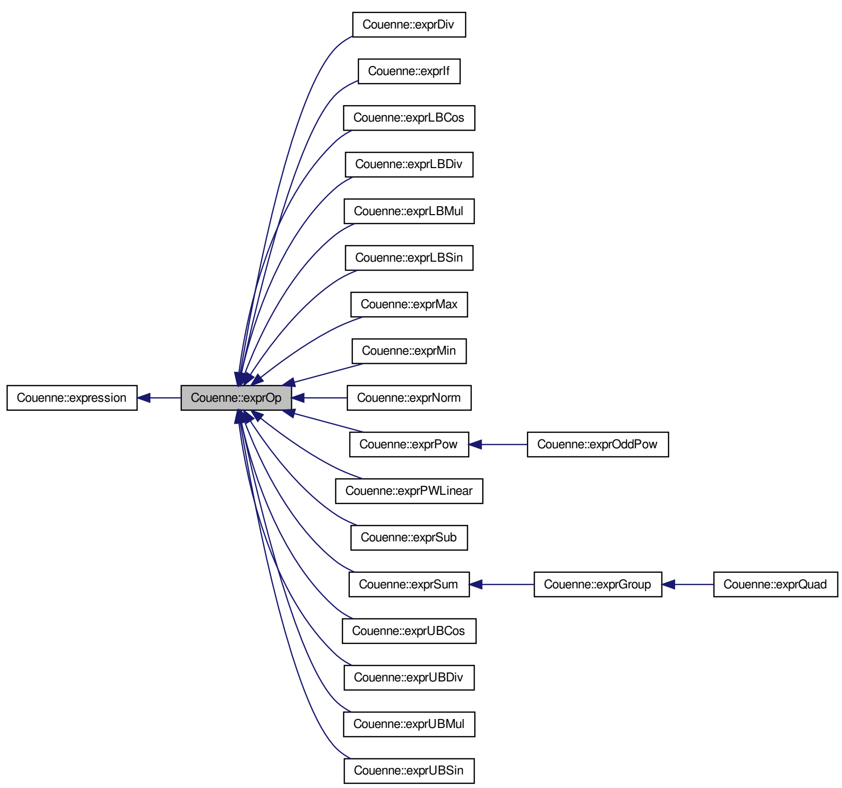
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprOddPow.hpp

7.88 Couenne::exprOp Class Reference

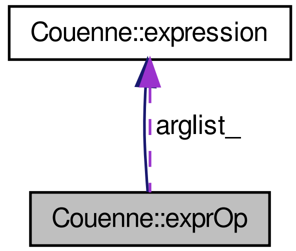
general n-ary operator-type expression: requires argument list.

`#include <CouenneExprOp.hpp>`

Inheritance diagram for Couenne::exprOp:



Collaboration diagram for Couenne::exprOp:



Public Member Functions

- virtual enum nodeType Type () const

  Node type.
- exprOp (expression ∗∗arglist, int nargs)

  Constructor.
- exprOp (expression ∗arg0, expression ∗arg1)

  Constructor with two arguments (for convenience)
- virtual ∼exprOp ()

  Destructor.
- exprOp (const exprOp &e, Domain ∗d=NULL)

  Copy constructor: only allocate space for argument list, which will be copied with clonearglist()
- expression ∗∗ ArgList () const

  return argument list
- virtual void ArgList (expression ∗∗al)

  set arglist (used in deleting nodes without deleting children)
- int nArgs () const

  return number of arguments
- virtual void print (std::ostream &out=std::cout, bool=false) const

  I/O.
- virtual enum pos printPos () const

  print position (PRE, INSIDE, POST)
- virtual std::string printOp () const

  print operator
- virtual int DepList (std::set< int > &deplist, enum dig_type type=ORIG_ONLY)

  fill in the set with all indices of variables appearing in the expression
- virtual expression ∗ simplify ()

  simplification
- expression ∗∗ clonearglist (Domain ∗d=NULL) const

  clone argument list (for use with clone method)
- int shrink_arglist (CouNumber, CouNumber)

compress argument list
- virtual int Linearity ()

  get a measure of "how linear" the expression is (see CouenneTypes.h)
- virtual exprAux ∗ standardize (CouenneProblem ∗, bool addAux=true)

  generate auxiliary variable
- virtual enum expr_type code ()

  return code to classify type of expression
- virtual bool isInteger ()

  is this expression integer?
- virtual int compare (exprOp &)

  compare with other generic exprOp
- virtual int rank ()

  used in rank-based branching variable choice
- virtual void fillDepSet (std::set< DepNode ∗, compNode > ∗dep, DepGraph ∗g)

  fill in dependence structure update dependence set with index of this variable
- virtual void replace (exprVar ∗, exprVar ∗)

  replace variable with other
- virtual void realign (const CouenneProblem ∗p)

  empty function to redirect variables to proper variable vector

Protected Attributes

- expression ∗∗ arglist_

  argument list is an array of pointers to other expressions
- int nargs_

  number of arguments (cardinality of arglist)

Additional Inherited Members

7.88.1 Detailed Description

general n-ary operator-type expression: requires argument list.

All non-unary and non-leaf operators, i.e., sum, subtraction, multiplication, power, division, max, min, etc. are derived from this class.

Definition at line 31 of file CouenneExprOp.hpp.

7.88.2 Constructor & Destructor Documentation

7.88.2.1 Couenne::exprOp::exprOp (**expression** ∗∗ ***arglist,*** int ***nargs***) [inline]

Constructor.

Definition at line 45 of file CouenneExprOp.hpp.

7.88.2.2 Couenne::exprOp::exprOp (**expression** ∗ ***arg0,*** **expression** ∗ ***arg1***) [inline]

Constructor with two arguments (for convenience)

Definition at line 51 of file CouenneExprOp.hpp.

7.88.2.3 virtual Couenne::exprOp::∼exprOp ( ) [virtual]

Destructor.

7.88.2.4 Couenne::exprOp::exprOp (const exprOp & *e*, Domain ∗ *d* = NULL) [inline]

Copy constructor: only allocate space for argument list, which will be copied with clonearglist()

Definition at line 61 of file CouenneExprOp.hpp.

7.88.3 Member Function Documentation

7.88.3.1 virtual enum nodeType Couenne::exprOp::Type ( ) const [inline], [virtual]

Node type.

Reimplemented from Couenne::expression.

Definition at line 41 of file CouenneExprOp.hpp.

7.88.3.2 expression∗∗ Couenne::exprOp::ArgList ( ) const [inline], [virtual]

return argument list

Reimplemented from Couenne::expression.

Definition at line 66 of file CouenneExprOp.hpp.

7.88.3.3 virtual void Couenne::exprOp::ArgList (expression ∗∗ *al*) [inline], [virtual]

set arglist (used in deleting nodes without deleting children)

Reimplemented from Couenne::expression.

Definition at line 70 of file CouenneExprOp.hpp.

7.88.3.4 int Couenne::exprOp::nArgs ( ) const [inline], [virtual]

return number of arguments

Reimplemented from Couenne::expression.

Definition at line 74 of file CouenneExprOp.hpp.

7.88.3.5 virtual void Couenne::exprOp::print (std::ostream & *out* = std::cout, bool = false) const [virtual]

I/O.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.88.3.6 virtual enum pos Couenne::exprOp::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Reimplemented in Couenne::exprUBMul, Couenne::exprUBCos, Couenne::exprUBSin, Couenne::exprUBDiv, Couenne::exprLBMul, Couenne::exprLBDiv, Couenne::exprMin, Couenne::exprLBCos, Couenne::exprLBSin, and Couenne::exprMax.

Definition at line 82 of file CouenneExprOp.hpp.

7.88.3.7 virtual std::string Couenne::exprOp::printOp ( ) const [inline], [virtual]

print operator

Reimplemented in Couenne::exprUBMul, Couenne::exprUBDiv, Couenne::exprUBCos, Couenne::exprUBSin, Couenne::exprLBMul, Couenne::exprLBDiv, Couenne::exprPow, Couenne::exprLBCos, Couenne::exprLBSin, Couenne::exprMin, Couenne::exprMax, Couenne::exprDiv, Couenne::exprSum, Couenne::exprOddPow, and Couenne::exprSub.

Definition at line 86 of file CouenneExprOp.hpp.

7.88.3.8 virtual int Couenne::exprOp::DepList (std::set< int > & *deplist,* enum dig_type *type* = ORIG_ONLY) [virtual]

fill in the set with all indices of variables appearing in the expression

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.88.3.9 virtual expression* Couenne::exprOp::simplify ( ) [virtual]

simplification

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, Couenne::exprGroup, Couenne::exprMin, Couenne::exprPow, Couenne::exprMax, Couenne::exprDiv, Couenne::exprSum, and Couenne::exprSub.

7.88.3.10 expression** Couenne::exprOp::clonearglist (Domain * *d* = NULL) const [inline]

clone argument list (for use with clone method)

Definition at line 97 of file CouenneExprOp.hpp.

7.88.3.11 int Couenne::exprOp::shrink_arglist (CouNumber , CouNumber)

compress argument list

7.88.3.12 virtual int Couenne::exprOp::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, Couenne::exprGroup, Couenne::exprMin, Couenne::exprPow, Couenne::exprMax, Couenne::exprDiv, Couenne::exprSum, and Couenne::exprSub.

Definition at line 110 of file CouenneExprOp.hpp.

7.88.3.13 virtual exprAux* Couenne::exprOp::standardize (CouenneProblem * , bool *addAux* = true) [virtual]

generate auxiliary variable

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprPow, Couenne::exprMin, Couenne::exprDiv, Couenne::exprMax, Couenne::exprSub, Couenne::exprSum, and Couenne::exprOddPow.

7.88.3.14 virtual enum expr_type Couenne::exprOp::code ( ) [inline], [virtual]

return code to classify type of expression

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, Couenne::exprGroup, Couenne::exprPow, Couenne::exprMin, Couenne::exprDiv, Couenne::exprMax, Couenne::exprSub, Couenne::exprSum, and Couenne::exprOddPow.

Definition at line 117 of file CouenneExprOp.hpp.

7.88.3.15 virtual bool Couenne::exprOp::isInteger ( ) [virtual]

is this expression integer?

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, Couenne::exprGroup, Couenne::exprDiv, and Couenne::exprPow.

7.88.3.16 virtual int Couenne::exprOp::compare (exprOp &) [virtual]

compare with other generic exprOp

7.88.3.17 virtual int Couenne::exprOp::rank ( ) [virtual]

used in rank-based branching variable choice

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.88.3.18 virtual void Couenne::exprOp::fillDepSet (std::set< DepNode *, compNode > * *dep*, DepGraph * *g*) [inline], [virtual]

fill in dependence structure update dependence set with index of this variable

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

Definition at line 131 of file CouenneExprOp.hpp.

7.88.3.19 virtual void Couenne::exprOp::replace (exprVar * , exprVar *) [virtual]

replace variable with other

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.88.3.20 virtual void Couenne::exprOp::realign (const CouenneProblem * *p*) [virtual]

empty function to redirect variables to proper variable vector

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.88.4 Member Data Documentation

7.88.4.1 expression** Couenne::exprOp::arglist_ [protected]

argument list is an array of pointers to other expressions

Definition at line 35 of file CouenneExprOp.hpp.

7.88.4.2 int Couenne::exprOp::nargs_ [protected]

number of arguments (cardinality of arglist)

Definition at line 36 of file CouenneExprOp.hpp.

The documentation for this class was generated from the following file:

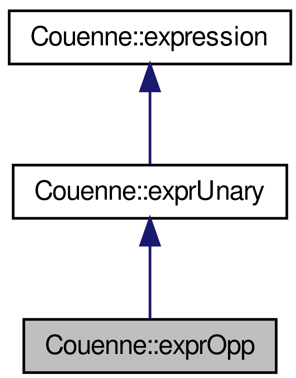
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprOp.hpp

7.89 Couenne::exprOpp Class Reference

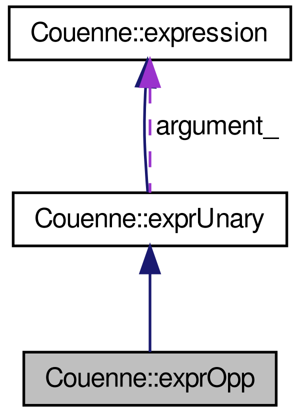
class opposite, $-f(x)$

`#include <CouenneExprOpp.hpp>`

Inheritance diagram for Couenne::exprOpp:



Collaboration diagram for Couenne::exprOpp:



Public Member Functions

- exprOpp (expression ∗al)

  Constructors, destructor.
- expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- unary_function F ()

  the operator's function
- void print (std::ostream &out, bool descend) const

  Output.
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)

  differentiation
- virtual expression ∗ simplify ()

  simplification
- int Linearity ()

  get a measure of "how linear" the expression is (see CouenneTypes.h)
- void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &, CouNumber &)

  Get value of lower and upper bound of an expression (if any)
- virtual void generateCuts (expression ∗, OsiCuts &, const CouenneCutGenerator ∗, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  special version for linear constraints
- virtual enum expr_type code ()

  code for comparisons

- bool isInteger ()

  is this expression integer?
- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX_EQ)

  implied bound processing
- exprAux ∗ standardize (CouenneProblem ∗, bool addAux=true)

  standardization (to deal with complex arguments)

Additional Inherited Members

7.89.1 Detailed Description

class opposite, $-f(x)$

Definition at line 27 of file CouenneExprOpp.hpp.

7.89.2 Constructor & Destructor Documentation

7.89.2.1 Couenne::exprOpp::exprOpp (expression ∗ *al*) [inline]

Constructors, destructor.

Definition at line 32 of file CouenneExprOpp.hpp.

7.89.3 Member Function Documentation

7.89.3.1 expression∗ Couenne::exprOpp::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 36 of file CouenneExprOpp.hpp.

7.89.3.2 unary_function Couenne::exprOpp::F ( ) [inline], [virtual]

the operator's function

Reimplemented from Couenne::exprUnary.

Definition at line 40 of file CouenneExprOpp.hpp.

7.89.3.3 void Couenne::exprOpp::print (std::ostream & *out*, bool *descend*) const [virtual]

Output.

Reimplemented from Couenne::exprUnary.

7.89.3.4 CouNumber Couenne::exprOpp::gradientNorm (const double ∗ *x*) [inline], [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

Definition at line 48 of file CouenneExprOpp.hpp.

7.89.3.5 expression* Couenne::exprOpp::differentiate (int *index*) [virtual]

differentiation

Reimplemented from Couenne::expression.

7.89.3.6 virtual expression* Couenne::exprOpp::simplify ( ) [virtual]

simplification

Reimplemented from Couenne::exprUnary.

7.89.3.7 int Couenne::exprOpp::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::exprUnary.

Definition at line 58 of file CouenneExprOpp.hpp.

7.89.3.8 void Couenne::exprOpp::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.89.3.9 void Couenne::exprOpp::getBounds (CouNumber & , CouNumber &) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.89.3.10 virtual void Couenne::exprOpp::generateCuts (expression * , OsiCuts & , const CouenneCutGenerator * , t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

special version for linear constraints

Reimplemented from Couenne::expression.

7.89.3.11 virtual enum expr_type Couenne::exprOpp::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprUnary.

Definition at line 75 of file CouenneExprOpp.hpp.

7.89.3.12 bool Couenne::exprOpp::isInteger ( ) [inline], [virtual]

is this expression integer?

Reimplemented from Couenne::exprUnary.

Definition at line 79 of file CouenneExprOpp.hpp.

7.89.3.13 bool Couenne::exprOpp::impliedBound (int , CouNumber * , CouNumber * , t_chg_bounds * , enum *auxSign* = expression::AUX_EQ) [virtual]

implied bound processing

Reimplemented from Couenne::expression.

7.89.3.14 exprAux* Couenne::exprOpp::standardize (CouenneProblem *, bool *addAux* = true) [virtual]

standardization (to deal with complex arguments)

Reimplemented from Couenne::exprUnary.

The documentation for this class was generated from the following file:

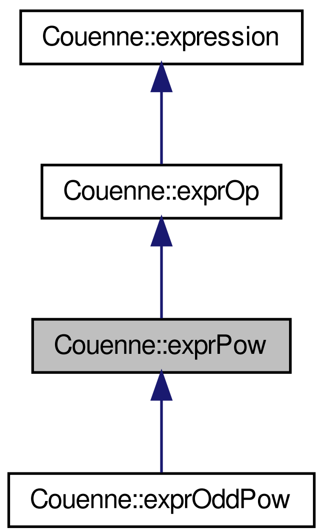
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprOpp.hpp

7.90 Couenne::exprPow Class Reference

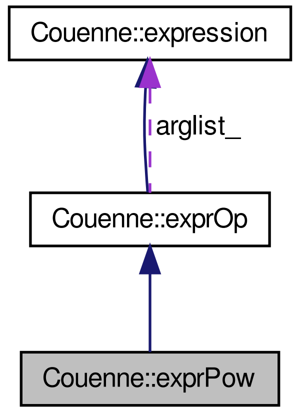
Power of an expression (binary operator), $f(x)^k$ with k constant.

`#include <CouenneExprPow.hpp>`

Inheritance diagram for Couenne::exprPow:



Collaboration diagram for Couenne::exprPow:



Public Member Functions

- exprPow (expression ∗∗al, int n=2, bool signpower=false)

  Constructor.
- exprPow (expression ∗arg0, expression ∗arg1, bool signpower=false)

  Constructor with only two arguments.
- expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- virtual std::string printOp () const

  print operator
- virtual CouNumber operator() ()

  function for the evaluation of the expression
- virtual CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- virtual expression ∗ differentiate (int index)

  differentiation
- virtual expression ∗ simplify ()

  simplification
- virtual int Linearity ()

  get a measure of "how linear" the expression is
- virtual bool isInteger ()

  is this expression integer?
- virtual void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)

- virtual exprAux * standardize (CouenneProblem *p, bool addAux=true)

  reduce expression in standard form, creating additional aux variables (and constraints)
- virtual void generateCuts (expression *w, OsiCuts &cs, const CouenneCutGenerator *cg, t_chg_bounds *=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  *generate equality between *this and *w*
- virtual expression * getFixVar ()

  return an index to the variable's argument that is better fixed in a branching rule for solving a nonconvexity gap
- virtual enum expr_type code ()

  code for comparison
- virtual bool impliedBound (int, CouNumber *, CouNumber *, t_chg_bounds *, enum auxSign=expression::AUX_EQ)

  implied bound processing
- virtual CouNumber selectBranch (const CouenneObject *obj, const OsiBranchingInformation *info, expression *&var, double *&brpts, double *&brDist, int &way)

  set up branching object by evaluating many branching points for each expression's arguments
- virtual void closestFeasible (expression *varind, expression *vardep, CouNumber &left, CouNumber &right) const

  compute y^{lv} and y^{uv} for Violation Transfer algorithm
- virtual bool isCuttable (CouenneProblem *problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side
- virtual bool isSignpower () const

  return whether this expression corresponds to a signed integer power

Additional Inherited Members

7.90.1 Detailed Description

Power of an expression (binary operator), $f(x)^k$ with k constant.

Definition at line 30 of file CouenneExprPow.hpp.

7.90.2 Constructor & Destructor Documentation

7.90.2.1 Couenne::exprPow::exprPow (expression ** *al*, int *n* = 2, bool *signpower* = false) [inline]

Constructor.

Definition at line 40 of file CouenneExprPow.hpp.

7.90.2.2 Couenne::exprPow::exprPow (expression * *arg0*, expression * *arg1*, bool *signpower* = false) [inline]

Constructor with only two arguments.

Definition at line 44 of file CouenneExprPow.hpp.

7.90.3 Member Function Documentation

7.90.3.1 expression* Couenne::exprPow::clone (Domain * *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOddPow.

Definition at line 48 of file CouenneExprPow.hpp.

7.90.3.2 virtual std::string Couenne::exprPow::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprOddPow.

Definition at line 52 of file CouenneExprPow.hpp.

7.90.3.3 CouNumber Couenne::exprPow::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute power

Implements Couenne::expression.

Reimplemented in Couenne::exprOddPow.

Definition at line 169 of file CouenneExprPow.hpp.

7.90.3.4 virtual CouNumber Couenne::exprPow::gradientNorm (const double * *x*) [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

7.90.3.5 virtual expression* Couenne::exprPow::differentiate (int *index*) [virtual]

differentiation

Reimplemented from Couenne::expression.

7.90.3.6 virtual expression* Couenne::exprPow::simplify ( ) [virtual]

simplification

Reimplemented from Couenne::exprOp.

7.90.3.7 virtual int Couenne::exprPow::Linearity ( ) [virtual]

get a measure of "how linear" the expression is

Reimplemented from Couenne::exprOp.

7.90.3.8 virtual bool Couenne::exprPow::isInteger ( ) [virtual]

is this expression integer?

Reimplemented from Couenne::exprOp.

7.90.3.9 virtual void Couenne::exprPow::getBounds (expression *&, expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOddPow.

7.90.3.10 virtual void Couenne::exprPow::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOddPow.

7.90.3.11 virtual exprAux∗ Couenne::exprPow::standardize (CouenneProblem ∗ *p*, bool *addAux* = true) [virtual]

reduce expression in standard form, creating additional aux variables (and constraints)

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprOddPow.

7.90.3.12 virtual void Couenne::exprPow::generateCuts (expression ∗ *w*, OsiCuts & *cs*, const CouenneCutGenerator ∗ *cg*, t_chg_bounds ∗ = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between ∗this and ∗w

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOddPow.

7.90.3.13 virtual expression∗ Couenne::exprPow::getFixVar ( ) [inline], [virtual]

return an index to the variable's argument that is better fixed in a branching rule for solving a nonconvexity gap

Reimplemented in Couenne::exprOddPow.

Definition at line 92 of file CouenneExprPow.hpp.

7.90.3.14 virtual enum expr_type Couenne::exprPow::code ( ) [inline], [virtual]

code for comparison

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprOddPow.

Definition at line 96 of file CouenneExprPow.hpp.

7.90.3.15 virtual bool Couenne::exprPow::impliedBound (int , CouNumber ∗ , CouNumber ∗ , t_chg_bounds ∗ , enum *auxSign* = expression::AUX_EQ) [virtual]

implied bound processing

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOddPow.

7.90.3.16 virtual CouNumber Couenne::exprPow::selectBranch (const CouenneObject ∗ *obj*, const OsiBranchingInformation ∗ *info*, expression ∗& *var*, double ∗& *brpts*, double ∗& *brDist*, int & *way*) [virtual]

set up branching object by evaluating many branching points for each expression's arguments

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOddPow.

7.90.3.17 virtual void Couenne::exprPow::closestFeasible (expression * *varind*, expression * *vardep*, CouNumber & *left*, CouNumber & *right*) const [virtual]

compute y^{lv} and y^{uv} for Violation Transfer algorithm

Reimplemented from Couenne::expression.

7.90.3.18 virtual bool Couenne::exprPow::isCuttable (CouenneProblem * *problem*, int *index*) const [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOddPow.

7.90.3.19 virtual bool Couenne::exprPow::isSignpower ( ) const [inline], [virtual]

return whether this expression corresponds to a signed integer power

Definition at line 123 of file CouenneExprPow.hpp.

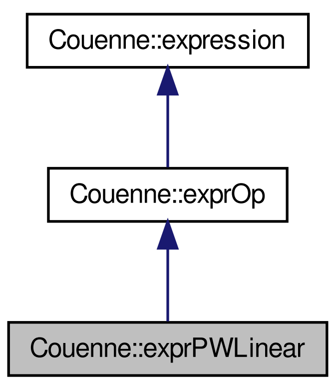
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprPow.hpp

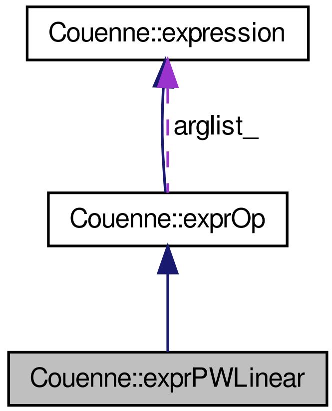
7.91 Couenne::exprPWLinear Class Reference

`#include <CouenneExprPWLinear.hpp>`

Inheritance diagram for Couenne::exprPWLinear:



Collaboration diagram for Couenne::exprPWLinear:



Additional Inherited Members

7.91.1 Detailed Description

Definition at line 18 of file CouenneExprPWLinear.hpp.

The documentation for this class was generated from the following file:

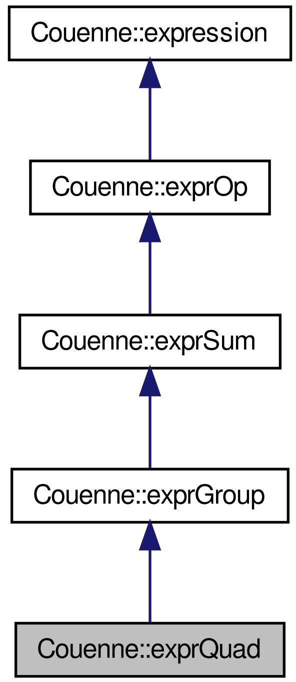
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprPWLinear.hpp

7.92 Couenne::exprQuad Class Reference

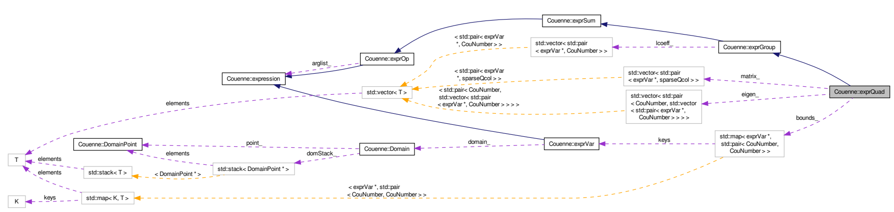
class exprQuad, with constant, linear and quadratic terms

`#include <CouenneExprQuad.hpp>`

Inheritance diagram for Couenne::exprQuad:



Collaboration diagram for Couenne::exprQuad:



Public Types

- typedef std::vector< std::pair
  < exprVar ∗, CouNumber > > sparseQcol

  matrix
- typedef std::vector< std::pair
  < exprVar ∗, sparseQcol > > sparseQ

Protected Attributes

Q matrix storage

Sparse implementation: given expression of the form $\sum_{i \in N, j \in N} q_{ij} x_i x_j$, qindexI_ and qindexJ_ contain respectively entries i and j for which q_{ij} is nonzero in $q_{ij} x_i x_j$:

- sparseQ matrix_

Convexification data structures

These are filled by alphaConvexify, which implements the alpha-convexification method described in the LaGO paper by Nowak and Vigerske – see also Adjiman and Floudas.

- std::vector< std::pair
  < CouNumber, std::vector
  < std::pair< exprVar
  ∗, CouNumber > > > > eigen_

  eigenvalues and eigenvectors
- std::map< exprVar ∗, std::pair
  < CouNumber, CouNumber > > bounds_

  current bounds (checked before re-computing eigenvalues/vectors)
- int nqterms_

  number of non-zeroes in Q
- exprQuad (CouNumber c0, std::vector< std::pair< exprVar ∗, CouNumber > > &lcoeff, std::vector< quadElem > &qcoeff, expression ∗∗al=NULL, int n=0)

  Constructor.
- exprQuad (const exprQuad &src, Domain ∗d=NULL)

  Copy constructor.
- sparseQ & getQ () const
- int getnQTerms ()
- virtual expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- virtual void print (std::ostream &=std::cout, bool=false) const

  Print expression to an iostream.
- virtual CouNumber operator() ()

  Function for the evaluation of the expression.
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- virtual expression ∗ differentiate (int index)

  Compute derivative of this expression with respect to variable whose index is passed as argument.
- virtual expression ∗ simplify ()

  Simplify expression.
- virtual int Linearity ()

  Get a measure of "how linear" the expression is.
- virtual void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &, CouNumber &)

  Get lower and upper bound of an expression (if any)

- virtual void generateCuts (expression *w, OsiCuts &cs, const CouenneCutGenerator *cg, t_chg_bounds *=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  Generate cuts for the quadratic expression, which are supporting hyperplanes of the concave upper envelope and the convex lower envelope.
- virtual bool alphaConvexify (const CouenneProblem *)

  Compute data for α-convexification of a quadratic form (fills in dCoeff_ and dIndex_ for the convex underestimator)
- void quadCuts (expression *w, OsiCuts &cs, const CouenneCutGenerator *cg)

  method exprQuad::quadCuts
- virtual int compare (exprQuad &)

  Compare two exprQuad.
- virtual enum expr_type code ()

  Code for comparisons.
- virtual int rank ()

  Used in rank-based branching variable choice.
- virtual bool isInteger ()

  is this expression integer?
- virtual int DepList (std::set< int > &deplist, enum dig_type type=ORIG_ONLY)

  fill in the set with all indices of variables appearing in the expression
- virtual CouNumber selectBranch (const CouenneObject *obj, const OsiBranchingInformation *info, expression *&var, double *&brpts, double *&brDist, int &way)

  Set up branching object by evaluating many branching points for each expression's arguments.
- virtual void fillDepSet (std::set< DepNode *, compNode > *dep, DepGraph *g)

  Fill dependence set of the expression associated with this auxiliary variable.
- virtual void replace (exprVar *x, exprVar *w)

  replace variable x with new (aux) w
- virtual void realign (const CouenneProblem *p)

  replace variable x with new (aux) w
- virtual bool impliedBound (int, CouNumber *, CouNumber *, t_chg_bounds *, enum auxSign=expression::AUX_EQ)

  implied bound processing
- CouNumber computeQBound (int sign)

  method to compute the bound based on sign: -1 for lower, +1 for upper
- virtual void closestFeasible (expression *varind, expression *vardep, CouNumber &left, CouNumber &right) const

  compute \$y^{lv}\$ and \$y^{uv}\$ for Violation Transfer algorithm
- void computeQuadFiniteBound (CouNumber &qMin, CouNumber &qMax, CouNumber *l, CouNumber *u, int &indInfLo, int &indInfUp)

  return lower and upper bound of quadratic expression
- virtual bool isCuttable (CouenneProblem *problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

Additional Inherited Members

7.92.1 Detailed Description

class exprQuad, with constant, linear and quadratic terms

It represents an expression of the form $a_0 + \sum_{i \in I} b_i x_i + x^T Q x + \sum_{i \in J} h_i(x)$, with $a_0 + \sum_{i \in I} b_i x_i$ an affine term, $x^T Q x$ a quadratic term, and a nonlinear sum $\sum_{i \in J} h_i(x)$. Standardization checks possible quadratic or linear terms in the latter and includes them in the former parts.

If $h_i(x)$ is a product of two nonlinear, nonquadratic functions $h'(x)h''(x)$, two auxiliary variables $w' = f'(x)$ and $w'' = h''(x)$ are created and the product $w'w''$ is included in the quadratic part of the exprQuad. If $h(x)$ nonquadratic, nonlinear function, an auxiliary variable $w = h(x)$ is created and included in the linear part.

Definition at line 44 of file CouenneExprQuad.hpp.

7.92.2 Member Typedef Documentation

7.92.2.1 typedef std::vector<std::pair <**exprVar** ∗, **CouNumber**> > **Couenne::exprQuad::sparseQcol**

matrix

Definition at line 49 of file CouenneExprQuad.hpp.

7.92.2.2 typedef std::vector<std::pair <**exprVar** ∗, **sparseQcol**> > **Couenne::exprQuad::sparseQ**

Definition at line 50 of file CouenneExprQuad.hpp.

7.92.3 Constructor & Destructor Documentation

7.92.3.1 Couenne::exprQuad::exprQuad (**CouNumber** *c0*, std::vector< std::pair< **exprVar** ∗, **CouNumber** > > & *lcoeff*, std::vector< **quadElem** > & *qcoeff*, **expression** ∗∗ *al* = NULL, int *n* = 0)

Constructor.

7.92.3.2 Couenne::exprQuad::exprQuad (const **exprQuad** & *src*, **Domain** ∗ *d* = NULL)

Copy constructor.

7.92.4 Member Function Documentation

7.92.4.1 **sparseQ**& Couenne::exprQuad::getQ ( ) const [inline]

Definition at line 94 of file CouenneExprQuad.hpp.

7.92.4.2 int Couenne::exprQuad::getnQTerms ( ) [inline]

Definition at line 97 of file CouenneExprQuad.hpp.

7.92.4.3 virtual **expression**∗ Couenne::exprQuad::clone (**Domain** ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::exprGroup.

Definition at line 101 of file CouenneExprQuad.hpp.

7.92.4.4 virtual void Couenne::exprQuad::print (std::ostream & = std::cout, bool = false) const [virtual]

Print expression to an iostream.

Reimplemented from Couenne::exprGroup.

7.92.4.5 CouNumber Couenne::exprQuad::operator() ( ) [inline], [virtual]

Function for the evaluation of the expression.

Compute sum of linear and nonlinear terms.

Reimplemented from Couenne::exprGroup.

Definition at line 293 of file CouenneExprQuad.hpp.

7.92.4.6 CouNumber Couenne::exprQuad::gradientNorm (const double * *x*) [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::exprGroup.

7.92.4.7 virtual expression* Couenne::exprQuad::differentiate (int *index*) [virtual]

Compute derivative of this expression with respect to variable whose index is passed as argument.

Reimplemented from Couenne::exprGroup.

7.92.4.8 virtual expression* Couenne::exprQuad::simplify ( ) [virtual]

Simplify expression.

Reimplemented from Couenne::exprGroup.

7.92.4.9 virtual int Couenne::exprQuad::Linearity ( ) [inline], [virtual]

Get a measure of "how linear" the expression is.

Reimplemented from Couenne::exprGroup.

Definition at line 121 of file CouenneExprQuad.hpp.

7.92.4.10 virtual void Couenne::exprQuad::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::exprGroup.

7.92.4.11 virtual void Couenne::exprQuad::getBounds (CouNumber & , CouNumber &) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::exprGroup.

7.92.4.12 virtual void Couenne::exprQuad::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

Generate cuts for the quadratic expression, which are supporting hyperplanes of the concave upper envelope and the convex lower envelope.

Reimplemented from Couenne::exprGroup.

7.92.4.13 virtual bool Couenne::exprQuad::alphaConvexify (const CouenneProblem *) [virtual]

Compute data for α-convexification of a quadratic form (fills in dCoeff_ and dIndex_ for the convex underestimator)

7.92.4.14 void Couenne::exprQuad::quadCuts (expression ∗ *w*, OsiCuts & *cs*, const CouenneCutGenerator ∗ *cg*)

method exprQuad::quadCuts

Based on the information (dIndex_, dCoeffLo_, dCoeffUp_) created/modified by alphaConvexify(), create convexification cuts for this expression.

The original constraint is :

$$\eta = a_0 + a^T x + x^T Q x$$

where η is the auxiliary corresponding to this expression and w_j are the auxiliaries corresponding to the other non-linear terms contained in the expression.

The under-estimator of $x^T Q x$ is given by

$$x^T Q x + \sum \lambda_{\min,i} (x_i - l_i)(u_i - x_i)$$

and its over-estimator is given by

$$x^T Q x + \sum \lambda_{\max,i} (x_i - l_i)(u_i - x_i)$$

(where $\lambda_{\min,i} = \frac{\lambda_{\min}}{w_i^2}$, $\lambda_{\max,i} = \frac{\lambda_{\max}}{w_i^2}$, and $w_i = u_i - l_i$), where $\lambda_{\max}$ ($\lambda_{\max}$) is the minimum (maximum) eigenvalue of the matrix $A = \mathrm{Diag}(\mathbf{u} - \mathbf{l}) Q \mathrm{Diag}(\mathbf{u} - \mathbf{l})$, obtained by pre- and post-multiplying Q by the diagonal matrix whose i-th element is $u_i - l_i$.

Let $\tilde{a}_0(\lambda)$, $\tilde{a}(\lambda)$ and $\tilde{Q}(\lambda)$ be

$$\tilde{a}_0(\lambda) = a_0 - \sum_{i=1}^{n} \lambda_i l_i u_i$$

$$\tilde{a}(\lambda) = a + \begin{bmatrix} \lambda_1 (u_1 + l_1) \\ \vdots \\ \lambda_n (u_n + l_n) \end{bmatrix},$$

$$\tilde{Q}(\lambda) = Q - \begin{pmatrix} \lambda_1 & & 0 \\ & \ddots & \\ 0 & & \lambda_n \end{pmatrix}.$$

The convex relaxation of the initial constraint is then given by the two constraints

$$\eta \geq \tilde{a}_0(\lambda_{\min}) + \tilde{a}(\lambda_{\min})^T x + x^T \tilde{Q}(\lambda_{\min}) x$$

$$\eta \leq \tilde{a}_0(\lambda_{\max}) + \tilde{a}(\lambda_{\max})^T x + x^T \tilde{Q}(\lambda_{\max}) x$$

The cut is computed as follow. Let (x^*, η^*) be the solution at hand. The two outer-approximation cuts are:

$$\eta \geq \tilde{a}_0(\lambda_{\min}) + \tilde{a}(\lambda_{\min})^T x + x^{*T} \tilde{Q}(\lambda_{\min})(2x - x^*)$$

and

$$\eta \leq \tilde{a}_0(\lambda_{\max}) + \tilde{a}(\lambda_{\max})^T x + x^{*T} \tilde{Q}(\lambda_{\max})(2x - x^*);$$

grouping coefficients, we get:

$$x^{*T} \tilde{Q}(\lambda_{\min}) x^* - \tilde{a}_0(\lambda_{\min}) \geq (\tilde{a}(\lambda_{\min}) + 2\tilde{Q}(\lambda_{\min}) x^*)^T x - \eta$$

and

$$x^{*T} \tilde{Q}(\lambda_{\max}) x^* - \tilde{a}_0(\lambda_{\max}) \leq (\tilde{a}(\lambda_{\max}) + 2\tilde{Q}(\lambda_{\max}) x^*)^T x - \eta$$

7.92.4.15 virtual int Couenne::exprQuad::compare (exprQuad &) [virtual]

Compare two exprQuad.

7.92.4.16 virtual enum expr_type Couenne::exprQuad::code ( ) [inline], [virtual]

Code for comparisons.

Reimplemented from Couenne::exprGroup.

Definition at line 231 of file CouenneExprQuad.hpp.

7.92.4.17 virtual int Couenne::exprQuad::rank ( ) [virtual]

Used in rank-based branching variable choice.

Reimplemented from Couenne::exprGroup.

7.92.4.18 virtual bool Couenne::exprQuad::isInteger ( ) [virtual]

is this expression integer?

Reimplemented from Couenne::exprGroup.

7.92.4.19 virtual int Couenne::exprQuad::DepList (std::set< int > & *deplist*, enum dig_type *type* = ORIG_ONLY) [virtual]

fill in the set with all indices of variables appearing in the expression

Reimplemented from Couenne::exprGroup.

7.92.4.20 virtual CouNumber Couenne::exprQuad::selectBranch (const CouenneObject * *obj*, const OsiBranchingInformation * *info*, expression *& *var*, double *& *brpts*, double *& *brDist*, int & *way*) [virtual]

Set up branching object by evaluating many branching points for each expression's arguments.

Reimplemented from Couenne::expression.

7.92.4.21 virtual void Couenne::exprQuad::fillDepSet (std::set< DepNode *, compNode > * *dep*, DepGraph * *g*) [virtual]

Fill dependence set of the expression associated with this auxiliary variable.

Reimplemented from Couenne::exprGroup.

7.92.4.22 virtual void Couenne::exprQuad::replace (exprVar * x, exprVar * w) [virtual]

replace variable x with new (aux) w

Reimplemented from Couenne::exprGroup.

7.92.4.23 virtual void Couenne::exprQuad::realign (const CouenneProblem * p) [virtual]

replace variable x with new (aux) w

Reimplemented from Couenne::exprGroup.

7.92.4.24 virtual bool Couenne::exprQuad::impliedBound (int , CouNumber * , CouNumber * , t_chg_bounds * , enum auxSign = expression::AUX_EQ) [virtual]

implied bound processing

Reimplemented from Couenne::exprSum.

7.92.4.25 CouNumber Couenne::exprQuad::computeQBound (int sign)

method to compute the bound based on sign: -1 for lower, +1 for upper

7.92.4.26 virtual void Couenne::exprQuad::closestFeasible (expression * varind, expression * vardep, CouNumber & left, CouNumber & right) const [virtual]

compute y^{lv} and y^{uv} for Violation Transfer algorithm

Reimplemented from Couenne::expression.

7.92.4.27 void Couenne::exprQuad::computeQuadFiniteBound (CouNumber & qMin, CouNumber & qMax, CouNumber * l, CouNumber * u, int & indInfLo, int & indInfUp) [protected]

return lower and upper bound of quadratic expression

7.92.4.28 virtual bool Couenne::exprQuad::isCuttable (CouenneProblem * problem, int index) const [inline], [protected], [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

Definition at line 286 of file CouenneExprQuad.hpp.

7.92.5 Member Data Documentation

7.92.5.1 sparseQ Couenne::exprQuad::matrix_ [mutable], [protected]

Definition at line 61 of file CouenneExprQuad.hpp.

7.92.5.2 std::vector<std::pair <CouNumber, std::vector <std::pair <exprVar *, CouNumber> > > > Couenne::exprQuad::eigen_ [mutable], [protected]

eigenvalues and eigenvectors

Definition at line 73 of file CouenneExprQuad.hpp.

7.92.5.3 std::map<exprVar *, std::pair <CouNumber, CouNumber> > Couenne::exprQuad::bounds_ [protected]

current bounds (checked before re-computing eigenvalues/vectors)

Definition at line 76 of file CouenneExprQuad.hpp.

7.92.5.4 int Couenne::exprQuad::nqterms_ [protected]

number of non-zeroes in Q

Definition at line 79 of file CouenneExprQuad.hpp.

The documentation for this class was generated from the following file:

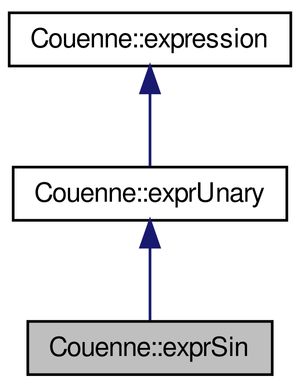
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprQuad.hpp

7.93 Couenne::exprSin Class Reference

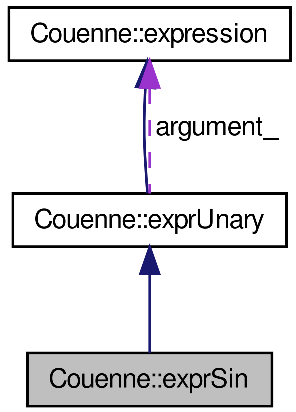
class for $\sin f(x)$

`#include <CouenneExprSin.hpp>`

Inheritance diagram for Couenne::exprSin:



Collaboration diagram for Couenne::exprSin:



Public Member Functions

- exprSin (expression ∗al)

  Constructors, destructor.
- expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- unary_function F ()

  the operator itself (e.g. sin, log...)
- std::string printOp () const

  print operator
- CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- expression ∗ differentiate (int index)

  differentiation
- void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)
- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate equality between ∗this and ∗w
- virtual enum expr_type code ()

  code for comparisons
- bool impliedBound (int index, CouNumber ∗l, CouNumber ∗u, t_chg_bounds ∗chg, enum auxSign=expression::AUX_EQ)

  implied bound processing

- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

  Set up branching object by evaluating many branching points for each expression's arguments.
- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

  closest feasible points in function in both directions
- virtual bool isCuttable (CouenneProblem ∗problem, int index) const

  can this expression be further linearized or are we on its concave ("bad") side

Additional Inherited Members

7.93.1 Detailed Description

class for $\sin f(x)$

Definition at line 47 of file CouenneExprSin.hpp.

7.93.2 Constructor & Destructor Documentation

7.93.2.1 Couenne::exprSin::exprSin (expression ∗ *al*) [inline]

Constructors, destructor.

Definition at line 52 of file CouenneExprSin.hpp.

7.93.3 Member Function Documentation

7.93.3.1 expression∗ Couenne::exprSin::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 56 of file CouenneExprSin.hpp.

7.93.3.2 unary_function Couenne::exprSin::F ( ) [inline], [virtual]

the operator itself (e.g. sin, log...)

Reimplemented from Couenne::exprUnary.

Definition at line 60 of file CouenneExprSin.hpp.

7.93.3.3 std::string Couenne::exprSin::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprUnary.

Definition at line 64 of file CouenneExprSin.hpp.

7.93.3.4 CouNumber Couenne::exprSin::gradientNorm (const double ∗ *x*) [inline], [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

Definition at line 68 of file CouenneExprSin.hpp.

7.93.3.5 expression* Couenne::exprSin::differentiate (int *index*) [virtual]

differentiation

Reimplemented from Couenne::expression.

7.93.3.6 void Couenne::exprSin::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.93.3.7 void Couenne::exprSin::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.93.3.8 void Couenne::exprSin::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate equality between *this and *w

Reimplemented from Couenne::expression.

7.93.3.9 virtual enum expr_type Couenne::exprSin::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprUnary.

Definition at line 90 of file CouenneExprSin.hpp.

7.93.3.10 bool Couenne::exprSin::impliedBound (int *index*, CouNumber * *l*, CouNumber * *u*, t_chg_bounds * *chg*, enum *auxSign* = expression::AUX_EQ) [inline], [virtual]

implied bound processing

Reimplemented from Couenne::expression.

Definition at line 94 of file CouenneExprSin.hpp.

7.93.3.11 virtual CouNumber Couenne::exprSin::selectBranch (const CouenneObject * *obj*, const OsiBranchingInformation * *info*, expression *& *var*, double *& *brpts*, double *& *brDist*, int & *way*) [inline], [virtual]

Set up branching object by evaluating many branching points for each expression's arguments.

Reimplemented from Couenne::expression.

Definition at line 111 of file CouenneExprSin.hpp.

7.93.3.12 virtual void Couenne::exprSin::closestFeasible (expression * *varind*, expression * *vardep*, CouNumber & *left*, CouNumber & *right*) const [virtual]

closest feasible points in function in both directions

Reimplemented from Couenne::expression.

7.93.3.13 virtual bool Couenne::exprSin::isCuttable (CouenneProblem * *problem*, int *index*) const [inline], [virtual]

can this expression be further linearized or are we on its concave ("bad") side

Reimplemented from Couenne::expression.

Definition at line 127 of file CouenneExprSin.hpp.

The documentation for this class was generated from the following file:

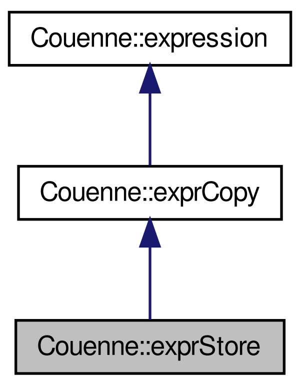
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprSin.hpp

7.94 Couenne::exprStore Class Reference

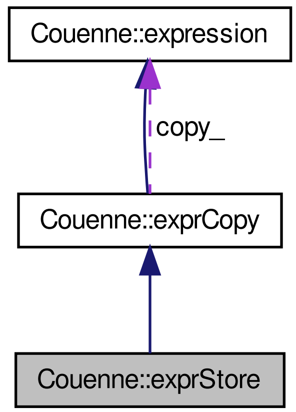
storage class for previously evaluated expressions

`#include <CouenneExprStore.hpp>`

Inheritance diagram for Couenne::exprStore:



Collaboration diagram for Couenne::exprStore:



Public Member Functions

- exprStore (expression ∗copy)

  Constructor.
- exprStore (const exprStore &e, Domain ∗d=NULL)

  Store constructor – Must go.
- virtual ∼exprStore ()

  Destructor.
- virtual void print (std::ostream &out=std::cout, bool descend=false) const

  Printing.
- virtual expression ∗ clone (Domain ∗d=NULL) const

  Cloning method.
- virtual CouNumber operator() ()

  function for evaluating the expression – returns value of exprCopy pointed to, which returns a value stored from a previous evaluation

Protected Attributes

- CouNumber value_

  Value of the (previously evaluated) expression.

Additional Inherited Members

7.94.1 Detailed Description

storage class for previously evaluated expressions

Definition at line 23 of file CouenneExprStore.hpp.

7.94.2 Constructor & Destructor Documentation

7.94.2.1 Couenne::exprStore::exprStore (expression * *copy*) [inline]

Constructor.

Definition at line 33 of file CouenneExprStore.hpp.

7.94.2.2 Couenne::exprStore::exprStore (const exprStore & *e*, Domain * *d* = NULL) [inline]

Store constructor – Must go.

Definition at line 37 of file CouenneExprStore.hpp.

7.94.2.3 virtual Couenne::exprStore::∼exprStore ( ) [inline], [virtual]

Destructor.

Definition at line 43 of file CouenneExprStore.hpp.

7.94.3 Member Function Documentation

7.94.3.1 virtual void Couenne::exprStore::print (std::ostream & *out* = std::cout, bool *descend* = false) const [virtual]

Printing.

Reimplemented from Couenne::exprCopy.

7.94.3.2 virtual expression* Couenne::exprStore::clone (Domain * *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::exprCopy.

Definition at line 51 of file CouenneExprStore.hpp.

7.94.3.3 virtual CouNumber Couenne::exprStore::operator() ( ) [inline], [virtual]

function for evaluating the expression – returns value of exprCopy pointed to, which returns a value stored from a previous evaluation

Reimplemented from Couenne::exprCopy.

Definition at line 57 of file CouenneExprStore.hpp.

7.94.4 Member Data Documentation

7.94.4.1 CouNumber Couenne::exprStore::value_ [protected]

Value of the (previously evaluated) expression.

Definition at line 28 of file CouenneExprStore.hpp.

The documentation for this class was generated from the following file:

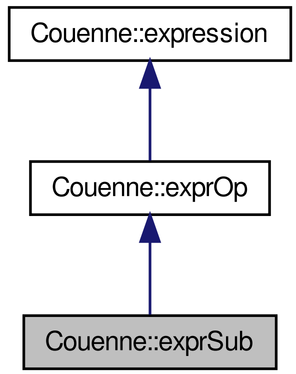
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprStore.hpp

7.95 Couenne::exprSub Class Reference

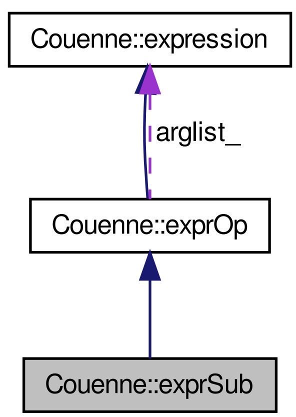
class for subtraction, $f(x) - g(x)$

`#include <CouenneExprSub.hpp>`

Inheritance diagram for Couenne::exprSub:



Collaboration diagram for Couenne::exprSub:



Public Member Functions

- exprSub (expression $**$al, int n=2)

Constructor.

- exprSub (expression ∗arg0, expression ∗arg1)

  Constructor with two explicit elements.
- expression ∗ clone (Domain ∗d=NULL) const

  Cloning method.
- std::string printOp () const

  print operator
- CouNumber operator() ()

  Function for the evaluation of the difference.
- expression ∗ differentiate (int index)

  Differentiation.
- expression ∗ simplify ()

  Simplification.
- virtual int Linearity ()

  Get a measure of "how linear" the expression is (see CouenneTypes.h)
- void getBounds (expression ∗&, expression ∗&)

  Get lower and upper bound of an expression (if any)
- void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)
- virtual exprAux ∗ standardize (CouenneProblem ∗p, bool addAux=true)

  Reduce expression in standard form, creating additional aux variables (and constraints)
- virtual void generateCuts (expression ∗, OsiCuts &, const CouenneCutGenerator ∗, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  Special version for linear constraints.
- virtual enum expr_type code ()

  Code for comparisons.
- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX_EQ)

  Implied bound processing.

Additional Inherited Members

7.95.1 Detailed Description

class for subtraction, $f(x) - g(x)$

Definition at line 22 of file CouenneExprSub.hpp.

7.95.2 Constructor & Destructor Documentation

7.95.2.1 Couenne::exprSub::exprSub (**expression** ∗∗ ***al,*** int ***n*** = 2) [inline]

Constructor.

Definition at line 27 of file CouenneExprSub.hpp.

7.95.2.2 Couenne::exprSub::exprSub (**expression** ∗ ***arg0,*** **expression** ∗ ***arg1***) [inline]

Constructor with two explicit elements.

Definition at line 31 of file CouenneExprSub.hpp.

7.95.3 Member Function Documentation

7.95.3.1 expression* Couenne::exprSub::clone (Domain * d = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::expression.

Definition at line 35 of file CouenneExprSub.hpp.

7.95.3.2 std::string Couenne::exprSub::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 39 of file CouenneExprSub.hpp.

7.95.3.3 CouNumber Couenne::exprSub::operator() ( ) [inline], [virtual]

Function for the evaluation of the difference.

Compute difference.

Implements Couenne::expression.

Definition at line 88 of file CouenneExprSub.hpp.

7.95.3.4 expression* Couenne::exprSub::differentiate (int *index*) [virtual]

Differentiation.

Reimplemented from Couenne::expression.

7.95.3.5 expression* Couenne::exprSub::simplify ( ) [virtual]

Simplification.

Reimplemented from Couenne::exprOp.

7.95.3.6 virtual int Couenne::exprSub::Linearity ( ) [inline], [virtual]

Get a measure of "how linear" the expression is (see CouenneTypes.h)

Reimplemented from Couenne::exprOp.

Definition at line 52 of file CouenneExprSub.hpp.

7.95.3.7 void Couenne::exprSub::getBounds (expression *& , expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.95.3.8 void Couenne::exprSub::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.95.3.9 virtual exprAux* Couenne::exprSub::standardize (CouenneProblem * *p*, bool *addAux* = true) [virtual]

Reduce expression in standard form, creating additional aux variables (and constraints)

Reimplemented from Couenne::exprOp.

7.95.3.10 virtual void Couenne::exprSub::generateCuts (expression *, OsiCuts &, const CouenneCutGenerator *, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

Special version for linear constraints.

Reimplemented from Couenne::expression.

7.95.3.11 virtual enum expr_type Couenne::exprSub::code ( ) [inline], [virtual]

Code for comparisons.

Reimplemented from Couenne::exprOp.

Definition at line 79 of file CouenneExprSub.hpp.

7.95.3.12 bool Couenne::exprSub::impliedBound (int, CouNumber *, CouNumber *, t_chg_bounds *, enum *auxSign* = expression::AUX_EQ) [virtual]

Implied bound processing.

Reimplemented from Couenne::expression.

The documentation for this class was generated from the following file:

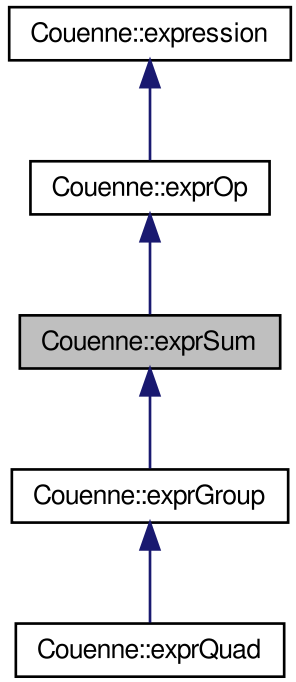
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprSub.hpp

7.96 Couenne::exprSum Class Reference

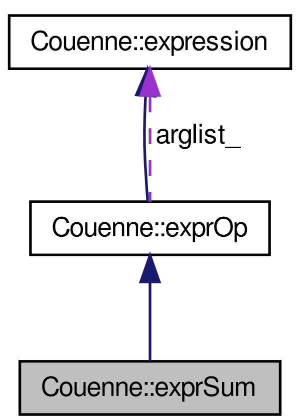
class sum, $\sum_{i=1}^{n} f_i(x)$

```
#include <CouenneExprSum.hpp>
```

Inheritance diagram for Couenne::exprSum:



Collaboration diagram for Couenne::exprSum:



Public Member Functions

- exprSum (expression ∗∗=NULL, int=0)

    Constructors, destructor.
- exprSum (expression ∗, expression ∗)

    Constructor with two elements.
- virtual ∼exprSum ()

    Empty destructor.
- virtual expression ∗ clone (Domain ∗d=NULL) const

    Cloning method.
- std::string printOp () const

    Print operator.
- virtual CouNumber operator() ()

    Function for the evaluation of the expression.
- virtual expression ∗ differentiate (int index)

    Differentiation.
- virtual expression ∗ simplify ()

    Simplification.
- virtual int Linearity ()

    Get a measure of "how linear" the expression is:
- virtual void getBounds (expression ∗&, expression ∗&)

    Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &, CouNumber &)

    Get lower and upper bound of an expression (if any)
- virtual exprAux ∗ standardize (CouenneProblem ∗p, bool addAux=true)

    Reduce expression in standard form, creating additional aux variables (and constraints)
- virtual void generateCuts (expression ∗, OsiCuts &, const CouenneCutGenerator ∗, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

    Special version for linear constraints.
- virtual enum expr_type code ()

    Code for comparison.
- virtual bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX_EQ)

    Implied bound.
- exprAux ∗ createQuadratic (CouenneProblem ∗)

    Checks for quadratic terms in the expression and returns an exprQuad if there are enough to create something that can be convexified.

Protected Member Functions

- int impliedBoundSum (CouNumber wl, CouNumber wu, std::vector< CouNumber > &xl, std::vector< CouNumber > &xu, std::vector< std::pair< int, CouNumber > > &nl, std::vector< std::pair< int, CouNumber > > &nu)

    inferring bounds on factors of a product

Additional Inherited Members

7.96.1 Detailed Description

class sum, $\sum_{i=1}^{n} f_i(x)$

Definition at line 22 of file CouenneExprSum.hpp.

7.96.2 Constructor & Destructor Documentation

7.96.2.1 Couenne::exprSum::exprSum (**expression** ** = NULL, int = 0)

Constructors, destructor.

7.96.2.2 Couenne::exprSum::exprSum (**expression** * , **expression** *)

Constructor with two elements.

7.96.2.3 virtual Couenne::exprSum::∼exprSum ( ) [inline], [virtual]

Empty destructor.

Definition at line 33 of file CouenneExprSum.hpp.

7.96.3 Member Function Documentation

7.96.3.1 virtual **expression*** Couenne::exprSum::clone (**Domain** * *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

Definition at line 36 of file CouenneExprSum.hpp.

7.96.3.2 std::string Couenne::exprSum::printOp ( ) const [inline], [virtual]

Print operator.

Reimplemented from Couenne::exprOp.

Definition at line 40 of file CouenneExprSum.hpp.

7.96.3.3 **CouNumber** Couenne::exprSum::operator() ( ) [inline], [virtual]

Function for the evaluation of the expression.

compute sum

Implements Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

Definition at line 118 of file CouenneExprSum.hpp.

7.96.3.4 virtual **expression*** Couenne::exprSum::differentiate (int *index*) [virtual]

Differentiation.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.96.3.5 virtual expression* Couenne::exprSum::simplify ( ) [virtual]

Simplification.

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.96.3.6 virtual int Couenne::exprSum::Linearity ( ) [virtual]

Get a measure of "how linear" the expression is:

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.96.3.7 virtual void Couenne::exprSum::getBounds (expression *&, expression *&) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.96.3.8 virtual void Couenne::exprSum::getBounds (CouNumber &, CouNumber &) [virtual]

Get lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.96.3.9 virtual exprAux* Couenne::exprSum::standardize (CouenneProblem * p, bool addAux = true) [virtual]

Reduce expression in standard form, creating additional aux variables (and constraints)

Reimplemented from Couenne::exprOp.

7.96.3.10 virtual void Couenne::exprSum::generateCuts (expression *, OsiCuts &, const CouenneCutGenerator *, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

Special version for linear constraints.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

7.96.3.11 virtual enum expr_type Couenne::exprSum::code ( ) [inline], [virtual]

Code for comparison.

Reimplemented from Couenne::exprOp.

Reimplemented in Couenne::exprQuad, and Couenne::exprGroup.

Definition at line 73 of file CouenneExprSum.hpp.

7.96.3.12 virtual bool Couenne::exprSum::impliedBound (int , CouNumber ∗ , CouNumber ∗ , t_chg_bounds ∗ , enum *auxSign* = expression::AUX_EQ) [virtual]

Implied bound.

An expression

$w = a0 + \sum_{i \in I1} a_i x_i + \sum_{i \in I2} a_i x_i$

is given such that all a_i are positive for $i \in I1$ and negative for $i \in I2$. If the bounds on $w \in [l,u]$, implied bounds on all $x_i, i \in I1 \cup I2$ are as follows:

$\forall i \in I1 \; x_i \geq (l - a0 - \sum_{j \in I1 | j \neq i} a_j u_j - \sum_{j \in I2} a_j l_j)/a_i \; x_i \leq (u - a0 - \sum_{j \in I1 | j \neq i} a_j l_j - \sum_{j \in I2} a_j u_j)/a_i$

$\forall i \in I2 \; x_i \geq (u - a0 - \sum_{j \in I1} a_j u_j - \sum_{j \in I2 | j \neq i} a_j l_j)/a_i \; x_i \leq (l - a0 - \sum_{j \in I1} a_j l_j - \sum_{j \in I2 | j \neq i} a_j u_j)/a_i,$

where l_i and u_i are lower and upper bound, respectively, of x_i. We also have to check if some of these bounds are infinite.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprQuad.

7.96.3.13 exprAux∗ Couenne::exprSum::createQuadratic (CouenneProblem ∗)

Checks for quadratic terms in the expression and returns an exprQuad if there are enough to create something that can be convexified.

7.96.3.14 int Couenne::exprSum::impliedBoundSum (CouNumber *wl*, CouNumber *wu*, std::vector< CouNumber > & *xl*, std::vector< CouNumber > & *xu*, std::vector< std::pair< int, CouNumber > > & *nl*, std::vector< std::pair< int, CouNumber > > & *nu*) [protected]

inferring bounds on factors of a product

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprSum.hpp

7.97 Couenne::exprTrilinear Class Reference

class for multiplications

`#include <CouenneExprTrilinear.hpp>`

Public Member Functions

- exprTrilinear (expression ∗∗, int)
  Constructor.
- exprTrilinear (expression ∗, expression ∗, expression ∗)
  Constructor with two arguments.
- expression ∗ clone (Domain ∗d=NULL) const
  Cloning method.
- CouNumber gradientNorm (const double ∗x)
  return l-2 norm of gradient at given point
- virtual void getBounds (expression ∗&, expression ∗&)
  Get lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &lb, CouNumber &ub)

Get value of lower and upper bound of an expression (if any)

- void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

    generate equality between ∗this and ∗w
- virtual enum expr_type code ()

    code for comparison
- bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum Couenne::expression::auxSign=Couenne::expression::AUX_EQ)

    implied bound processing
- virtual CouNumber selectBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way)

    set up branching object by evaluating many branching points for each expression's arguments
- virtual void closestFeasible (expression ∗varind, expression ∗vardep, CouNumber &left, CouNumber &right) const

    compute y^{lv} and y^{uv} for Violation Transfer algorithm

7.97.1 Detailed Description

class for multiplications

Definition at line 21 of file CouenneExprTrilinear.hpp.

7.97.2 Constructor & Destructor Documentation

7.97.2.1 Couenne::exprTrilinear::exprTrilinear (expression ∗∗ , int)

Constructor.

7.97.2.2 Couenne::exprTrilinear::exprTrilinear (expression ∗ , expression ∗ , expression ∗)

Constructor with two arguments.

7.97.3 Member Function Documentation

7.97.3.1 expression∗ Couenne::exprTrilinear::clone (Domain ∗ d = NULL) const [inline]

Cloning method.

Definition at line 32 of file CouenneExprTrilinear.hpp.

7.97.3.2 CouNumber Couenne::exprTrilinear::gradientNorm (const double ∗ x)

return l-2 norm of gradient at given point

7.97.3.3 virtual void Couenne::exprTrilinear::getBounds (expression ∗& , expression ∗&) [virtual]

Get lower and upper bound of an expression (if any)

7.97.3.4 virtual void Couenne::exprTrilinear::getBounds (CouNumber & lb, CouNumber & ub) [virtual]

Get value of lower and upper bound of an expression (if any)

7.97.3.5 void Couenne::exprTrilinear::generateCuts (expression * *w*, OsiCuts & *cs*, const CouenneCutGenerator * *cg*, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY)

generate equality between *this and *w

7.97.3.6 virtual enum expr_type Couenne::exprTrilinear::code ( ) [inline], [virtual]

code for comparison

Definition at line 52 of file CouenneExprTrilinear.hpp.

7.97.3.7 bool Couenne::exprTrilinear::impliedBound (int , CouNumber * , CouNumber * , t_chg_bounds * , enum Couenne::expression::auxSign = Couenne::expression::AUX_EQ)

implied bound processing

7.97.3.8 virtual CouNumber Couenne::exprTrilinear::selectBranch (const CouenneObject * *obj*, const OsiBranchingInformation * *info*, expression *& *var*, double *& *brpts*, double *& *brDist*, int & *way*) [virtual]

set up branching object by evaluating many branching points for each expression's arguments

7.97.3.9 virtual void Couenne::exprTrilinear::closestFeasible (expression * *varind*, expression * *vardep*, CouNumber & *left*, CouNumber & *right*) const [virtual]

compute y^{lv} and y^{uv} for Violation Transfer algorithm

The documentation for this class was generated from the following file:

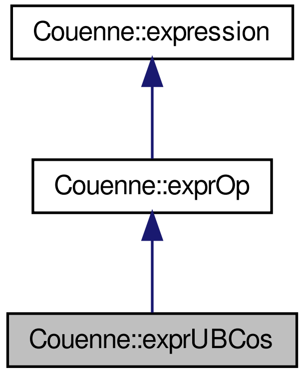
- /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprTrilinear.hpp

7.98 Couenne::exprUBCos Class Reference

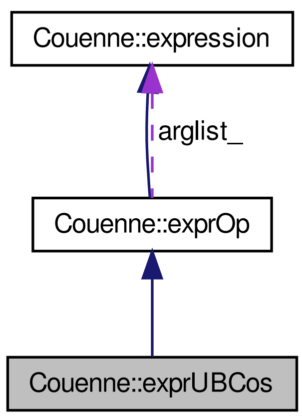
class to compute lower bound of a cosine based on the bounds of its arguments

`#include <CouenneExprBCos.hpp>`

Inheritance diagram for Couenne::exprUBCos:



Collaboration diagram for Couenne::exprUBCos:



Public Member Functions

- exprUBCos (expression ∗lb, expression ∗ub)

    Constructors, destructor.
- expression ∗ clone (Domain ∗d=NULL) const

    cloning method
- CouNumber operator() ()

function for the evaluation of the expression
- std::string printOp () const

  print operator
- enum pos printPos () const

  print position (PRE, INSIDE, POST)

Additional Inherited Members

7.98.1 Detailed Description

class to compute lower bound of a cosine based on the bounds of its arguments

Definition at line 80 of file CouenneExprBCos.hpp.

7.98.2 Constructor & Destructor Documentation

7.98.2.1 Couenne::exprUBCos::exprUBCos (expression ∗ *lb*, expression ∗ *ub*) [inline]

Constructors, destructor.

Definition at line 85 of file CouenneExprBCos.hpp.

7.98.3 Member Function Documentation

7.98.3.1 expression∗ Couenne::exprUBCos::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 92 of file CouenneExprBCos.hpp.

7.98.3.2 CouNumber Couenne::exprUBCos::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute sum

Implements Couenne::expression.

Definition at line 111 of file CouenneExprBCos.hpp.

7.98.3.3 std::string Couenne::exprUBCos::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 100 of file CouenneExprBCos.hpp.

7.98.3.4 enum pos Couenne::exprUBCos::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Reimplemented from Couenne::exprOp.

Definition at line 104 of file CouenneExprBCos.hpp.

The documentation for this class was generated from the following file:

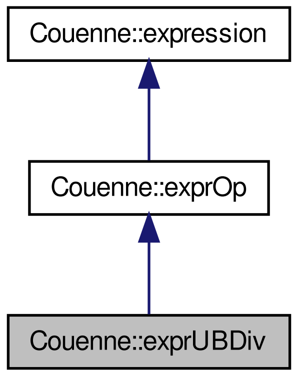
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBCos.hpp

7.99 Couenne::exprUBDiv Class Reference

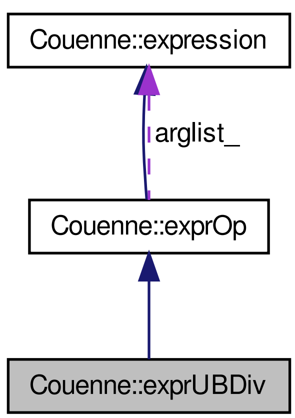
class to compute upper bound of a fraction based on the bounds of both numerator and denominator

`#include <CouenneExprBDiv.hpp>`

Inheritance diagram for Couenne::exprUBDiv:



Collaboration diagram for Couenne::exprUBDiv:



Public Member Functions

- exprUBDiv (expression **al, int n)
  Constructors, destructor.
- expression * clone (Domain *d=NULL) const
  cloning method
- CouNumber operator() ()
  function for the evaluation of the expression
- enum pos printPos () const
  print position (PRE, INSIDE, POST)
- std::string printOp () const
  print operator

Additional Inherited Members

7.99.1 Detailed Description

class to compute upper bound of a fraction based on the bounds of both numerator and denominator

Definition at line 85 of file CouenneExprBDiv.hpp.

7.99.2 Constructor & Destructor Documentation

7.99.2.1 Couenne::exprUBDiv::exprUBDiv (expression ** *al*, int *n*) [inline]

Constructors, destructor.

Definition at line 90 of file CouenneExprBDiv.hpp.

7.99.3 Member Function Documentation

7.99.3.1 expression* Couenne::exprUBDiv::clone (Domain * *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 94 of file CouenneExprBDiv.hpp.

7.99.3.2 CouNumber Couenne::exprUBDiv::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute sum

Implements Couenne::expression.

Definition at line 112 of file CouenneExprBDiv.hpp.

7.99.3.3 enum pos Couenne::exprUBDiv::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Reimplemented from Couenne::exprOp.

Definition at line 101 of file CouenneExprBDiv.hpp.

7.99.3.4 std::string Couenne::exprUBDiv::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 105 of file CouenneExprBDiv.hpp.

The documentation for this class was generated from the following file:

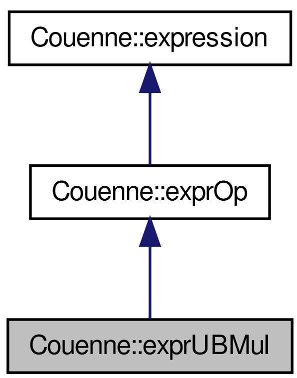
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBDiv.hpp

7.100 Couenne::exprUBMul Class Reference

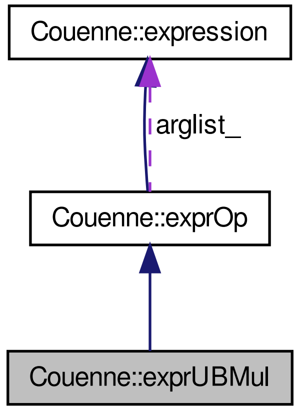
class to compute upper bound of a product based on the bounds of both factors

`#include <CouenneExprBMul.hpp>`

Inheritance diagram for Couenne::exprUBMul:



Collaboration diagram for Couenne::exprUBMul:



Public Member Functions

- exprUBMul (expression ∗∗al, int n)

  Constructors, destructor.
- expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- CouNumber operator() ()

  function for the evaluation of the expression
- enum pos printPos () const

  print position (PRE, INSIDE, POST)
- std::string printOp () const

  print operator

Additional Inherited Members

7.100.1 Detailed Description

class to compute upper bound of a product based on the bounds of both factors

Definition at line 93 of file CouenneExprBMul.hpp.

7.100.2 Constructor & Destructor Documentation

7.100.2.1 Couenne::exprUBMul::exprUBMul (**expression** ∗∗ *al,* int *n*) [inline]

Constructors, destructor.

Definition at line 98 of file CouenneExprBMul.hpp.

7.100.3 Member Function Documentation

7.100.3.1 expression∗ Couenne::exprUBMul::clone (Domain ∗ d = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 102 of file CouenneExprBMul.hpp.

7.100.3.2 CouNumber Couenne::exprUBMul::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute sum

Implements Couenne::expression.

Definition at line 120 of file CouenneExprBMul.hpp.

7.100.3.3 enum pos Couenne::exprUBMul::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Reimplemented from Couenne::exprOp.

Definition at line 109 of file CouenneExprBMul.hpp.

7.100.3.4 std::string Couenne::exprUBMul::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 113 of file CouenneExprBMul.hpp.

The documentation for this class was generated from the following file:

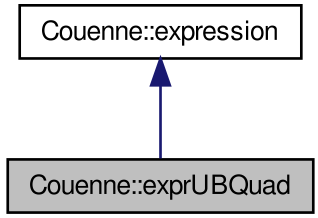
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBMul.hpp

7.101 Couenne::exprUBQuad Class Reference

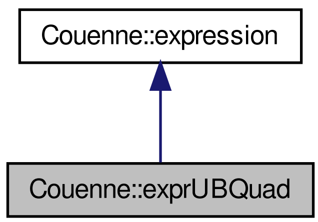
class to compute upper bound of a fraction based on the bounds of both numerator and denominator

`#include <CouenneExprBQuad.hpp>`

Inheritance diagram for Couenne::exprUBQuad:



Collaboration diagram for Couenne::exprUBQuad:



Public Member Functions

- exprUBQuad (exprQuad ∗ref)

  Constructor.
- exprUBQuad (const exprUBQuad &src, Domain ∗d=NULL)

  copy constructor
- ∼exprUBQuad ()

  destructor
- expression ∗ clone (Domain ∗d=NULL) const

  cloning method
- CouNumber operator() ()

  function for the evaluation of the expression
- virtual void print (std::ostream &s=std::cout, bool descend=false) const

  I/O.

Additional Inherited Members

7.101.1 Detailed Description

class to compute upper bound of a fraction based on the bounds of both numerator and denominator

Definition at line 60 of file CouenneExprBQuad.hpp.

7.101.2 Constructor & Destructor Documentation

7.101.2.1 Couenne::exprUBQuad::exprUBQuad (exprQuad * *ref*) [inline]

Constructor.

Definition at line 67 of file CouenneExprBQuad.hpp.

7.101.2.2 Couenne::exprUBQuad::exprUBQuad (const exprUBQuad & *src*, Domain * *d* = NULL) [inline]

copy constructor

Definition at line 71 of file CouenneExprBQuad.hpp.

7.101.2.3 Couenne::exprUBQuad::~exprUBQuad ( ) [inline]

destructor

Definition at line 77 of file CouenneExprBQuad.hpp.

7.101.3 Member Function Documentation

7.101.3.1 expression* Couenne::exprUBQuad::clone (Domain * *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 80 of file CouenneExprBQuad.hpp.

7.101.3.2 CouNumber Couenne::exprUBQuad::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

Implements Couenne::expression.

Definition at line 84 of file CouenneExprBQuad.hpp.

7.101.3.3 virtual void Couenne::exprUBQuad::print (std::ostream & *s* = std::cout, bool *descend* = false) const [inline], [virtual]

I/O.

Reimplemented from Couenne::expression.

Definition at line 88 of file CouenneExprBQuad.hpp.

The documentation for this class was generated from the following file:

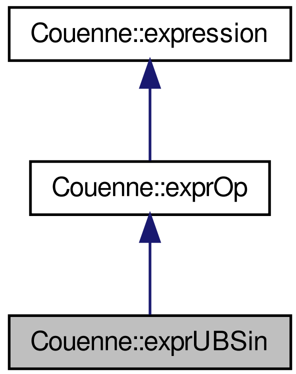
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBQuad.hpp

7.102 Couenne::exprUBSin Class Reference

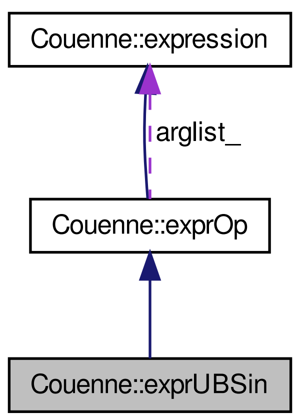
class to compute lower bound of a sine based on the bounds on its arguments

`#include <CouenneExprBSin.hpp>`

Inheritance diagram for Couenne::exprUBSin:



Collaboration diagram for Couenne::exprUBSin:



Public Member Functions

- exprUBSin (expression ∗lb, expression ∗ub)

Constructors, destructor.

- expression ∗ clone (Domain ∗d=NULL) const

  cloning method

- CouNumber operator() ()

  function for the evaluation of the expression

- std::string printOp () const

  print operator

- enum pos printPos () const

  print position (PRE, INSIDE, POST)

Additional Inherited Members

7.102.1 Detailed Description

class to compute lower bound of a sine based on the bounds on its arguments

Definition at line 80 of file CouenneExprBSin.hpp.

7.102.2 Constructor & Destructor Documentation

7.102.2.1 Couenne::exprUBSin::exprUBSin (expression ∗ *lb*, expression ∗ *ub*) [inline]

Constructors, destructor.

Definition at line 85 of file CouenneExprBSin.hpp.

7.102.3 Member Function Documentation

7.102.3.1 expression∗ Couenne::exprUBSin::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::expression.

Definition at line 92 of file CouenneExprBSin.hpp.

7.102.3.2 CouNumber Couenne::exprUBSin::operator() ( ) [inline], [virtual]

function for the evaluation of the expression

compute sum

Implements Couenne::expression.

Definition at line 111 of file CouenneExprBSin.hpp.

7.102.3.3 std::string Couenne::exprUBSin::printOp ( ) const [inline], [virtual]

print operator

Reimplemented from Couenne::exprOp.

Definition at line 100 of file CouenneExprBSin.hpp.

7.102.3.4 enum pos Couenne::exprUBSin::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Reimplemented from Couenne::exprOp.

Definition at line 104 of file CouenneExprBSin.hpp.

The documentation for this class was generated from the following file:

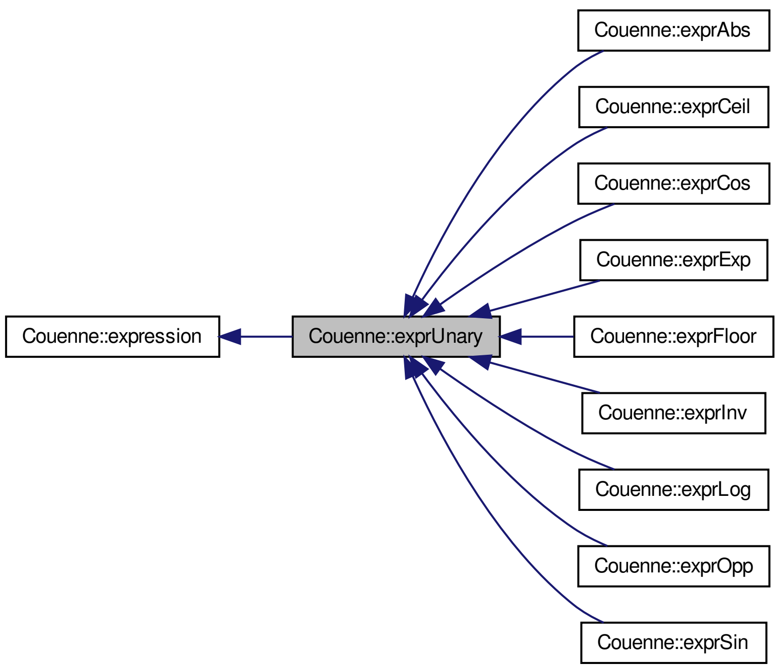
- /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBSin.hpp

7.103 Couenne::exprUnary Class Reference

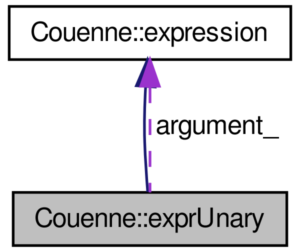
expression class for unary functions (sin, log, etc.)

`#include <CouenneExprUnary.hpp>`

Inheritance diagram for Couenne::exprUnary:



Collaboration diagram for Couenne::exprUnary:



Public Member Functions

- virtual enum nodeType Type () const

  node type
- exprUnary (expression ∗argument)

  Constructor.
- virtual unary_function F ()

  the operator itself (e.g. sin, log...)
- ∼exprUnary ()

  Destructor.
- int nArgs () const

  return number of arguments
- virtual expression ∗ Argument () const

  return argument (when applicable, i.e., with univariate functions)
- virtual expression ∗∗ ArgPtr ()

  return pointer to argument (when applicable, i.e., with univariate functions)
- virtual void print (std::ostream &out=std::cout, bool=false) const

  print this expression to iostream
- virtual enum pos printPos () const

  print position (PRE, INSIDE, POST)
- virtual std::string printOp () const

  print operator
- virtual CouNumber operator() ()

  compute value of unary operator
- virtual int DepList (std::set< int > &deplist, enum dig_type type=ORIG_ONLY)

  fill in the set with all indices of variables appearing in the expression
- expression ∗ simplify ()

  simplification
- virtual int Linearity ()

  get a measure of "how linear" the expression is (see CouenneTypes.h) for general univariate functions, return nonlinear.
- virtual exprAux ∗ standardize (CouenneProblem ∗, bool addAux=true)

reduce expression in standard form, creating additional aux variables (and constraints)

- virtual enum expr_type code ()

  type of operator
- virtual bool isInteger ()

  is this expression integer?
- virtual int compare (exprUnary &)

  compare two unary functions
- virtual int rank ()

  used in rank-based branching variable choice
- virtual void fillDepSet (std::set< DepNode $*$, compNode > $*$dep, DepGraph $*$g)

  fill in dependence structure
- virtual void replace (exprVar $*$, exprVar $*$)

  replace variable with other
- virtual void realign (const CouenneProblem $*$p)

  empty function to redirect variables to proper variable vector

Protected Attributes

- expression $*$ argument_

  single argument taken by this expression

Additional Inherited Members

7.103.1 Detailed Description

expression class for unary functions (sin, log, etc.)

univariate operator-type expression: requires single argument. All unary functions are derived from this base class, which has a lot of common methods that need not be re-implemented by any univariate class.

Definition at line 33 of file CouenneExprUnary.hpp.

7.103.2 Constructor & Destructor Documentation

7.103.2.1 Couenne::exprUnary::exprUnary (expression $*$ *argument*) [inline]

Constructor.

Definition at line 47 of file CouenneExprUnary.hpp.

7.103.2.2 Couenne::exprUnary::∼exprUnary ( ) [inline]

Destructor.

Definition at line 56 of file CouenneExprUnary.hpp.

7.103.3 Member Function Documentation

7.103.3.1 virtual enum nodeType Couenne::exprUnary::Type ( ) const [inline], [virtual]

node type

Reimplemented from Couenne::expression.

Definition at line 43 of file CouenneExprUnary.hpp.

7.103.3.2 virtual unary_function Couenne::exprUnary::F ( ) [inline], [virtual]

the operator itself (e.g. sin, log...)

Reimplemented in Couenne::exprSin, Couenne::exprInv, Couenne::exprOpp, Couenne::exprExp, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, Couenne::exprLog, and Couenne::exprAbs.

Definition at line 52 of file CouenneExprUnary.hpp.

7.103.3.3 int Couenne::exprUnary::nArgs ( ) const [inline], [virtual]

return number of arguments

Reimplemented from Couenne::expression.

Definition at line 60 of file CouenneExprUnary.hpp.

7.103.3.4 virtual expression* Couenne::exprUnary::Argument ( ) const [inline], [virtual]

return argument (when applicable, i.e., with univariate functions)

Reimplemented from Couenne::expression.

Definition at line 64 of file CouenneExprUnary.hpp.

7.103.3.5 virtual expression** Couenne::exprUnary::ArgPtr ( ) [inline], [virtual]

return pointer to argument (when applicable, i.e., with univariate functions)

Reimplemented from Couenne::expression.

Definition at line 68 of file CouenneExprUnary.hpp.

7.103.3.6 virtual void Couenne::exprUnary::print (std::ostream & *out* = std::cout, bool = false) const [virtual]

print this expression to iostream

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprInv, and Couenne::exprOpp.

7.103.3.7 virtual enum pos Couenne::exprUnary::printPos ( ) const [inline], [virtual]

print position (PRE, INSIDE, POST)

Definition at line 75 of file CouenneExprUnary.hpp.

7.103.3.8 virtual std::string Couenne::exprUnary::printOp ( ) const [inline], [virtual]

print operator

Reimplemented in Couenne::exprSin, Couenne::exprAbs, Couenne::exprExp, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, and Couenne::exprLog.

Definition at line 79 of file CouenneExprUnary.hpp.

7.103.3.9 virtual CouNumber Couenne::exprUnary::operator() ( ) [inline], [virtual]

compute value of unary operator

Implements Couenne::expression.

Definition at line 83 of file CouenneExprUnary.hpp.

7.103.3.10 virtual int Couenne::exprUnary::DepList (std::set< int > & *deplist*, enum dig_type *type* = ORIG_ONLY) [inline], [virtual]

fill in the set with all indices of variables appearing in the expression

Reimplemented from Couenne::expression.

Definition at line 88 of file CouenneExprUnary.hpp.

7.103.3.11 expression* Couenne::exprUnary::simplify ( ) [virtual]

simplification

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOpp.

7.103.3.12 virtual int Couenne::exprUnary::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.h) for general univariate functions, return nonlinear.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprInv, and Couenne::exprOpp.

Definition at line 96 of file CouenneExprUnary.hpp.

7.103.3.13 virtual exprAux* Couenne::exprUnary::standardize (CouenneProblem *, bool *addAux* = true) [virtual]

reduce expression in standard form, creating additional aux variables (and constraints)

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOpp.

7.103.3.14 virtual enum expr_type Couenne::exprUnary::code ( ) [inline], [virtual]

type of operator

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprSin, Couenne::exprInv, Couenne::exprOpp, Couenne::exprCeil, Couenne::exprCos, Couenne::exprFloor, Couenne::exprAbs, Couenne::exprExp, and Couenne::exprLog.

Definition at line 104 of file CouenneExprUnary.hpp.

7.103.3.15 virtual bool Couenne::exprUnary::isInteger ( ) [virtual]

is this expression integer?

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprOpp, and Couenne::exprAbs.

7.103.3.16 virtual int Couenne::exprUnary::compare (exprUnary &) [virtual]

compare two unary functions

7.103.3.17 virtual int Couenne::exprUnary::rank ( ) [inline], [virtual]

used in rank-based branching variable choice

Reimplemented from Couenne::expression.

Definition at line 114 of file CouenneExprUnary.hpp.

7.103.3.18 virtual void Couenne::exprUnary::fillDepSet (std::set< DepNode *, compNode > * *dep*, DepGraph * *g*) [inline], [virtual]

fill in dependence structure

Reimplemented from Couenne::expression.

Definition at line 118 of file CouenneExprUnary.hpp.

7.103.3.19 virtual void Couenne::exprUnary::replace (exprVar * , exprVar *) [virtual]

replace variable with other

Reimplemented from Couenne::expression.

7.103.3.20 virtual void Couenne::exprUnary::realign (const CouenneProblem * *p*) [inline], [virtual]

empty function to redirect variables to proper variable vector

Reimplemented from Couenne::expression.

Definition at line 125 of file CouenneExprUnary.hpp.

7.103.4 Member Data Documentation

7.103.4.1 expression* Couenne::exprUnary::argument_ [protected]

single argument taken by this expression

Definition at line 38 of file CouenneExprUnary.hpp.

The documentation for this class was generated from the following file:

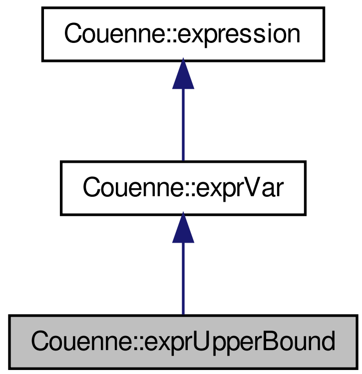
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprUnary.hpp

7.104 Couenne::exprUpperBound Class Reference

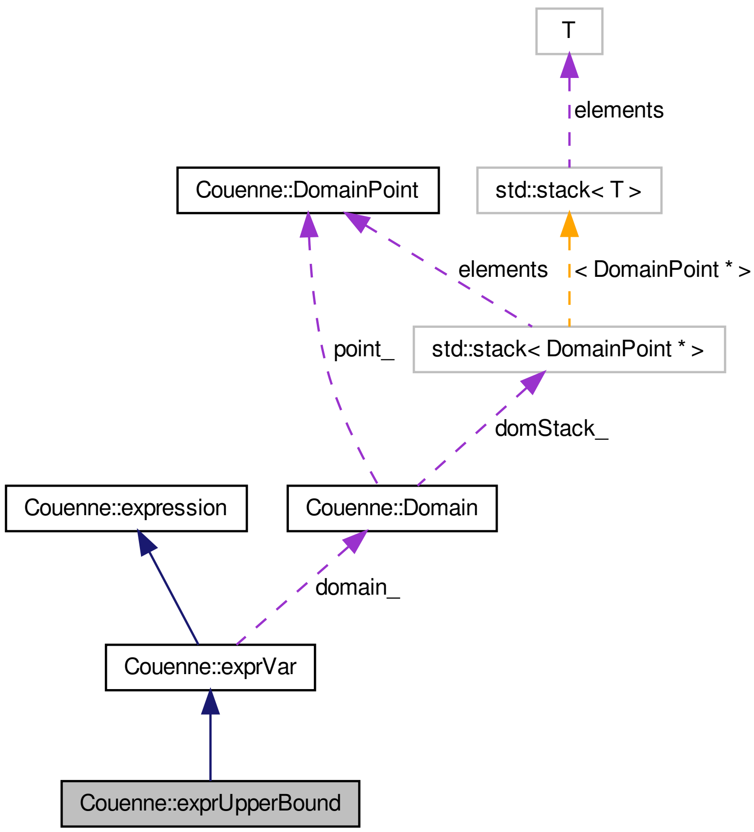
upper bound

```
#include <CouenneExprBound.hpp>
```

Inheritance diagram for Couenne::exprUpperBound:



Collaboration diagram for Couenne::exprUpperBound:



Public Member Functions

- enum nodeType Type () const

  Node type.
- exprUpperBound (int varIndex, Domain ∗d=NULL)

  Constructor.
- exprUpperBound (const exprUpperBound &src, Domain ∗d=NULL)

  Copy constructor.
- exprUpperBound ∗ clone (Domain ∗d=NULL) const

  cloning method
- void print (std::ostream &out=std::cout, bool=false) const

  Print to iostream.
- CouNumber operator() ()

  return the value of the variable
- expression ∗ differentiate (int)

  differentiation

- int dependsOn (int *, int, enum dig_type type=STOP_AT_AUX)
  dependence on variable set
- virtual int Linearity ()
  get a measure of "how linear" the expression is:
- virtual enum expr_type code ()
  code for comparisons

Additional Inherited Members

7.104.1 Detailed Description

upper bound

Definition at line 87 of file CouenneExprBound.hpp.

7.104.2 Constructor & Destructor Documentation

7.104.2.1 Couenne::exprUpperBound::exprUpperBound (int *varIndex*, Domain * *d* = NULL) [inline]

Constructor.

Definition at line 96 of file CouenneExprBound.hpp.

7.104.2.2 Couenne::exprUpperBound::exprUpperBound (const exprUpperBound & *src*, Domain * *d* = NULL) [inline]

Copy constructor.

Definition at line 100 of file CouenneExprBound.hpp.

7.104.3 Member Function Documentation

7.104.3.1 enum nodeType Couenne::exprUpperBound::Type ( ) const [inline], [virtual]

Node type.

Reimplemented from Couenne::exprVar.

Definition at line 92 of file CouenneExprBound.hpp.

7.104.3.2 exprUpperBound* Couenne::exprUpperBound::clone (Domain * *d* = NULL) const [inline], [virtual]

cloning method

Reimplemented from Couenne::exprVar.

Definition at line 104 of file CouenneExprBound.hpp.

7.104.3.3 void Couenne::exprUpperBound::print (std::ostream & *out* = std::cout, bool = false) const [inline], [virtual]

Print to iostream.

Reimplemented from Couenne::exprVar.

Definition at line 108 of file CouenneExprBound.hpp.

7.104.3.4 CouNumber Couenne::exprUpperBound::operator() ( ) [inline], [virtual]

return the value of the variable

Reimplemented from Couenne::exprVar.

Definition at line 113 of file CouenneExprBound.hpp.

7.104.3.5 expression* Couenne::exprUpperBound::differentiate (int) [inline], [virtual]

differentiation

Reimplemented from Couenne::exprVar.

Definition at line 117 of file CouenneExprBound.hpp.

7.104.3.6 int Couenne::exprUpperBound::dependsOn (int *, int, enum dig_type *type* = STOP_AT_AUX) [inline], [virtual]

dependence on variable set

Reimplemented from Couenne::expression.

Definition at line 121 of file CouenneExprBound.hpp.

7.104.3.7 virtual int Couenne::exprUpperBound::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is:

Reimplemented from Couenne::exprVar.

Definition at line 125 of file CouenneExprBound.hpp.

7.104.3.8 virtual enum expr_type Couenne::exprUpperBound::code ( ) [inline], [virtual]

code for comparisons

Reimplemented from Couenne::exprVar.

Definition at line 129 of file CouenneExprBound.hpp.

The documentation for this class was generated from the following file:

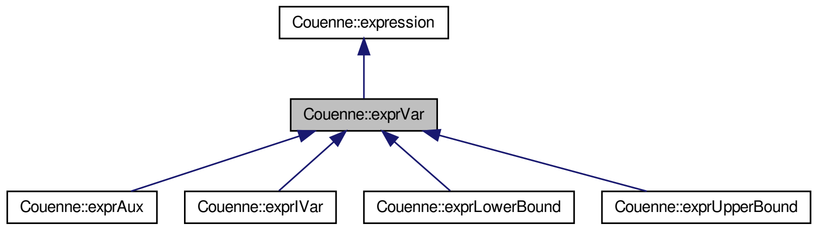
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprBound.hpp

7.105 Couenne::exprVar Class Reference

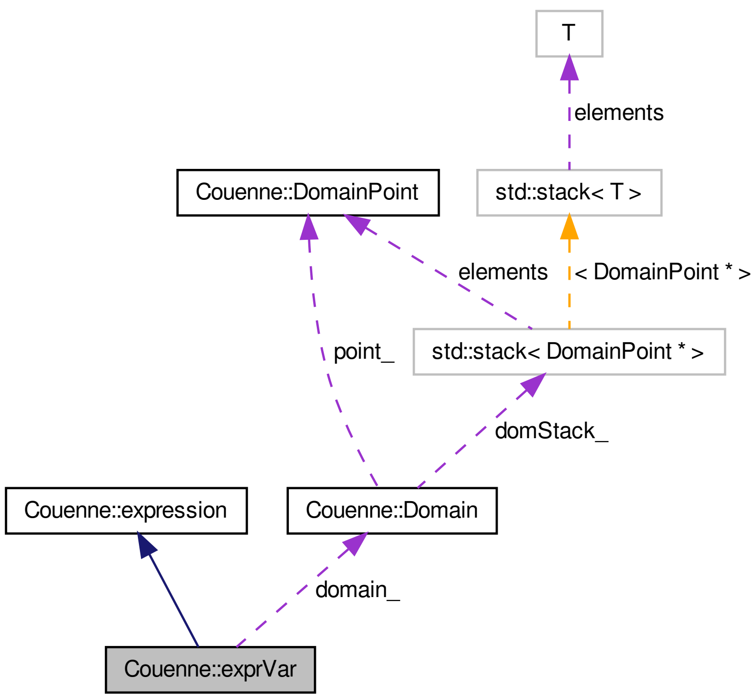
variable-type operator

`#include <CouenneExprVar.hpp>`

Inheritance diagram for Couenne::exprVar:



Collaboration diagram for Couenne::exprVar:



Public Member Functions

- virtual enum nodeType Type () const

    Node type.

- exprVar (int varIndex, Domain ∗d=NULL)

    Constructor.

- virtual ∼exprVar ()

  destructor
- exprVar (const exprVar &e, Domain ∗d=NULL)

  Copy constructor.
- virtual exprVar ∗ clone (Domain ∗d=NULL) const

  Cloning method.
- int Index () const

  Get variable index in problem.
- virtual expression ∗ Lb ()

  Get lower bound expression.
- virtual expression ∗ Ub ()

  Get upper bound expression.
- virtual CouNumber & lb ()

  Get/set lower bound value.
- virtual CouNumber & ub ()

  Get/set upper bound value.
- virtual void print (std::ostream &out=std::cout, bool=false) const

  print
- virtual CouNumber operator() ()

  return the value of the variable
- virtual CouNumber gradientNorm (const double ∗x)

  return l-2 norm of gradient at given point
- virtual expression ∗ differentiate (int index)

  differentiation
- virtual int DepList (std::set< int > &deplist, enum dig_type type=ORIG_ONLY)

  fill in the set with all indices of variables appearing in the expression
- virtual void crossBounds ()

  set bounds depending on both branching rules and propagated bounds.
- virtual expression ∗ simplify ()

  simplify
- virtual int Linearity ()

  get a measure of "how linear" the expression is (see CouenneTypes.hpp)
- virtual bool isDefinedInteger ()

  is this expression defined as an integer?
- virtual bool isInteger ()

  is this variable integer?
- virtual void getBounds (expression ∗&, expression ∗&)

  Get expressions of lower and upper bound of an expression (if any)
- virtual void getBounds (CouNumber &lb, CouNumber &ub)

  Get value of lower and upper bound of an expression (if any)
- virtual void generateCuts (OsiCuts &, const CouenneCutGenerator ∗, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  Get values of lower and upper bound of an expression (if any)
- virtual void generateCuts (expression ∗w, OsiCuts &cs, const CouenneCutGenerator ∗cg, t_chg_bounds ∗=NULL, int=-1, CouNumber=-COUENNE_INFINITY, CouNumber=COUENNE_INFINITY)

  generate convexification cut for constraint w = this
- virtual enum expr_type code ()

code for comparison

- virtual bool impliedBound (int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗, enum auxSign=expression::AUX-_EQ)

    implied bound processing
- virtual int rank ()

    rank of an original variable is always one
- virtual void fillDepSet (std::set< DepNode ∗, compNode > ∗, DepGraph ∗)

    update dependence set with index of this variable
- virtual bool isFixed ()

    is this variable fixed?
- virtual void linkDomain (Domain ∗d)

    link this variable to a domain
- virtual Domain ∗ domain ()

    return pointer to variable domain
- virtual void decreaseMult ()
- virtual void zeroMult ()

    Disable variable (empty for compatibility with exprAux)
- virtual void setInteger (bool value)

    Set this variable as integer (empty for compatibility with exprAux)
- virtual enum convexity convexity () const

    either CONVEX, CONCAVE, AFFINE, or NONCONVEX
- virtual CouenneObject ∗ properObject (CouenneCutGenerator ∗c, CouenneProblem ∗p, Bonmin::BabSetupBase ∗base, JnlstPtr jnlst_)

    return proper object to handle expression associated with this variable (NULL if this is not an auxiliary)
- virtual enum auxSign sign () const

    return its sign in the definition constraint

Protected Attributes

- int varIndex_

    The index of the variable.
- Domain ∗ domain_

    Pointer to a descriptor of the current point/bounds.

Additional Inherited Members

7.105.1 Detailed Description

variable-type operator

All variables of the expression must be objects of this class or of the derived exprAux class

Definition at line 45 of file CouenneExprVar.hpp.

7.105.2 Constructor & Destructor Documentation

7.105.2.1 Couenne::exprVar::exprVar (int *varIndex*, Domain ∗ *d* = NULL) [inline]

Constructor.

Definition at line 59 of file CouenneExprVar.hpp.

7.105.2.2 virtual Couenne::exprVar::∼exprVar ( ) [inline], [virtual]

destructor

Definition at line 64 of file CouenneExprVar.hpp.

7.105.2.3 Couenne::exprVar::exprVar (const exprVar & *e*, Domain ∗ *d* = NULL) [inline]

Copy constructor.

Definition at line 67 of file CouenneExprVar.hpp.

7.105.3 Member Function Documentation

7.105.3.1 virtual enum nodeType Couenne::exprVar::Type ( ) const [inline], [virtual]

Node type.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprUpperBound, Couenne::exprAux, and Couenne::exprLowerBound.

Definition at line 55 of file CouenneExprVar.hpp.

7.105.3.2 virtual exprVar∗ Couenne::exprVar::clone (Domain ∗ *d* = NULL) const [inline], [virtual]

Cloning method.

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprUpperBound, Couenne::exprAux, Couenne::exprLowerBound, and Couenne::exprIVar.

Definition at line 72 of file CouenneExprVar.hpp.

7.105.3.3 int Couenne::exprVar::Index ( ) const [inline], [virtual]

Get variable index in problem.

Reimplemented from Couenne::expression.

Definition at line 76 of file CouenneExprVar.hpp.

7.105.3.4 virtual expression∗ Couenne::exprVar::Lb ( ) [virtual]

Get lower bound expression.

Reimplemented in Couenne::exprAux.

7.105.3.5 virtual expression∗ Couenne::exprVar::Ub ( ) [virtual]

Get upper bound expression.

Reimplemented in Couenne::exprAux.

7.105.3.6 virtual CouNumber& Couenne::exprVar::lb ( ) [inline], [virtual]

Get/set lower bound value.

Definition at line 84 of file CouenneExprVar.hpp.

7.105.3.7 virtual CouNumber& Couenne::exprVar::ub ( ) [inline], [virtual]

Get/set upper bound value.

Definition at line 85 of file CouenneExprVar.hpp.

7.105.3.8 virtual void Couenne::exprVar::print (std::ostream & *out* = std::cout, bool = false) const [inline], [virtual]

print

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprUpperBound, Couenne::exprAux, Couenne::exprLowerBound, and Couenne::exprIVar.

Definition at line 88 of file CouenneExprVar.hpp.

7.105.3.9 virtual CouNumber Couenne::exprVar::operator() ( ) [inline], [virtual]

return the value of the variable

Implements Couenne::expression.

Reimplemented in Couenne::exprUpperBound, Couenne::exprAux, and Couenne::exprLowerBound.

Definition at line 93 of file CouenneExprVar.hpp.

7.105.3.10 virtual CouNumber Couenne::exprVar::gradientNorm (const double * *x*) [inline], [virtual]

return l-2 norm of gradient at given point

Reimplemented from Couenne::expression.

Definition at line 97 of file CouenneExprVar.hpp.

7.105.3.11 virtual expression* Couenne::exprVar::differentiate (int *index*) [inline], [virtual]

differentiation

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprUpperBound, and Couenne::exprLowerBound.

Definition at line 101 of file CouenneExprVar.hpp.

7.105.3.12 virtual int Couenne::exprVar::DepList (std::set< int > & *deplist*, enum dig_type *type* = ORIG_ONLY) [inline], [virtual]

fill in the set with all indices of variables appearing in the expression

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprAux.

Definition at line 106 of file CouenneExprVar.hpp.

7.105.3.13 virtual void Couenne::exprVar::crossBounds ( ) [inline], [virtual]

set bounds depending on both branching rules and propagated bounds.

To be used after standardization

Reimplemented in Couenne::exprAux.

Definition at line 118 of file CouenneExprVar.hpp.

7.105.3.14 virtual expression* Couenne::exprVar::simplify ( ) [inline], [virtual]

simplify

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprAux.

Definition at line 121 of file CouenneExprVar.hpp.

7.105.3.15 virtual int Couenne::exprVar::Linearity ( ) [inline], [virtual]

get a measure of "how linear" the expression is (see CouenneTypes.hpp)

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprUpperBound, Couenne::exprAux, and Couenne::exprLowerBound.

Definition at line 125 of file CouenneExprVar.hpp.

7.105.3.16 virtual bool Couenne::exprVar::isDefinedInteger ( ) [inline], [virtual]

is this expression defined as an integer?

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprAux, and Couenne::exprIVar.

Definition at line 129 of file CouenneExprVar.hpp.

7.105.3.17 virtual bool Couenne::exprVar::isInteger ( ) [inline], [virtual]

is this variable integer?

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprAux, and Couenne::exprIVar.

Definition at line 133 of file CouenneExprVar.hpp.

7.105.3.18 virtual void Couenne::exprVar::getBounds (expression *& , expression *&) [virtual]

Get expressions of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.105.3.19 virtual void Couenne::exprVar::getBounds (CouNumber & *lb*, CouNumber & *ub*) [virtual]

Get value of lower and upper bound of an expression (if any)

Reimplemented from Couenne::expression.

7.105.3.20 virtual void Couenne::exprVar::generateCuts (OsiCuts & , const CouenneCutGenerator * , t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [inline], [virtual]

Get values of lower and upper bound of an expression (if any)

generate cuts for expression associated with this auxiliary

Reimplemented in Couenne::exprAux.

Definition at line 156 of file CouenneExprVar.hpp.

7.105.3.21 virtual void Couenne::exprVar::generateCuts (expression * w, OsiCuts & cs, const CouenneCutGenerator * cg, t_chg_bounds * = NULL, int = -1, CouNumber = -COUENNE_INFINITY, CouNumber = COUENNE_INFINITY) [virtual]

generate convexification cut for constraint w = this

Reimplemented from Couenne::expression.

7.105.3.22 virtual enum expr_type Couenne::exprVar::code ( ) [inline], [virtual]

code for comparison

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprUpperBound, and Couenne::exprLowerBound.

Definition at line 171 of file CouenneExprVar.hpp.

7.105.3.23 virtual bool Couenne::exprVar::impliedBound (int , CouNumber * , CouNumber * , t_chg_bounds * , enum auxSign = expression::AUX_EQ) [virtual]

implied bound processing

Reimplemented from Couenne::expression.

7.105.3.24 virtual int Couenne::exprVar::rank ( ) [inline], [virtual]

rank of an original variable is always one

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprAux.

Definition at line 178 of file CouenneExprVar.hpp.

7.105.3.25 virtual void Couenne::exprVar::fillDepSet (std::set< DepNode *, compNode > * , DepGraph *) [virtual]

update dependence set with index of this variable

Reimplemented from Couenne::expression.

7.105.3.26 virtual bool Couenne::exprVar::isFixed ( ) [inline], [virtual]

is this variable fixed?

Definition at line 185 of file CouenneExprVar.hpp.

7.105.3.27 virtual void Couenne::exprVar::linkDomain (Domain * d) [inline], [virtual]

link this variable to a domain

Reimplemented from Couenne::expression.

Reimplemented in Couenne::exprAux.

Definition at line 189 of file CouenneExprVar.hpp.

7.105.3.28 virtual Domain* Couenne::exprVar::domain ( ) [inline], [virtual]

return pointer to variable domain

Definition at line 193 of file CouenneExprVar.hpp.

7.105.3.29 virtual void Couenne::exprVar::decreaseMult ( ) [inline], [virtual]

Reimplemented in Couenne::exprAux.

Definition at line 197 of file CouenneExprVar.hpp.

7.105.3.30 virtual void Couenne::exprVar::zeroMult ( ) [inline], [virtual]

Disable variable (empty for compatibility with exprAux)

Reimplemented in Couenne::exprAux.

Definition at line 200 of file CouenneExprVar.hpp.

7.105.3.31 virtual void Couenne::exprVar::setInteger (bool *value*) [inline], [virtual]

Set this variable as integer (empty for compatibility with exprAux)

Reimplemented in Couenne::exprAux.

Definition at line 203 of file CouenneExprVar.hpp.

7.105.3.32 virtual enum convexity Couenne::exprVar::convexity ( ) const [inline], [virtual]

either CONVEX, CONCAVE, AFFINE, or NONCONVEX

Reimplemented from Couenne::expression.

Definition at line 206 of file CouenneExprVar.hpp.

7.105.3.33 virtual CouenneObject* Couenne::exprVar::properObject (CouenneCutGenerator * *c*, CouenneProblem * *p*, Bonmin::BabSetupBase * *base*, JnlstPtr *jnlst_*) [virtual]

return proper object to handle expression associated with this variable (NULL if this is not an auxiliary)

Reimplemented in Couenne::exprAux.

7.105.3.34 virtual enum auxSign Couenne::exprVar::sign ( ) const [inline], [virtual]

return its sign in the definition constraint

Reimplemented in Couenne::exprAux.

Definition at line 217 of file CouenneExprVar.hpp.

7.105.4 Member Data Documentation

7.105.4.1 int Couenne::exprVar::varIndex_ [protected]

The index of the variable.

Definition at line 49 of file CouenneExprVar.hpp.

7.105.4.2 Domain* Couenne::exprVar::domain_ [protected]

Pointer to a descriptor of the current point/bounds.

Definition at line 50 of file CouenneExprVar.hpp.

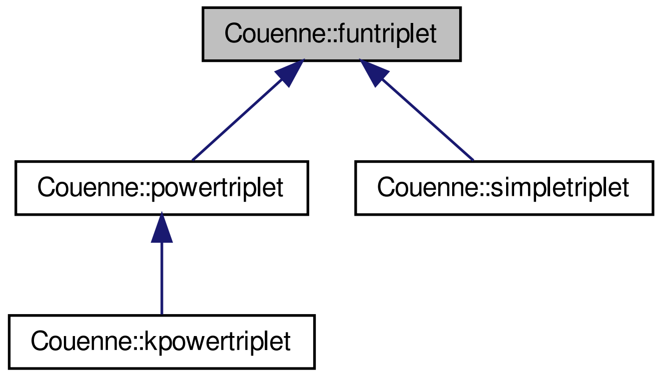
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprVar.hpp

7.106 Couenne::funtriplet Class Reference

`#include <CouenneFunTriplets.hpp>`

Inheritance diagram for Couenne::funtriplet:



Public Member Functions

- funtriplet ()

    Basic constructor.
- virtual ∼funtriplet ()

    Destructor.
- virtual CouNumber F (CouNumber x)=0
- virtual CouNumber Fp (CouNumber x)=0
- virtual CouNumber Fpp (CouNumber x)=0
- virtual CouNumber FpInv (CouNumber x)=0

7.106.1 Detailed Description

Definition at line 22 of file CouenneFunTriplets.hpp.

7.106.2 Constructor & Destructor Documentation

7.106.2.1 Couenne::funtriplet::funtriplet ( ) [inline]

Basic constructor.

Definition at line 27 of file CouenneFunTriplets.hpp.

7.106.2.2 virtual Couenne::funtriplet::∼funtriplet ( ) [inline], [virtual]

Destructor.

Definition at line 30 of file CouenneFunTriplets.hpp.

7.106.3 Member Function Documentation

7.106.3.1 virtual CouNumber Couenne::funtriplet::F (CouNumber *x*) [pure virtual]

Implemented in Couenne::kpowertriplet, Couenne::powertriplet, and Couenne::simpletriplet.

7.106.3.2 virtual CouNumber Couenne::funtriplet::Fp (CouNumber *x*) [pure virtual]

Implemented in Couenne::kpowertriplet, Couenne::powertriplet, and Couenne::simpletriplet.

7.106.3.3 virtual CouNumber Couenne::funtriplet::Fpp (CouNumber *x*) [pure virtual]

Implemented in Couenne::kpowertriplet, Couenne::powertriplet, and Couenne::simpletriplet.

7.106.3.4 virtual CouNumber Couenne::funtriplet::FpInv (CouNumber *x*) [pure virtual]

Implemented in Couenne::kpowertriplet, Couenne::powertriplet, and Couenne::simpletriplet.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/util/CouenneFunTriplets.hpp

7.107 Couenne::GlobalCutOff Class Reference

`#include <CouenneGlobalCutOff.hpp>`

Public Member Functions

- GlobalCutOff ()
- GlobalCutOff (double c, const double ∗s=NULL, int n=0)
- ∼GlobalCutOff ()
- void setCutOff (const CouenneProblem ∗p, double cutoff, const double ∗s=NULL)
- double getCutOff () const
- double ∗ getCutOffSol () const

7.107.1 Detailed Description

Definition at line 19 of file CouenneGlobalCutOff.hpp.

7.107.2 Constructor & Destructor Documentation

7.107.2.1 Couenne::GlobalCutOff::GlobalCutOff ( )

7.107.2.2 Couenne::GlobalCutOff::GlobalCutOff (double *c*, const double ∗ *s* = NULL, int *n* = 0)

7.107.2.3 Couenne::GlobalCutOff::∼GlobalCutOff ( )

7.107.3 Member Function Documentation

7.107.3.1 void Couenne::GlobalCutOff::setCutOff (const CouenneProblem ∗ *p*, double *cutoff*, const double ∗ *s* = NULL)

7.107.3.2 double Couenne::GlobalCutOff::getCutOff ( ) const [inline]

Definition at line 38 of file CouenneGlobalCutOff.hpp.

7.107.3.3 double∗ Couenne::GlobalCutOff::getCutOffSol ( ) const [inline]

Definition at line 39 of file CouenneGlobalCutOff.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/problem/CouenneGlobalCutOff.hpp

7.108 Couenne::InitHeuristic Class Reference

A heuristic that stores the initial solution of the NLP.

`#include <BonInitHeuristic.hpp>`

Public Member Functions

- InitHeuristic (double objValue, const double ∗sol, CouenneProblem &cp)

  Constructor with model and Ipopt problems.
- InitHeuristic (const InitHeuristic &other)

  Copy constructor.
- virtual ∼InitHeuristic ()

  Destructor.
- virtual CbcHeuristic ∗ clone () const

  Clone.
- InitHeuristic & operator= (const InitHeuristic &rhs)

  Assignment operator.
- virtual void resetModel (CbcModel ∗model)
- virtual int solution (double &objectiveValue, double ∗newSolution)

  Run heuristic, return 1 if a better solution than the one passed is found and 0 otherwise.

7.108.1 Detailed Description

A heuristic that stores the initial solution of the NLP.

This is computed before Cbc is started, and in this way we can tell Cbc about this.

Definition at line 24 of file BonInitHeuristic.hpp.

7.108.2 Constructor & Destructor Documentation

7.108.2.1 Couenne::InitHeuristic::InitHeuristic (double *objValue,* const double ∗ *sol,* CouenneProblem & *cp*)

Constructor with model and Ipopt problems.

7.108.2.2 Couenne::InitHeuristic::InitHeuristic (const InitHeuristic & *other*)

Copy constructor.

7.108.2.3 virtual Couenne::InitHeuristic::∼InitHeuristic ( ) [virtual]

Destructor.

7.108.3 Member Function Documentation

7.108.3.1 virtual CbcHeuristic∗ Couenne::InitHeuristic::clone ( ) const [virtual]

Clone.

7.108.3.2 InitHeuristic& Couenne::InitHeuristic::operator= (const InitHeuristic & *rhs*)

Assignment operator.

7.108.3.3 virtual void Couenne::InitHeuristic::resetModel (CbcModel ∗ *model*) [inline], [virtual]

Definition at line 42 of file BonInitHeuristic.hpp.

7.108.3.4 virtual int Couenne::InitHeuristic::solution (double & *objectiveValue,* double ∗ *newSolution*) [virtual]

Run heuristic, return 1 if a better solution than the one passed is found and 0 otherwise.

objectiveValue Best known solution in input and value of solution found in output newSolution Solution found by heuristic.

Todo Find a quicker way to get to Couenne objects, store them or something

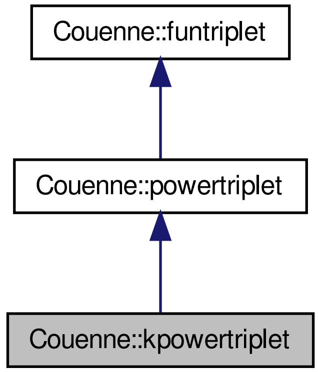
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/heuristics/BonInitHeuristic.hpp

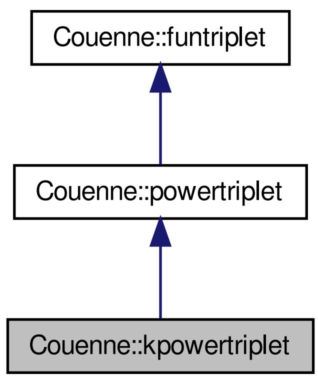
7.109 Couenne::kpowertriplet Class Reference

```
#include <CouenneFunTriplets.hpp>
```

Inheritance diagram for Couenne::kpowertriplet:



Collaboration diagram for Couenne::kpowertriplet:



Public Member Functions

- kpowertriplet (CouNumber exponent, CouNumber k)

  Basic constructor.
- virtual ∼kpowertriplet ()

  Destructor.
- virtual CouNumber F (CouNumber x)
- virtual CouNumber Fp (CouNumber x)

- virtual CouNumber Fpp (CouNumber x)
- virtual CouNumber FpInv (CouNumber x)

Protected Attributes

- CouNumber mult_

7.109.1 Detailed Description

Definition at line 103 of file CouenneFunTriplets.hpp.

7.109.2 Constructor & Destructor Documentation

7.109.2.1 Couenne::kpowertriplet::kpowertriplet (CouNumber *exponent*, CouNumber *k*) [inline]

Basic constructor.

Definition at line 112 of file CouenneFunTriplets.hpp.

7.109.2.2 virtual Couenne::kpowertriplet::∼kpowertriplet ( ) [inline], [virtual]

Destructor.

Definition at line 117 of file CouenneFunTriplets.hpp.

7.109.3 Member Function Documentation

7.109.3.1 virtual CouNumber Couenne::kpowertriplet::F (CouNumber *x*) [inline], [virtual]

Reimplemented from Couenne::powertriplet.

Definition at line 119 of file CouenneFunTriplets.hpp.

7.109.3.2 virtual CouNumber Couenne::kpowertriplet::Fp (CouNumber *x*) [inline], [virtual]

Reimplemented from Couenne::powertriplet.

Definition at line 122 of file CouenneFunTriplets.hpp.

7.109.3.3 virtual CouNumber Couenne::kpowertriplet::Fpp (CouNumber *x*) [inline], [virtual]

Reimplemented from Couenne::powertriplet.

Definition at line 125 of file CouenneFunTriplets.hpp.

7.109.3.4 virtual CouNumber Couenne::kpowertriplet::FpInv (CouNumber *x*) [inline], [virtual]

Reimplemented from Couenne::powertriplet.

Definition at line 128 of file CouenneFunTriplets.hpp.

7.109.4 Member Data Documentation

7.109.4.1 CouNumber Couenne::kpowertriplet::mult_ [protected]

Definition at line 107 of file CouenneFunTriplets.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/util/CouenneFunTriplets.hpp

7.110 less_than_str Struct Reference

`#include <CouenneProblem.hpp>`

Public Member Functions

- bool operator() (register const char *a, register const char *b) const

7.110.1 Detailed Description

Definition at line 128 of file CouenneProblem.hpp.

7.110.2 Member Function Documentation

7.110.2.1 bool less_than_str::operator() (register const char * *a*, register const char * *b*) const [inline]

Definition at line 129 of file CouenneProblem.hpp.

The documentation for this struct was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/problem/CouenneProblem.hpp

7.111 Couenne::LinMap Class Reference

`#include <CouenneLQelems.hpp>`

Public Member Functions

- std::map< int, CouNumber > & Map ()

  public access
- void insert (int index, CouNumber coe)

  insert a pair <int,CouNumber> into a map for linear terms

7.111.1 Detailed Description

Definition at line 48 of file CouenneLQelems.hpp.

7.111.2 Member Function Documentation

7.111.2.1 std::map<int, CouNumber>& Couenne::LinMap::Map ( ) [inline]

public access

Definition at line 56 of file CouenneLQelems.hpp.

7.111.2.2 void Couenne::LinMap::insert (int *index*, CouNumber *coe*) [inline]

insert a pair <int,CouNumber> into a map for linear terms

Definition at line 60 of file CouenneLQelems.hpp.

The documentation for this class was generated from the following file:

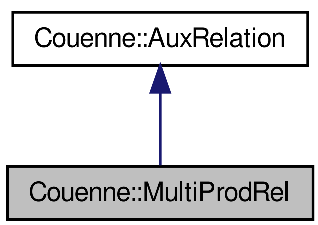
- /home/ted/COIN/trunk/Couenne/src/standardize/CouenneLQelems.hpp

7.112 Couenne::MultiProdRel Class Reference

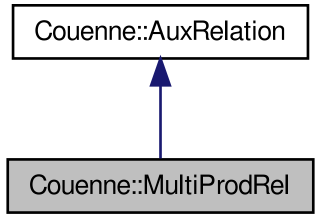
Identifies 5-ples of variables of the form.

`#include <CouenneCrossConv.hpp>`

Inheritance diagram for Couenne::MultiProdRel:



Collaboration diagram for Couenne::MultiProdRel:



Public Member Functions

- virtual int findRelations ()
- virtual void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

7.112.1 Detailed Description

Identifies 5-ples of variables of the form.

x_k := x_i x_j x_l := x_i x_p

x_q := x_k x_p OR x_q := x_k / x_j x_r := x_k x_j x_r := x_l / x_p

and generates, ONLY ONCE, a cut

x_q = x_r (in both cases).

Definition at line 82 of file CouenneCrossConv.hpp.

7.112.2 Member Function Documentation

7.112.2.1 virtual int Couenne::MultiProdRel::findRelations ( ) [virtual]

Implements Couenne::AuxRelation.

7.112.2.2 virtual void Couenne::MultiProdRel::generateCuts (const OsiSolverInterface & , OsiCuts & , const CglTreeInfo = CglTreeInfo()) const [virtual]

Reimplemented from Couenne::AuxRelation.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/cut/crossconv/CouenneCrossConv.hpp

7.113 myclass Struct Reference

`#include <CouenneProblem.hpp>`

Public Member Functions

- bool operator() (register const Node &a, register const Node &b)

7.113.1 Detailed Description

Definition at line 122 of file CouenneProblem.hpp.

7.113.2 Member Function Documentation

7.113.2.1 bool myclass::operator() (register const **Node** & *a*, register const **Node** & *b*) [inline]

Definition at line 123 of file CouenneProblem.hpp.

The documentation for this struct was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/problem/CouenneProblem.hpp

7.114 myclass0 Struct Reference

`#include <CouenneProblem.hpp>`

Public Member Functions

- bool operator() (register const Node &a, register const Node &b)

7.114.1 Detailed Description

Definition at line 76 of file CouenneProblem.hpp.

7.114.2 Member Function Documentation

7.114.2.1 bool myclass0::operator() (register const **Node** & *a*, register const **Node** & *b*) [inline]

Definition at line 77 of file CouenneProblem.hpp.

The documentation for this struct was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/problem/CouenneProblem.hpp

7.115 Nauty Class Reference

`#include <Nauty.h>`

Public Types

- enum VarStatus { FIX_AT_ZERO, FIX_AT_ONE, FREE }

Public Member Functions

- Nauty (int n_)
- ∼Nauty ()
- void addElement (int ix, int jx)
- void clearPartitions ()
- void computeAuto ()
- void deleteElement (int ix, int jx)
- void color_node (int ix, int color)
- void insertRHS (int rhs, int cons)
- double getGroupSize () const
- int getNautyCalls () const
- double getNautyTime () const
- int getN () const
- int getNumGenerators () const
- int getNumOrbits () const
- std::vector< std::vector< int > > ∗ getOrbits () const

  Returns the orbits in a "convenient" form.
- void getVstat (double ∗v, int nv)
- void setWriteAutoms (const std::string &afilename)

  Methods to classify orbits.
- void unsetWriteAutoms ()

7.115.1 Detailed Description

Definition at line 23 of file Nauty.h.

7.115.2 Member Enumeration Documentation

7.115.2.1 enum Nauty::VarStatus

Enumerator:

FIX_AT_ZERO

FIX_AT_ONE

FREE

Definition at line 27 of file Nauty.h.

7.115.3 Constructor & Destructor Documentation

7.115.3.1 Nauty::Nauty (int *n_*)

7.115.3.2 Nauty::∼Nauty ( )

7.115.4 Member Function Documentation

7.115.4.1 void Nauty::addElement (int *ix,* int *jx*)

7.115.4.2 void Nauty::clearPartitions ( )

7.115.4.3 void Nauty::computeAuto ( )

7.115.4.4 void Nauty::deleteElement (int *ix*, int *jx*)

7.115.4.5 void Nauty::color_node (int *ix*, int *color*) [inline]

Definition at line 36 of file Nauty.h.

7.115.4.6 void Nauty::insertRHS (int *rhs*, int *cons*) [inline]

Definition at line 37 of file Nauty.h.

7.115.4.7 double Nauty::getGroupSize ( ) const

7.115.4.8 int Nauty::getNautyCalls ( ) const [inline]

Definition at line 40 of file Nauty.h.

7.115.4.9 double Nauty::getNautyTime ( ) const [inline]

Definition at line 41 of file Nauty.h.

7.115.4.10 int Nauty::getN ( ) const [inline]

Definition at line 43 of file Nauty.h.

7.115.4.11 int Nauty::getNumGenerators ( ) const

7.115.4.12 int Nauty::getNumOrbits ( ) const

7.115.4.13 std::vector<std::vector<int> >* Nauty::getOrbits ( ) const

Returns the orbits in a "convenient" form.

7.115.4.14 void Nauty::getVstat (double * *v*, int *nv*)

7.115.4.15 void Nauty::setWriteAutoms (const std::string & *afilename*)

Methods to classify orbits.

Not horribly efficient, but gets the job done

7.115.4.16 void Nauty::unsetWriteAutoms ( )

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/branch/Nauty.h

7.116 Couenne::CouenneInfo::NlpSolution Class Reference

Class for storing an Nlp Solution.

`#include <BonCouenneInfo.hpp>`

Public Member Functions

- NlpSolution (int n, const double *sol, double objval)

- ∼NlpSolution ()

Accessor methods

- const double ∗ solution () const
- double objVal () const
- int nVars () const

7.116.1 Detailed Description

Class for storing an Nlp Solution.

Definition at line 26 of file BonCouenneInfo.hpp.

7.116.2 Constructor & Destructor Documentation

7.116.2.1 Couenne::CouenneInfo::NlpSolution::NlpSolution (int *n*, const double ∗ *sol*, double *objval*)

7.116.2.2 Couenne::CouenneInfo::NlpSolution::∼NlpSolution ( )

7.116.3 Member Function Documentation

7.116.3.1 const double∗ Couenne::CouenneInfo::NlpSolution::solution ( ) const [inline]

Definition at line 37 of file BonCouenneInfo.hpp.

7.116.3.2 double Couenne::CouenneInfo::NlpSolution::objVal ( ) const [inline]

Definition at line 41 of file BonCouenneInfo.hpp.

7.116.3.3 int Couenne::CouenneInfo::NlpSolution::nVars ( ) const [inline]

Definition at line 45 of file BonCouenneInfo.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/main/BonCouenneInfo.hpp

7.117 Couenne::NlpSolveHeuristic Class Reference

```
#include <BonNlpHeuristic.hpp>
```

Public Member Functions

- NlpSolveHeuristic ()

  Default constructor.
- NlpSolveHeuristic (CbcModel &mip, Bonmin::OsiTMINLPInterface &nlp, bool cloneNlp=false, CouenneProblem ∗couenne=NULL)

  Constructor with model and Ipopt problems.
- NlpSolveHeuristic (const NlpSolveHeuristic &other)

  Copy constructor.

- virtual ∼NlpSolveHeuristic ()

  Destructor.
- virtual CbcHeuristic ∗ clone () const

  Clone.
- NlpSolveHeuristic & operator= (const NlpSolveHeuristic &rhs)

  Assignment operator.
- void setNlp (Bonmin::OsiTMINLPInterface &nlp, bool cloneNlp=true)

  Set the nlp solver.
- void setCouenneProblem (CouenneProblem ∗)

  set the couenne problem to use.
- virtual void resetModel (CbcModel ∗model)

  Does nothing.
- virtual int solution (double &objectiveValue, double ∗newSolution)

  Run heuristic, return 1 if a better solution than the one passed is found and 0 otherwise.
- void setMaxNlpInf (double value)

  set maxNlpInf.
- void setNumberSolvePerLevel (int value)

  set number of nlp's solved for each given level of the tree

Static Public Member Functions

- static void registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions >)

  initialize options

7.117.1 Detailed Description

Definition at line 28 of file BonNlpHeuristic.hpp.

7.117.2 Constructor & Destructor Documentation

7.117.2.1 Couenne::NlpSolveHeuristic::NlpSolveHeuristic ( )

Default constructor.

7.117.2.2 Couenne::NlpSolveHeuristic::NlpSolveHeuristic (CbcModel & *mip*, Bonmin::OsiTMINLPInterface & *nlp*, bool *cloneNlp* = false, CouenneProblem ∗ *couenne* = NULL)

Constructor with model and Ipopt problems.

7.117.2.3 Couenne::NlpSolveHeuristic::NlpSolveHeuristic (const NlpSolveHeuristic & *other*)

Copy constructor.

7.117.2.4 virtual Couenne::NlpSolveHeuristic::∼NlpSolveHeuristic ( ) [virtual]

Destructor.

7.117.3 Member Function Documentation

7.117.3.1 virtual CbcHeuristic∗ Couenne::NlpSolveHeuristic::clone ( ) const [virtual]

Clone.

7.117.3.2 NlpSolveHeuristic& Couenne::NlpSolveHeuristic::operator= (const NlpSolveHeuristic & *rhs*)

Assignment operator.

7.117.3.3 void Couenne::NlpSolveHeuristic::setNlp (Bonmin::OsiTMINLPInterface & *nlp*, bool *cloneNlp* = true)

Set the nlp solver.

7.117.3.4 void Couenne::NlpSolveHeuristic::setCouenneProblem (CouenneProblem ∗)

set the couenne problem to use.

7.117.3.5 virtual void Couenne::NlpSolveHeuristic::resetModel (CbcModel ∗ *model*) [inline], [virtual]

Does nothing.

Definition at line 53 of file BonNlpHeuristic.hpp.

7.117.3.6 virtual int Couenne::NlpSolveHeuristic::solution (double & *objectiveValue*, double ∗ *newSolution*) [virtual]

Run heuristic, return 1 if a better solution than the one passed is found and 0 otherwise.

objectiveValue Best known solution in input and value of solution found in output newSolution Solution found by heuristic.

Todo Find a quicker way to get to Couenne objects, store them or something

7.117.3.7 void Couenne::NlpSolveHeuristic::setMaxNlpInf (double *value*) [inline]

set maxNlpInf.

Definition at line 61 of file BonNlpHeuristic.hpp.

7.117.3.8 void Couenne::NlpSolveHeuristic::setNumberSolvePerLevel (int *value*) [inline]

set number of nlp's solved for each given level of the tree

Definition at line 64 of file BonNlpHeuristic.hpp.

7.117.3.9 static void Couenne::NlpSolveHeuristic::registerOptions (Ipopt::SmartPtr< Bonmin::RegisteredOptions >) [static]

initialize options

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/heuristics/BonNlpHeuristic.hpp

7.118 Node Class Reference

```
#include <CouenneProblem.hpp>
```

Public Member Functions

- void node (int, double, double, double, int, int)
- void color_vertex (register int k)
- int get_index () const
- double get_coeff () const
- double get_lb () const
- double get_ub () const
- int get_color () const
- int get_code () const
- int get_sign () const
- void bounds (register double a, register double b)

7.118.1 Detailed Description

Definition at line 53 of file CouenneProblem.hpp.

7.118.2 Member Function Documentation

7.118.2.1 void Node::node (int , double , double , double , int , int)

7.118.2.2 void Node::color_vertex (register int *k*) [inline]

Definition at line 63 of file CouenneProblem.hpp.

7.118.2.3 int Node::get_index ( ) const [inline]

Definition at line 64 of file CouenneProblem.hpp.

7.118.2.4 double Node::get_coeff ( ) const [inline]

Definition at line 65 of file CouenneProblem.hpp.

7.118.2.5 double Node::get_lb ( ) const [inline]

Definition at line 66 of file CouenneProblem.hpp.

7.118.2.6 double Node::get_ub ( ) const [inline]

Definition at line 67 of file CouenneProblem.hpp.

7.118.2.7 int Node::get_color ( ) const [inline]

Definition at line 68 of file CouenneProblem.hpp.

7.118.2.8 int Node::get_code ( ) const [inline]

Definition at line 69 of file CouenneProblem.hpp.

7.118.2.9 int Node::get_sign ( ) const [inline]

Definition at line 70 of file CouenneProblem.hpp.

7.118.2.10 void Node::bounds (register double *a*, register double *b*) [inline]

Definition at line 71 of file CouenneProblem.hpp.

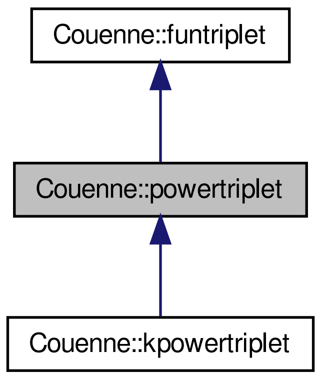
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/problem/CouenneProblem.hpp

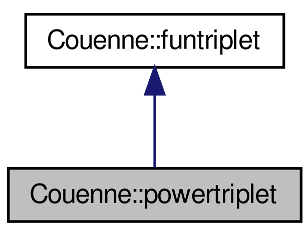
7.119 Couenne::powertriplet Class Reference

```
#include <CouenneFunTriplets.hpp>
```

Inheritance diagram for Couenne::powertriplet:



Collaboration diagram for Couenne::powertriplet:



Public Member Functions

- powertriplet (CouNumber exponent, bool signpower=false)

  Basic constructor.
- virtual ∼powertriplet ()

  Destructor.
- virtual CouNumber F (CouNumber x)
- virtual CouNumber Fp (CouNumber x)
- virtual CouNumber Fpp (CouNumber x)
- virtual CouNumber FpInv (CouNumber x)

Protected Attributes

- CouNumber exponent_
- bool issignpower_

7.119.1 Detailed Description

Definition at line 72 of file CouenneFunTriplets.hpp.

7.119.2 Constructor & Destructor Documentation

7.119.2.1 Couenne::powertriplet::powertriplet (CouNumber *exponent,* bool *signpower* = false) [inline]

Basic constructor.

Definition at line 82 of file CouenneFunTriplets.hpp.

7.119.2.2 virtual Couenne::powertriplet::∼powertriplet ( ) [inline], [virtual]

Destructor.

Definition at line 86 of file CouenneFunTriplets.hpp.

7.119.3 Member Function Documentation

7.119.3.1 virtual CouNumber Couenne::powertriplet::F (CouNumber *x*) [inline], [virtual]

Implements Couenne::funtriplet.

Reimplemented in Couenne::kpowertriplet.

Definition at line 88 of file CouenneFunTriplets.hpp.

7.119.3.2 virtual CouNumber Couenne::powertriplet::Fp (CouNumber *x*) [inline], [virtual]

Implements Couenne::funtriplet.

Reimplemented in Couenne::kpowertriplet.

Definition at line 91 of file CouenneFunTriplets.hpp.

7.119.3.3 virtual CouNumber Couenne::powertriplet::Fpp (CouNumber *x*) [inline], [virtual]

Implements Couenne::funtriplet.

Reimplemented in Couenne::kpowertriplet.

Definition at line 94 of file CouenneFunTriplets.hpp.

7.119.3.4 virtual CouNumber Couenne::powertriplet::FpInv (CouNumber *x*) [inline], [virtual]

Implements Couenne::funtriplet.

Reimplemented in Couenne::kpowertriplet.

Definition at line 97 of file CouenneFunTriplets.hpp.

7.119.4 Member Data Documentation

7.119.4.1 CouNumber Couenne::powertriplet::exponent_ [protected]

Definition at line 76 of file CouenneFunTriplets.hpp.

7.119.4.2 bool Couenne::powertriplet::issignpower_ [protected]

Definition at line 77 of file CouenneFunTriplets.hpp.

The documentation for this class was generated from the following file:

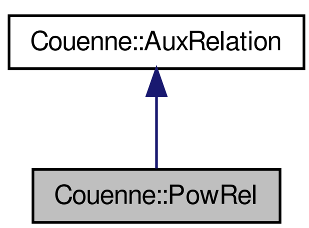
- /home/ted/COIN/trunk/Couenne/src/util/CouenneFunTriplets.hpp

7.120 Couenne::PowRel Class Reference

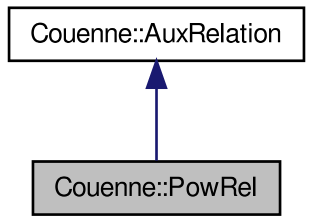
Identifies 5-tuple of the form.

`#include <CouenneCrossConv.hpp>`

Inheritance diagram for Couenne::PowRel:



Collaboration diagram for Couenne::PowRel:



Public Member Functions

- virtual int findRelations ()
- virtual void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

7.120.1 Detailed Description

Identifies 5-tuple of the form.

x_j := x_i ^ alpha x_p := x_i ^ beta

and generates cuts based on the relation

x_p = x_j ^ {beta/alpha}

Definition at line 125 of file CouenneCrossConv.hpp.

7.120.2 Member Function Documentation

7.120.2.1 virtual int Couenne::PowRel::findRelations ( ) [virtual]

Implements Couenne::AuxRelation.

7.120.2.2 virtual void Couenne::PowRel::generateCuts (const OsiSolverInterface & , OsiCuts & , const CglTreeInfo = CglTreeInfo()) const [virtual]

Reimplemented from Couenne::AuxRelation.

The documentation for this class was generated from the following file:

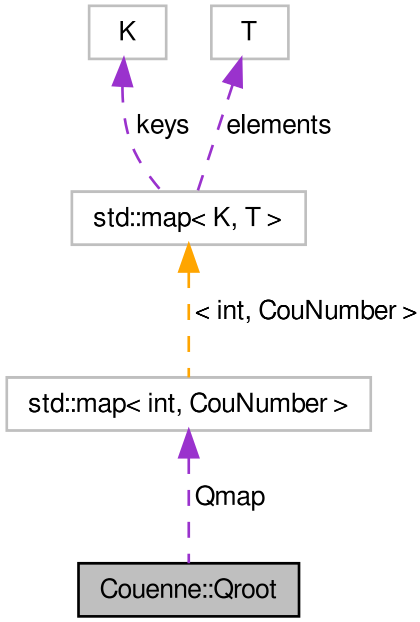
- /home/ted/COIN/trunk/Couenne/src/cut/crossconv/CouenneCrossConv.hpp

7.121 Couenne::Qroot Class Reference

class that stores result of previous calls to rootQ into a map for faster access

`#include <CouenneRootQ.hpp>`

Collaboration diagram for Couenne::Qroot:



Public Member Functions

- Qroot ()

  Empty constructor – we only need the method to work on the static structure.
- ∼Qroot ()

  Empty destructor.
- CouNumber operator() (int k)

  Retrieve root of Q with order = k.

Static Protected Attributes

- static std::map< int, CouNumber > Qmap

  Maps an integer k with the root of $Q^k(x)$.

7.121.1 Detailed Description

class that stores result of previous calls to rootQ into a map for faster access

Definition at line 29 of file CouenneRootQ.hpp.

7.121.2 Constructor & Destructor Documentation

7.121.2.1 Couenne::Qroot::Qroot ( ) [inline]

Empty constructor – we only need the method to work on the static structure.

Definition at line 41 of file CouenneRootQ.hpp.

7.121.2.2 Couenne::Qroot::∼Qroot ( ) [inline]

Empty destructor.

Definition at line 44 of file CouenneRootQ.hpp.

7.121.3 Member Function Documentation

7.121.3.1 CouNumber Couenne::Qroot::operator() (int *k*) [inline]

Retrieve root of Q with order = k.

If no such computation has been performed yet, do it here

Definition at line 49 of file CouenneRootQ.hpp.

7.121.4 Member Data Documentation

7.121.4.1 std::map<int, CouNumber> Couenne::Qroot::Qmap [static], [protected]

Maps an integer k with the root of $Q^k(x)$.

Definition at line 35 of file CouenneRootQ.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/util/CouenneRootQ.hpp

7.122 Couenne::quadElem Class Reference

```
#include <CouenneLQelems.hpp>
```

Public Member Functions

- quadElem (exprVar ∗i, exprVar ∗j, CouNumber c)
- quadElem (const quadElem &src)
- quadElem ∗ clone ()
- exprVar ∗ varI ()
- exprVar ∗ varJ ()
- CouNumber coeff ()

7.122.1 Detailed Description

Definition at line 20 of file CouenneLQelems.hpp.

7.122.2 Constructor & Destructor Documentation

7.122.2.1 Couenne::quadElem::quadElem (exprVar ∗ *i*, exprVar ∗ *j*, CouNumber *c*) [inline]

Definition at line 29 of file CouenneLQelems.hpp.

7.122.2.2 Couenne::quadElem::quadElem (const quadElem & *src*) [inline]

Definition at line 34 of file CouenneLQelems.hpp.

7.122.3 Member Function Documentation

7.122.3.1 quadElem∗ Couenne::quadElem::clone ( ) [inline]

Definition at line 39 of file CouenneLQelems.hpp.

7.122.3.2 exprVar∗ Couenne::quadElem::varI ( ) [inline]

Definition at line 42 of file CouenneLQelems.hpp.

7.122.3.3 exprVar∗ Couenne::quadElem::varJ ( ) [inline]

Definition at line 43 of file CouenneLQelems.hpp.

7.122.3.4 CouNumber Couenne::quadElem::coeff ( ) [inline]

Definition at line 44 of file CouenneLQelems.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/standardize/CouenneLQelems.hpp

7.123 Couenne::QuadMap Class Reference

`#include <CouenneLQelems.hpp>`

Public Member Functions

- std::map< std::pair< int, int >
  , CouNumber > & Map ()

  public access
- void insert (int indI, int indJ, CouNumber coe)

  insert a pair <<int,int>,CouNumber> into a map for quadratic terms

7.123.1 Detailed Description

Definition at line 75 of file CouenneLQelems.hpp.

7.123.2 Member Function Documentation

7.123.2.1 std::map<std::pair <int, int>, CouNumber>& Couenne::QuadMap::Map ( ) [inline]

public access

Definition at line 83 of file CouenneLQelems.hpp.

7.123.2.2 void Couenne::QuadMap::insert (int indI, int indJ, CouNumber coe) [inline]

insert a pair <<int,int>,CouNumber> into a map for quadratic terms

Definition at line 87 of file CouenneLQelems.hpp.

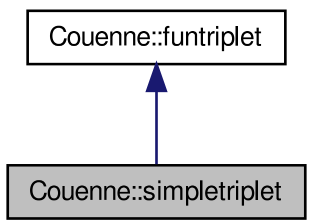
The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/standardize/CouenneLQelems.hpp

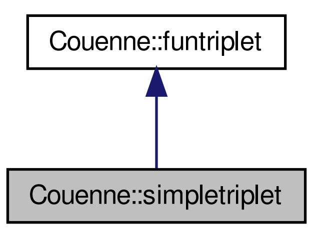
7.124 Couenne::simpletriplet Class Reference

`#include <CouenneFunTriplets.hpp>`

Inheritance diagram for Couenne::simpletriplet:



Collaboration diagram for Couenne::simpletriplet:



Public Member Functions

- simpletriplet (unary_function f=NULL, unary_function fp=NULL, unary_function fpp=NULL, unary_function fpI=N-ULL)

  Basic constructor.
- virtual ∼simpletriplet ()

  Destructor.
- virtual CouNumber F (CouNumber x)
- virtual CouNumber Fp (CouNumber x)
- virtual CouNumber Fpp (CouNumber x)
- virtual CouNumber FpInv (CouNumber x)

Protected Attributes

- unary_function f_
- unary_function fp_
- unary_function fpp_
- unary_function fpI_

7.124.1 Detailed Description

Definition at line 40 of file CouenneFunTriplets.hpp.

7.124.2 Constructor & Destructor Documentation

7.124.2.1 Couenne::simpletriplet::simpletriplet (**unary_function** *f* = NULL, **unary_function** *fp* = NULL, **unary_function** *fpp* = NULL, **unary_function** *fpI* = NULL) [inline]

Basic constructor.

Definition at line 52 of file CouenneFunTriplets.hpp.

7.124.2.2 virtual Couenne::simpletriplet::∼simpletriplet ( ) [inline], [virtual]

Destructor.

Definition at line 62 of file CouenneFunTriplets.hpp.

7.124.3 Member Function Documentation

7.124.3.1 virtual CouNumber Couenne::simpletriplet::F (CouNumber *x*) [inline], [virtual]

Implements Couenne::funtriplet.

Definition at line 64 of file CouenneFunTriplets.hpp.

7.124.3.2 virtual CouNumber Couenne::simpletriplet::Fp (CouNumber *x*) [inline], [virtual]

Implements Couenne::funtriplet.

Definition at line 65 of file CouenneFunTriplets.hpp.

7.124.3.3 virtual CouNumber Couenne::simpletriplet::Fpp (CouNumber x) [inline], [virtual]

Implements Couenne::funtriplet.

Definition at line 66 of file CouenneFunTriplets.hpp.

7.124.3.4 virtual CouNumber Couenne::simpletriplet::FpInv (CouNumber x) [inline], [virtual]

Implements Couenne::funtriplet.

Definition at line 67 of file CouenneFunTriplets.hpp.

7.124.4 Member Data Documentation

7.124.4.1 unary_function Couenne::simpletriplet::f_ [protected]

Definition at line 44 of file CouenneFunTriplets.hpp.

7.124.4.2 unary_function Couenne::simpletriplet::fp_ [protected]

Definition at line 45 of file CouenneFunTriplets.hpp.

7.124.4.3 unary_function Couenne::simpletriplet::fpp_ [protected]

Definition at line 46 of file CouenneFunTriplets.hpp.

7.124.4.4 unary_function Couenne::simpletriplet::fpI_ [protected]

Definition at line 47 of file CouenneFunTriplets.hpp.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/util/CouenneFunTriplets.hpp

7.125 Couenne::SmartAsl Class Reference

```
#include <BonCouenneSetup.hpp>
```

Public Member Functions

- SmartAsl ()
- virtual ∼SmartAsl ()

Public Attributes

- ASL ∗ asl

7.125.1 Detailed Description

Definition at line 33 of file BonCouenneSetup.hpp.

7.125.2 Constructor & Destructor Documentation

7.125.2.1 Couenne::SmartAsl::SmartAsl ( ) [inline]

Definition at line 36 of file BonCouenneSetup.hpp.

7.125.2.2 virtual Couenne::SmartAsl::∼SmartAsl ( ) [virtual]

7.125.3 Member Data Documentation

7.125.3.1 ASL∗ Couenne::SmartAsl::asl

Definition at line 35 of file BonCouenneSetup.hpp.

The documentation for this class was generated from the following file:

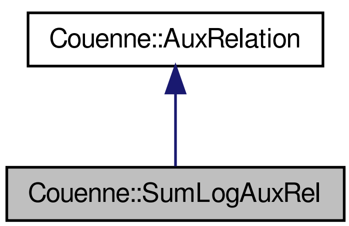
- /home/ted/COIN/trunk/Couenne/src/main/BonCouenneSetup.hpp

7.126 Couenne::SumLogAuxRel Class Reference

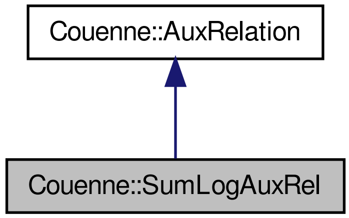
Identifies 5-ples of variables of the form.

`#include <CouenneCrossConv.hpp>`

Inheritance diagram for Couenne::SumLogAuxRel:



Collaboration diagram for Couenne::SumLogAuxRel:



Public Member Functions

- virtual int findRelations ()
- virtual void generateCuts (const OsiSolverInterface &, OsiCuts &, const CglTreeInfo=CglTreeInfo()) const

7.126.1 Detailed Description

Identifies 5-ples of variables of the form.

x_3 := log x_1 x_4 := log x_2 x_5 := x_1 x_2 in [l,u]

and generates a cut

x_3 + x_4 in [max {0, log l}, max {0, log u}].

This has to be repeatedly generated, even when l=u (l and/or u could change in other nodes).

Definition at line 58 of file CouenneCrossConv.hpp.

7.126.2 Member Function Documentation

7.126.2.1 virtual int Couenne::SumLogAuxRel::findRelations ( ) [virtual]

Implements Couenne::AuxRelation.

7.126.2.2 virtual void Couenne::SumLogAuxRel::generateCuts (const OsiSolverInterface & , OsiCuts & , const CglTreeInfo = CglTreeInfo()) const [virtual]

Reimplemented from Couenne::AuxRelation.

The documentation for this class was generated from the following file:

- /home/ted/COIN/trunk/Couenne/src/cut/crossconv/CouenneCrossConv.hpp

7.127 Couenne::t_chg_bounds Class Reference

status of lower/upper bound of a variable, to be checked/modified in bound tightening

```
#include <CouenneTypes.hpp>
```

Public Types

- enum ChangeStatus { UNCHANGED = 0, CHANGED = 1, EXACT = 2 }

Public Member Functions

- t_chg_bounds ()
- t_chg_bounds (const t_chg_bounds &src)
- const char & lower () const
- const char & upper () const
- void setLower (ChangeStatus lower)
- void setUpper (ChangeStatus upper)
- void setLowerBits (char lower)
- void setUpperBits (char upper)
- t_chg_bounds operator= (const t_chg_bounds &src)

7.127.1 Detailed Description

status of lower/upper bound of a variable, to be checked/modified in bound tightening

Definition at line 66 of file CouenneTypes.hpp.

7.127.2 Member Enumeration Documentation

7.127.2.1 enum Couenne::t_chg_bounds::ChangeStatus

Enumerator:

UNCHANGED

CHANGED

EXACT

Definition at line 69 of file CouenneTypes.hpp.

7.127.3 Constructor & Destructor Documentation

7.127.3.1 Couenne::t_chg_bounds::t_chg_bounds ( ) [inline]

Definition at line 75 of file CouenneTypes.hpp.

7.127.3.2 Couenne::t_chg_bounds::t_chg_bounds (const t_chg_bounds & *src*) [inline]

Definition at line 79 of file CouenneTypes.hpp.

7.127.4 Member Function Documentation

7.127.4.1 const char& Couenne::t_chg_bounds::lower ( ) const [inline]

Definition at line 83 of file CouenneTypes.hpp.

7.127.4.2 const char& Couenne::t_chg_bounds::upper ( ) const [inline]

Definition at line 84 of file CouenneTypes.hpp.

7.127.4.3 void Couenne::t_chg_bounds::setLower (ChangeStatus *lower*) [inline]

Definition at line 85 of file CouenneTypes.hpp.

7.127.4.4 void Couenne::t_chg_bounds::setUpper (ChangeStatus *upper*) [inline]

Definition at line 86 of file CouenneTypes.hpp.

7.127.4.5 void Couenne::t_chg_bounds::setLowerBits (char *lower*) [inline]

Definition at line 87 of file CouenneTypes.hpp.

7.127.4.6 void Couenne::t_chg_bounds::setUpperBits (char *upper*) [inline]

Definition at line 88 of file CouenneTypes.hpp.

7.127.4.7 t_chg_bounds Couenne::t_chg_bounds::operator= (const t_chg_bounds & *src*) [inline]

Definition at line 89 of file CouenneTypes.hpp.

The documentation for this class was generated from the following file:

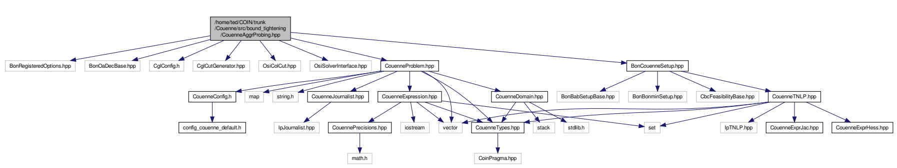
- /home/ted/COIN/trunk/Couenne/src/expression/CouenneTypes.hpp

8 File Documentation

8.1 /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneAggrProbing.hpp File Reference

```
#include "BonRegisteredOptions.hpp"
#include "BonOaDecBase.hpp"
#include "CglConfig.h"
#include "CglCutGenerator.hpp"
#include "OsiColCut.hpp"
#include "OsiSolverInterface.hpp"
#include "CouenneProblem.hpp"
#include "BonCouenneSetup.hpp"
```

Include dependency graph for CouenneAggrProbing.hpp:



Classes

- class Couenne::CouenneAggrProbing
  Cut Generator for aggressive BT; i.e., an aggressive probing.

Namespaces

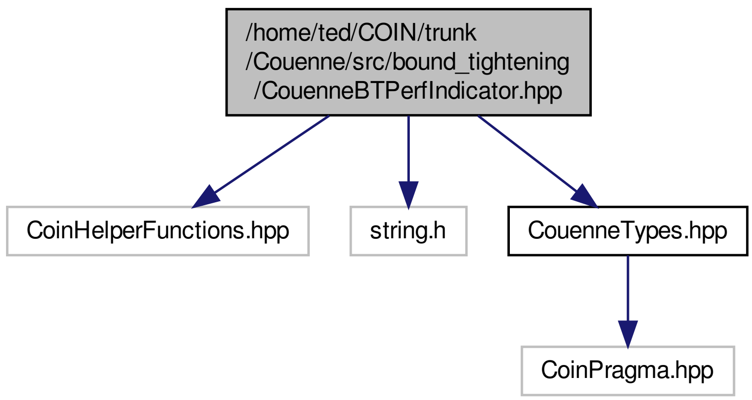
- namespace Couenne

  general include file for different compilers

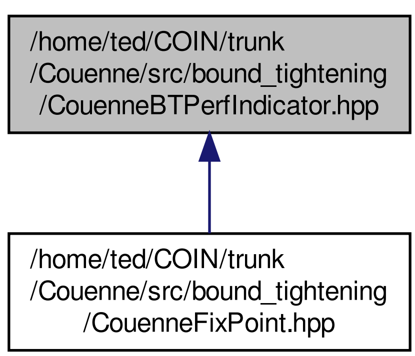
8.2 /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneBTPerfIndicator.hpp File Reference

```
#include "CoinHelperFunctions.hpp"
#include <string.h>
#include "CouenneTypes.hpp"
```

Include dependency graph for CouenneBTPerfIndicator.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::CouenneBTPerfIndicator

Namespaces

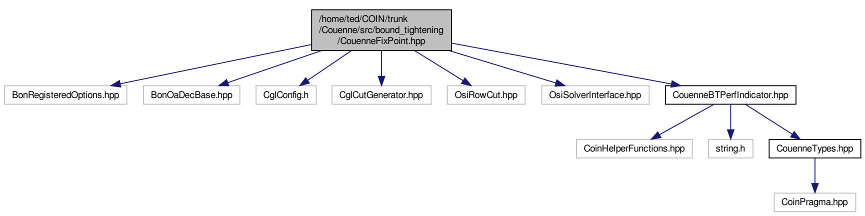
- namespace Couenne

  general include file for different compilers

8.3 /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneFixPoint.hpp File Reference

```
#include "BonRegisteredOptions.hpp"
#include "BonOaDecBase.hpp"
#include "CglConfig.h"
#include "CglCutGenerator.hpp"
#include "OsiRowCut.hpp"
#include "OsiSolverInterface.hpp"
#include "CouenneBTPerfIndicator.hpp"
```

Include dependency graph for CouenneFixPoint.hpp:



Classes

- class Couenne::CouenneFixPoint

  Cut Generator for FBBT fixpoint.

Namespaces

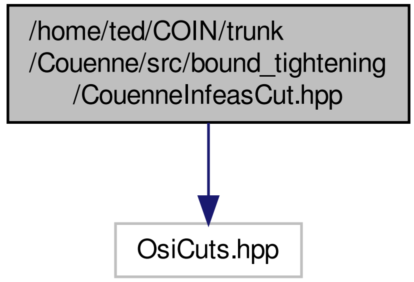
- namespace Couenne

  general include file for different compilers

8.4 /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneInfeasCut.hpp File Reference

```
#include "OsiCuts.hpp"
```

Include dependency graph for CouenneInfeasCut.hpp:



Functions

- void WipeMakeInfeas (OsiCuts &cs)

  Add a fictitious cut 1<= x_0 <= -1 as a signal to the node solver that this node is deemed infeasible by this cut generator (most likely a bound tightener).
- bool isWiped (OsiCuts &cs)

  Check whether the previous cut generators have added an infeasible cut.

8.4.1 Function Documentation

8.4.1.1 void WipeMakeInfeas (OsiCuts & *cs*)

Add a fictitious cut 1<= x_0 <= -1 as a signal to the node solver that this node is deemed infeasible by this cut generator (most likely a bound tightener).

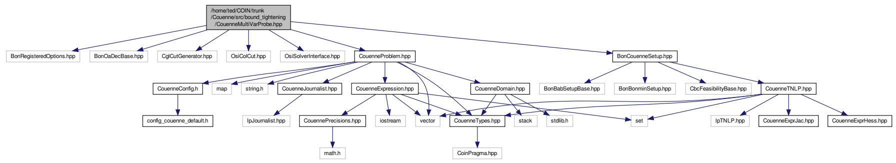
8.4.1.2 bool isWiped (OsiCuts & *cs*)

Check whether the previous cut generators have added an infeasible cut.

8.5 /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneMultiVarProbe.hpp File Reference

```
#include "BonRegisteredOptions.hpp"
#include "BonOaDecBase.hpp"
#include "CglCutGenerator.hpp"
#include "OsiColCut.hpp"
#include "OsiSolverInterface.hpp"
#include "CouenneProblem.hpp"
#include "BonCouenneSetup.hpp"
```

Include dependency graph for CouenneMultiVarProbe.hpp:



Classes

- class Couenne::CouenneMultiVarProbe

Namespaces

- namespace Couenne

  general include file for different compilers

8.6 /home/ted/COIN/trunk/Couenne/src/bound_tightening/CouenneSparseBndVec.hpp File Reference

Classes

- class Couenne::CouenneSparseBndVec< T >

Namespaces

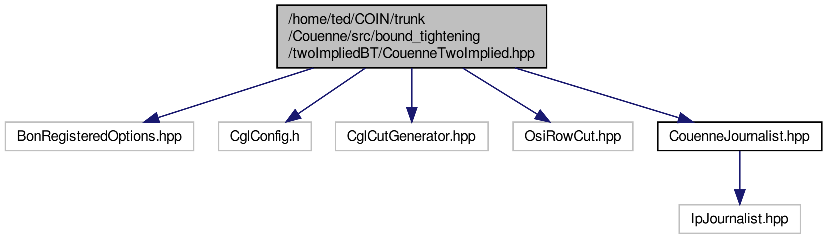
- namespace Couenne

  general include file for different compilers

8.7 /home/ted/COIN/trunk/Couenne/src/bound_tightening/twoImpliedBT/CouenneTwoImplied.hpp File Reference

```
#include "BonRegisteredOptions.hpp"
#include "CglConfig.h"
#include "CglCutGenerator.hpp"
#include "OsiRowCut.hpp"
#include "CouenneJournalist.hpp"
```

Include dependency graph for CouenneTwoImplied.hpp:



Classes

- class Couenne::CouenneTwoImplied

  Cut Generator for implied bounds derived from pairs of linear (in)equalities.

Namespaces

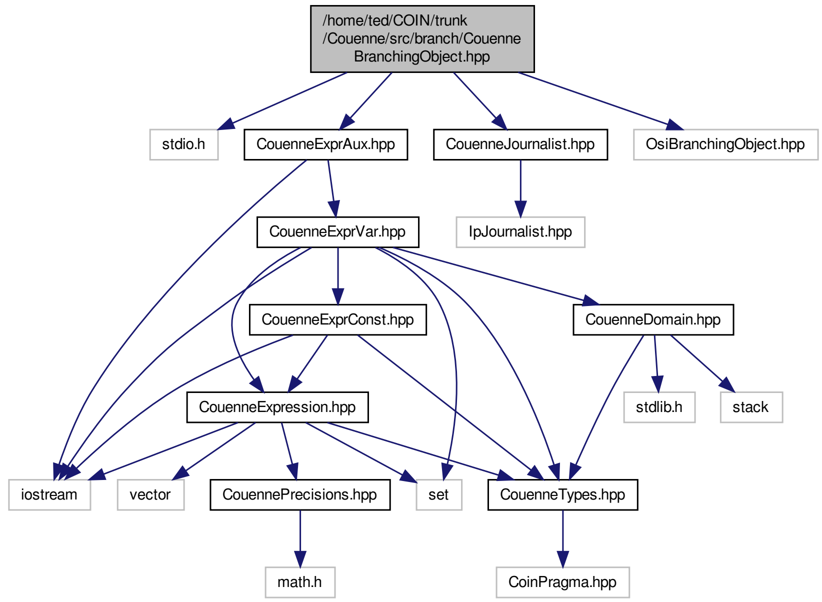
- namespace Ipopt
- namespace Couenne

  general include file for different compilers

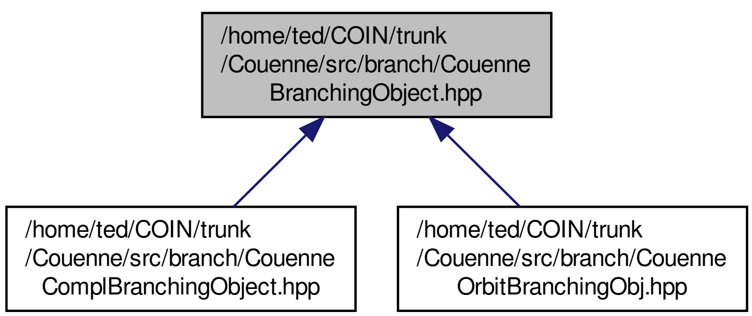
8.8 /home/ted/COIN/trunk/Couenne/src/branch/CouenneBranchingObject.hpp File Reference

```
#include "stdio.h"
#include "CouenneExprAux.hpp"
#include "CouenneJournalist.hpp"
#include "OsiBranchingObject.hpp"
```

Include dependency graph for CouenneBranchingObject.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::CouenneBranchingObject

  "Spatial" branching object.

Namespaces

- namespace Couenne

  general include file for different compilers

Macros

- #define COUENNE_CROP 1
- #define COUENNE_LCROP (1e2∗COUENNE_CROP)
- #define COUENNE_LARGE_INTERVAL 1e4
- #define COUENNE_NEAR_BOUND 1e-2

8.8.1 Macro Definition Documentation

8.8.1.1 #define COUENNE_CROP 1

Definition at line 25 of file CouenneBranchingObject.hpp.

8.8.1.2 #define COUENNE_LCROP (1e2∗COUENNE_CROP)

Definition at line 26 of file CouenneBranchingObject.hpp.

8.8.1.3 #define COUENNE_LARGE_INTERVAL 1e4

Definition at line 28 of file CouenneBranchingObject.hpp.

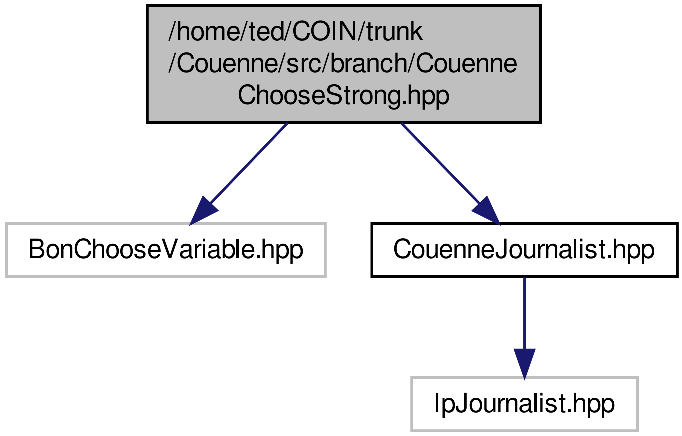
8.8.1.4 #define COUENNE_NEAR_BOUND 1e-2

Definition at line 29 of file CouenneBranchingObject.hpp.

8.9 /home/ted/COIN/trunk/Couenne/src/branch/CouenneChooseStrong.hpp File Reference

```
#include "BonChooseVariable.hpp"
#include "CouenneJournalist.hpp"
```

Include dependency graph for CouenneChooseStrong.hpp:



Classes

- class Couenne::CouenneChooseStrong

Namespaces

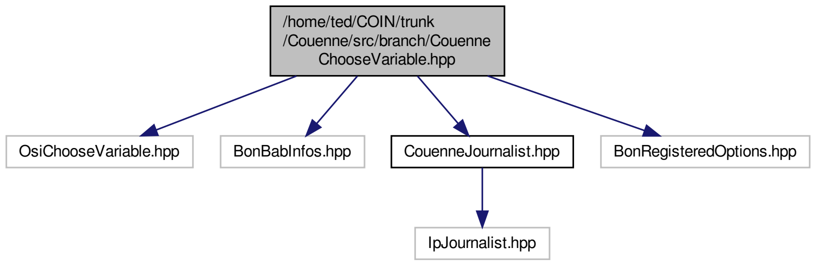
- namespace Couenne

  general include file for different compilers

8.10 /home/ted/COIN/trunk/Couenne/src/branch/CouenneChooseVariable.hpp File Reference

```
#include "OsiChooseVariable.hpp"
#include "BonBabInfos.hpp"
#include "CouenneJournalist.hpp"
#include "BonRegisteredOptions.hpp"
```

Include dependency graph for CouenneChooseVariable.hpp:



Classes

- class Couenne::CouenneChooseVariable

    Choose a variable for branching.

Namespaces

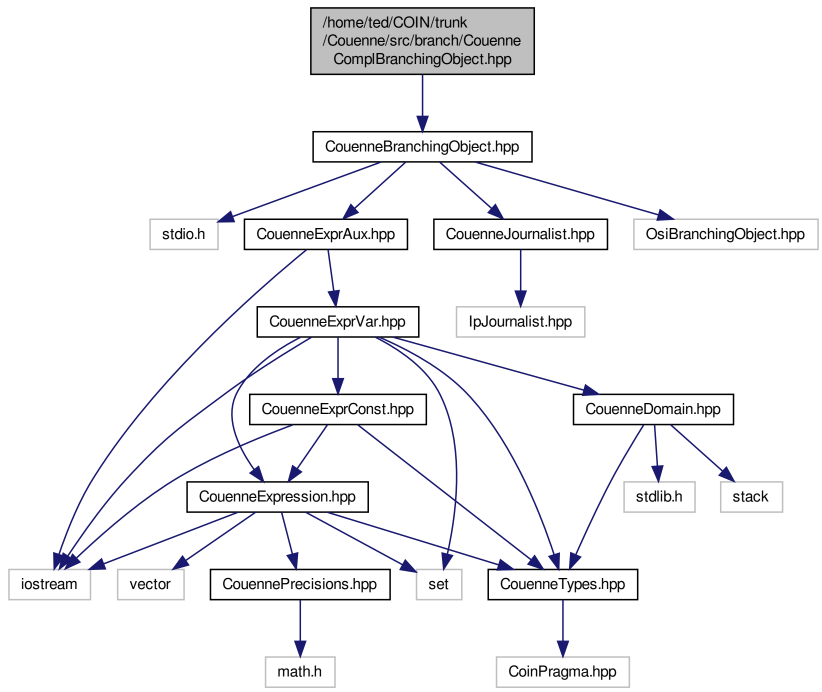
- namespace Couenne

    general include file for different compilers

8.11 /home/ted/COIN/trunk/Couenne/src/branch/CouenneComplBranchingObject.hpp File Reference

```
#include "CouenneBranchingObject.hpp"
```

Include dependency graph for CouenneComplBranchingObject.hpp:



Classes

- class Couenne::CouenneComplBranchingObject

    "Spatial" branching object for complementarity constraints.

Namespaces

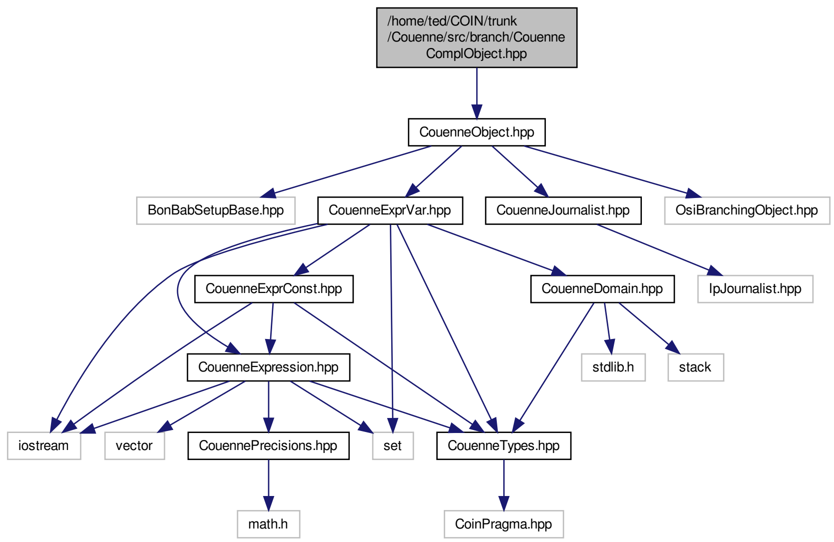
- namespace Couenne

    general include file for different compilers

8.12 /home/ted/COIN/trunk/Couenne/src/branch/CouenneComplObject.hpp File Reference

```
#include "CouenneObject.hpp"
```

Include dependency graph for CouenneComplObject.hpp:



Classes

- class Couenne::CouenneComplObject

    OsiObject for complementarity constraints $x_1 x_2 \geq, \leq, = 0$.

Namespaces

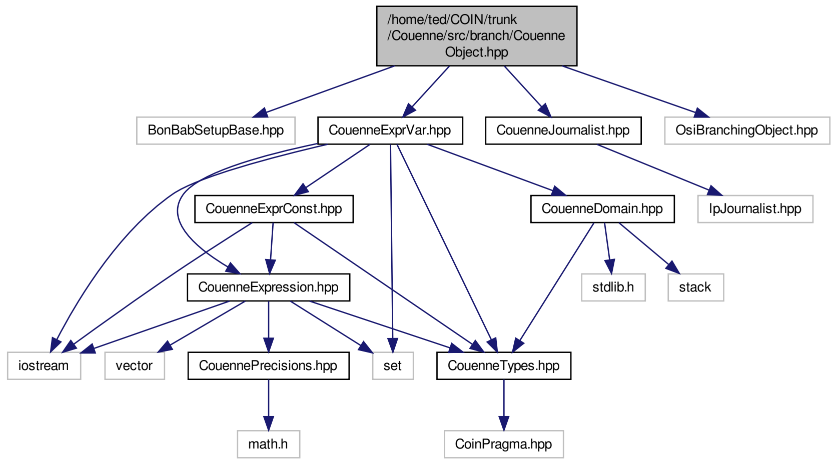
- namespace Couenne

    general include file for different compilers

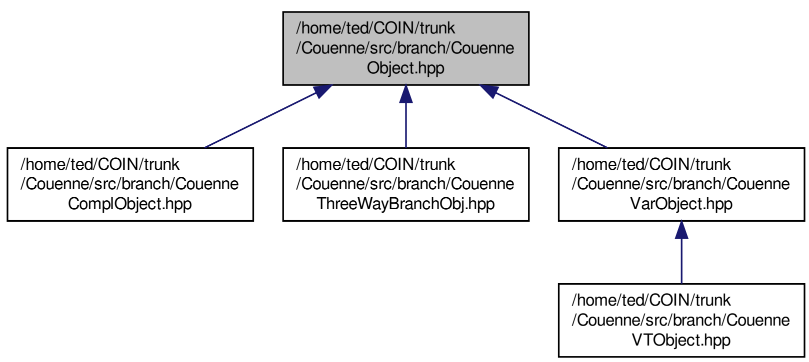
8.13 /home/ted/COIN/trunk/Couenne/src/branch/CouenneObject.hpp File Reference

```
#include "BonBabSetupBase.hpp"
#include "CouenneExprVar.hpp"
#include "CouenneJournalist.hpp"
#include "OsiBranchingObject.hpp"
```

Include dependency graph for CouenneObject.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::CouenneObject

    OsiObject for auxiliary variables $w=f(x)$.

Namespaces

- namespace Couenne

    general include file for different compilers

Macros

- #define AGGR_MUL 2
- #define THRES_ZERO_SYMM 0.8

Enumerations

- enum {
  Couenne::TWO_LEFT, Couenne::TWO_RIGHT, Couenne::TWO_RAND, Couenne::THREE_LEFT,
  Couenne::THREE_CENTER, Couenne::THREE_RIGHT, Couenne::THREE_RAND, Couenne::BRANCH_NONE
  }

  Define what kind of branching (two- or three-way) and where to start from: left, (center,) or right.

Functions

- CouNumber Couenne::minMaxDelta (funtriplet ∗ft, CouNumber lb, CouNumber ub)
- CouNumber Couenne::maxHeight (funtriplet ∗ft, CouNumber lb, CouNumber ub)

Variables

- const CouNumber Couenne::default_alpha = 0.25
- const CouNumber Couenne::default_clamp = 0.2
- const CouNumber Couenne::max_pseudocost = 1000.
- const double Couenne::large_bound = 1e9

  if |branching point| > this, change it
- const CouNumber Couenne::closeToBounds = .05

8.13.1 Macro Definition Documentation

8.13.1.1 #define AGGR_MUL 2

Definition at line 30 of file CouenneObject.hpp.

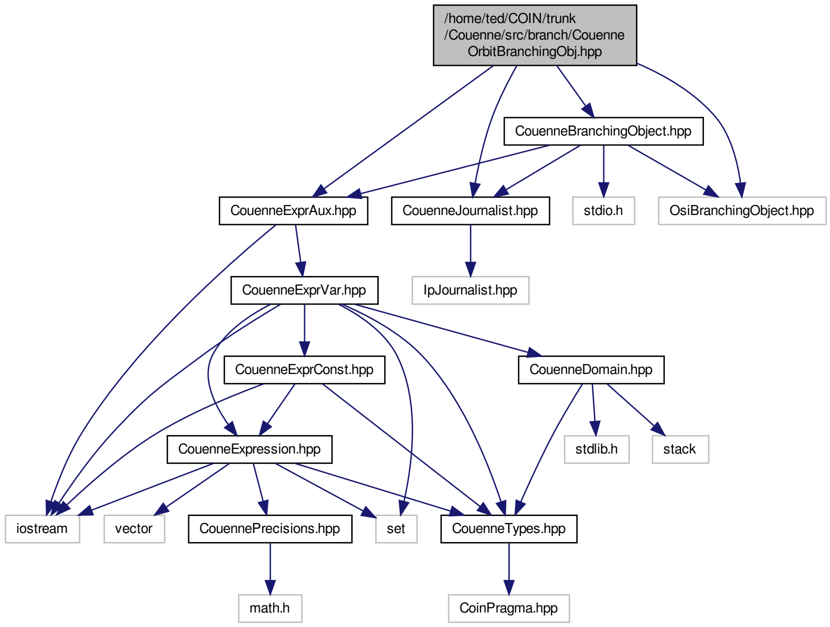
8.13.1.2 #define THRES_ZERO_SYMM 0.8

Definition at line 31 of file CouenneObject.hpp.

8.14 /home/ted/COIN/trunk/Couenne/src/branch/CouenneOrbitBranchingObj.hpp File Reference

```
#include "CouenneExprAux.hpp"
#include "CouenneJournalist.hpp"
#include "OsiBranchingObject.hpp"
#include "CouenneBranchingObject.hpp"
```

Include dependency graph for CouenneOrbitBranchingObj.hpp:



Classes

- class Couenne::CouenneOrbitBranchingObj

    "Spatial" branching object.

Namespaces

- namespace Couenne

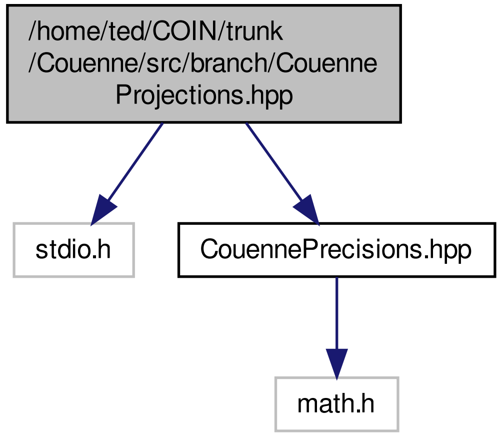
    general include file for different compilers

8.15 /home/ted/COIN/trunk/Couenne/src/branch/CouenneOrbitObj.hpp File Reference

8.16 /home/ted/COIN/trunk/Couenne/src/branch/CouenneProjections.hpp File Reference

```
#include <stdio.h>
#include "CouennePrecisions.hpp"
```

Include dependency graph for CouenneProjections.hpp:



Namespaces

- namespace Couenne

  general include file for different compilers

Functions

- CouNumber Couenne::project (CouNumber a, CouNumber b, CouNumber c, CouNumber x0, CouNumber y0, CouNumber lb, CouNumber ub, int sign, CouNumber ∗xp=NULL, CouNumber ∗yp=NULL)

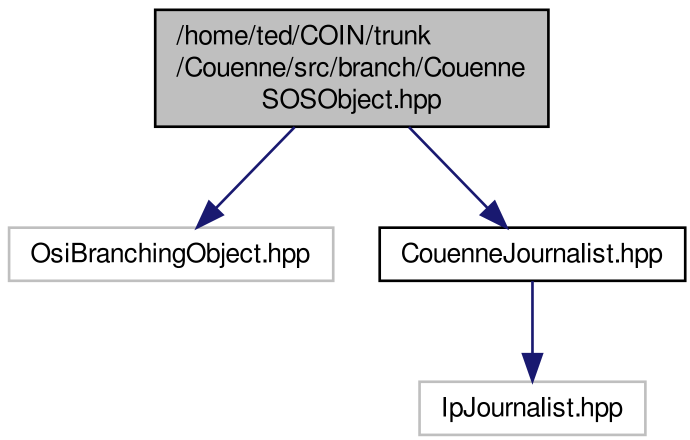
  Compute projection of point (x0, y0) on the segment defined by line ax + by + c <>= 0 (sign provided by parameter sign) and bounds [lb, ub] on x.
- CouNumber Couenne::projectSeg (CouNumber x0, CouNumber y0, CouNumber x1, CouNumber y1, CouNumber x2, CouNumber y2, int sign, CouNumber ∗xp=NULL, CouNumber ∗yp=NULL)

  Compute projection of point (x0, y0) on the segment defined by two points (x1,y1), (x2, y2) – sign provided by parameter sign.

8.17 /home/ted/COIN/trunk/Couenne/src/branch/CouenneSOSObject.hpp File Reference

```
#include "OsiBranchingObject.hpp"
#include "CouenneJournalist.hpp"
```

Include dependency graph for CouenneSOSObject.hpp:



Classes

- class Couenne::CouenneSOSBranchingObject
- class Couenne::CouenneSOSObject

Namespaces

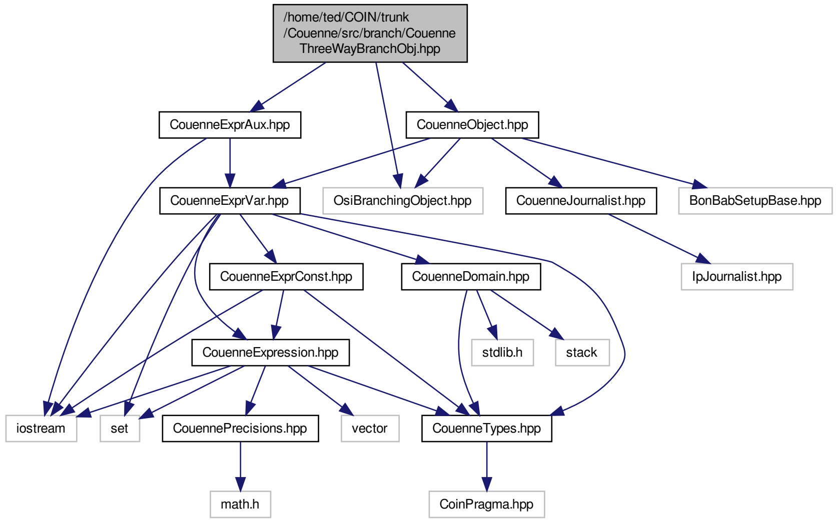
- namespace Couenne

  general include file for different compilers

8.18 /home/ted/COIN/trunk/Couenne/src/branch/CouenneThreeWayBranchObj.hpp File Reference

```
#include "OsiBranchingObject.hpp"
#include "CouenneExprAux.hpp"
#include "CouenneObject.hpp"
```

Include dependency graph for CouenneThreeWayBranchObj.hpp:



Classes

- class Couenne::CouenneThreeWayBranchObj

  Spatial, three-way branching object.

Namespaces

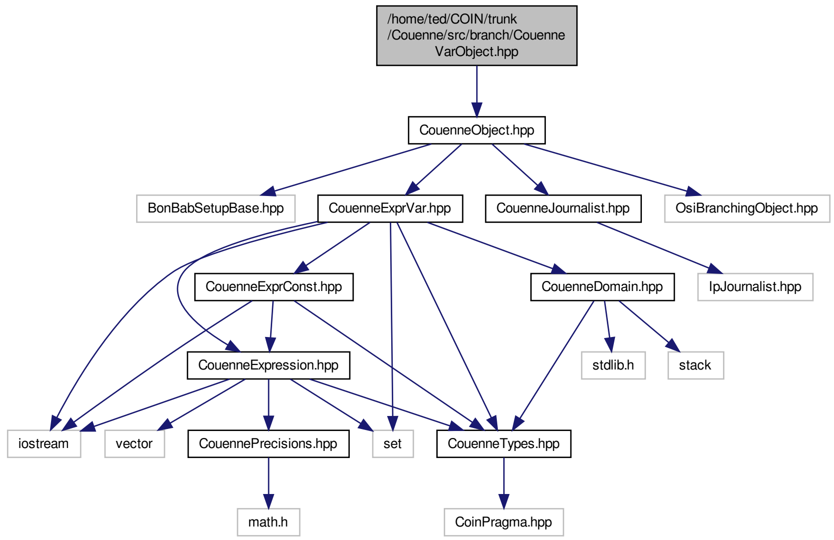
- namespace Couenne

  general include file for different compilers

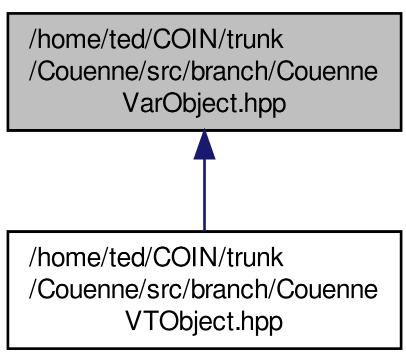
8.19 /home/ted/COIN/trunk/Couenne/src/branch/CouenneVarObject.hpp File Reference

`#include "CouenneObject.hpp"`

Include dependency graph for CouenneVarObject.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::CouenneVarObject

  OsiObject for variables in a MINLP.

Namespaces

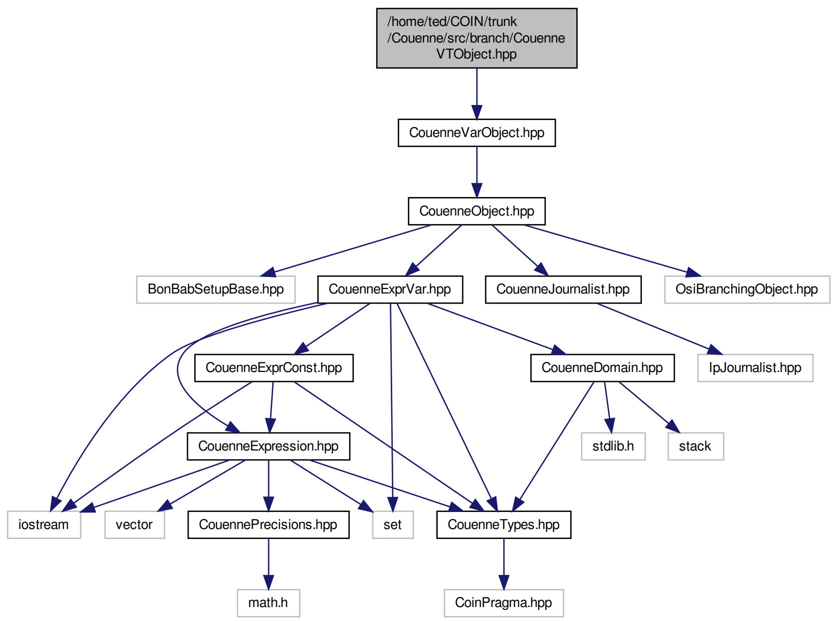
- namespace Couenne

  general include file for different compilers

8.20 /home/ted/COIN/trunk/Couenne/src/branch/CouenneVTObject.hpp File Reference

`#include "CouenneVarObject.hpp"`

Include dependency graph for CouenneVTObject.hpp:



Classes

- class Couenne::CouenneVTObject

  OsiObject for violation transfer on variables in a MINLP.

Namespaces

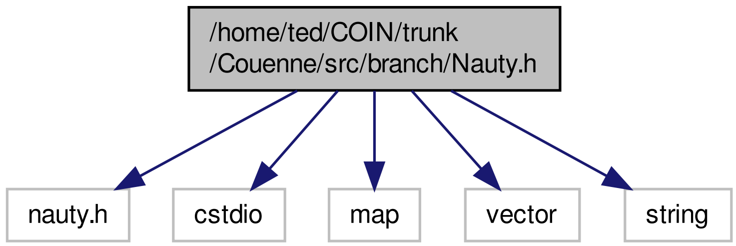
- namespace Couenne

  general include file for different compilers

8.21 /home/ted/COIN/trunk/Couenne/src/branch/Nauty.h File Reference

`#include "nauty.h"`

```
#include <cstdio>
#include <map>
#include <vector>
#include <string>
```
Include dependency graph for Nauty.h:

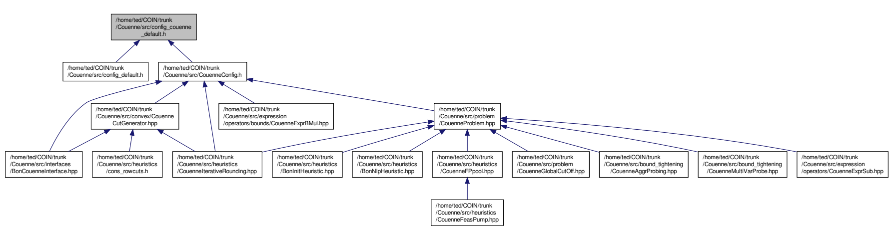


Classes

- class Nauty

8.22 /home/ted/COIN/trunk/Couenne/src/config_couenne_default.h File Reference

This graph shows which files directly or indirectly include this file:



Macros

- #define COUENNE_VERSION "trunk"
- #define COUENNE_VERSION_MAJOR 9999
- #define COUENNE_VERSION_MINOR 9999
- #define COUENNE_VERSION_RELEASE 9999

8.22.1 Macro Definition Documentation

8.22.1.1 #define COUENNE_VERSION "trunk"

Definition at line 8 of file config_couenne_default.h.

8.22.1.2 #define COUENNE_VERSION_MAJOR 9999

Definition at line 11 of file config_couenne_default.h.

8.22.1.3 #define COUENNE_VERSION_MINOR 9999

Definition at line 14 of file config_couenne_default.h.

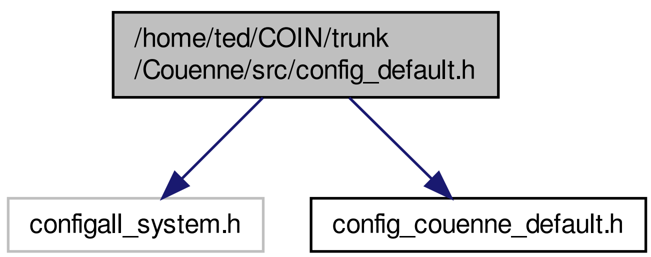
8.22.1.4 #define COUENNE_VERSION_RELEASE 9999

Definition at line 17 of file config_couenne_default.h.

8.23 /home/ted/COIN/trunk/Couenne/src/config_default.h File Reference

```
#include "configall_system.h"
#include "config_couenne_default.h"
```

Include dependency graph for config_default.h:



Macros

- #define COIN_COUENNE_CHECKLEVEL 0
- #define COIN_COUENNE_VERBOSITY 0

8.23.1 Macro Definition Documentation

8.23.1.1 #define COIN_COUENNE_CHECKLEVEL 0

Definition at line 14 of file config_default.h.

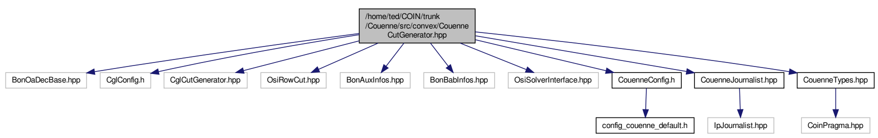
8.23.1.2 #define COIN_COUENNE_VERBOSITY 0

Definition at line 17 of file config_default.h.

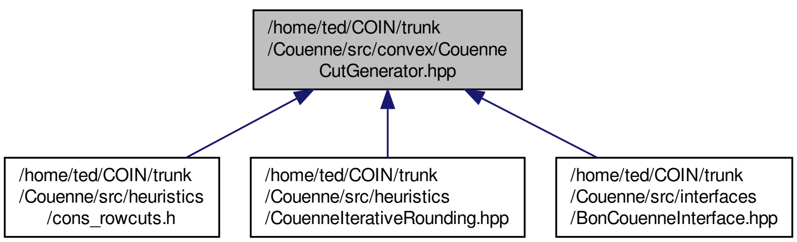
8.24 /home/ted/COIN/trunk/Couenne/src/convex/CouenneCutGenerator.hpp File Reference

```
#include "BonOaDecBase.hpp"
#include "CglConfig.h"
#include "CglCutGenerator.hpp"
#include "OsiRowCut.hpp"
#include "BonAuxInfos.hpp"
#include "BonBabInfos.hpp"
#include "OsiSolverInterface.hpp"
#include "CouenneConfig.h"
#include "CouenneJournalist.hpp"
#include "CouenneTypes.hpp"
```

Include dependency graph for CouenneCutGenerator.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::CouenneCutGenerator

    Cut Generator for linear convexifications.

Namespaces

- namespace Ipopt
- namespace Bonmin
- namespace Couenne

    general include file for different compilers

Functions

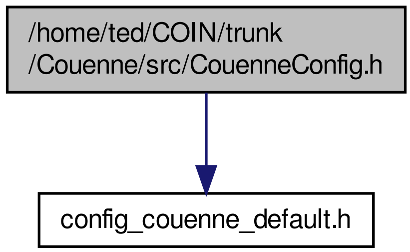
- void Couenne::sparse2dense (int ncols, t_chg_bounds ∗chg_bds, int ∗&changed, int &nchanged)

  translate sparse to dense vector (should be replaced)

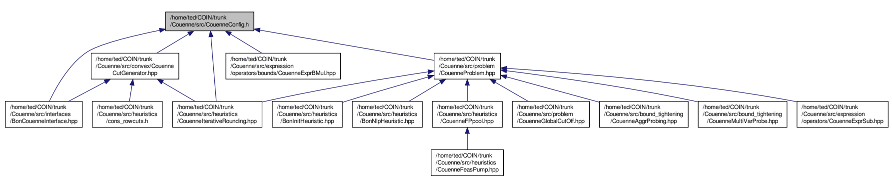
8.25 /home/ted/COIN/trunk/Couenne/src/CouenneConfig.h File Reference

```
#include "config_couenne_default.h"
```

Include dependency graph for CouenneConfig.h:



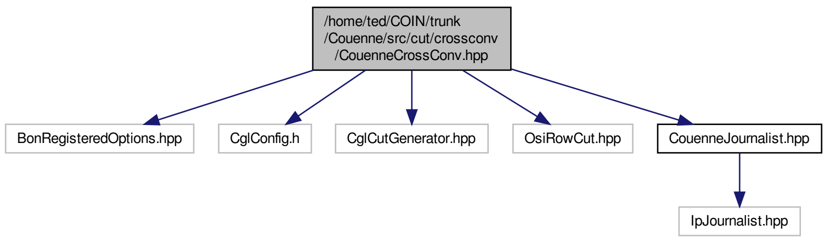
This graph shows which files directly or indirectly include this file:



8.26 /home/ted/COIN/trunk/Couenne/src/cut/crossconv/CouenneCrossConv.hpp File Reference

```
#include "BonRegisteredOptions.hpp"
#include "CglConfig.h"
#include "CglCutGenerator.hpp"
#include "OsiRowCut.hpp"
#include "CouenneJournalist.hpp"
```

Include dependency graph for CouenneCrossConv.hpp:



Classes

- class Couenne::AuxRelation

  Base class definition for relations between auxiliaries.
- class Couenne::SumLogAuxRel

  Identifies 5-ples of variables of the form.
- class Couenne::MultiProdRel

  Identifies 5-ples of variables of the form.
- class Couenne::BiProdDivRel

  Identifies 5-tuple of the form.
- class Couenne::PowRel

  Identifies 5-tuple of the form.
- class Couenne::CouenneCrossConv

  Cut Generator that uses relationships between auxiliaries.

Namespaces

- namespace Ipopt
- namespace Couenne

  general include file for different compilers

8.27 /home/ted/COIN/trunk/Couenne/src/cut/ellipcuts/CouenneEllipCuts.hpp File Reference

Namespaces

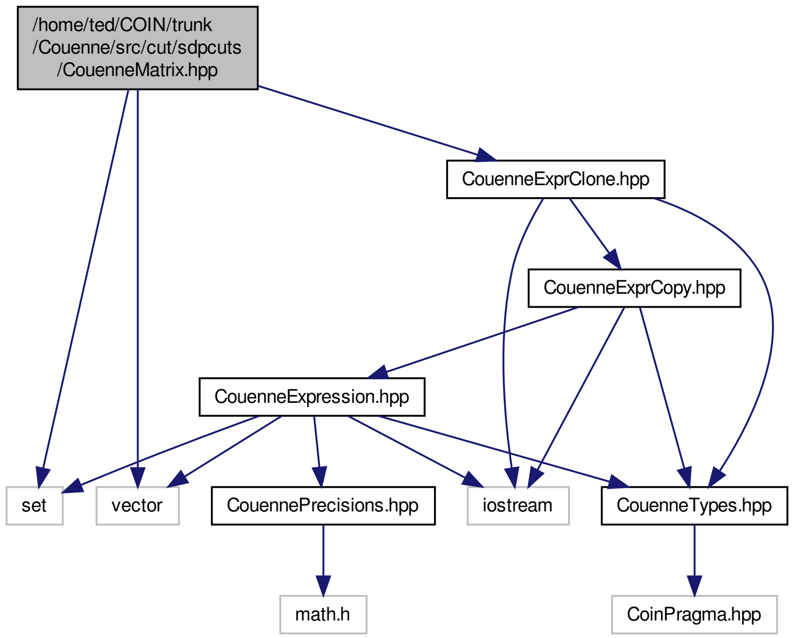
- namespace Couenne

  general include file for different compilers

8.28 /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouenneMatrix.hpp File Reference

```
#include <set>
#include <vector>
#include "CouenneExprClone.hpp"
```

Include dependency graph for CouenneMatrix.hpp:



Classes

- class Couenne::CouenneScalar
- class Couenne::CouenneSparseVector
- struct Couenne::CouenneSparseVector::compare_scalars
- class Couenne::CouenneExprMatrix
- struct Couenne::CouenneExprMatrix::compare_pair_ind

Namespaces

- namespace Couenne

  general include file for different compilers

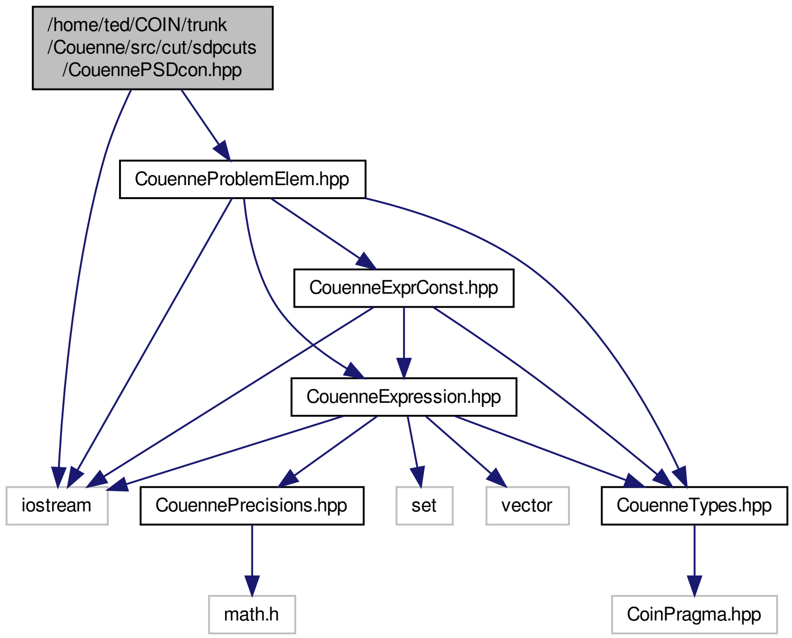
Functions

- bool Couenne::operator< (const CouenneScalar &first, const CouenneScalar &second)

8.29 /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouennePSDcon.hpp File Reference

```
#include "CouenneProblemElem.hpp"
#include <iostream>
```

Include dependency graph for CouennePSDcon.hpp:



Classes

- class Couenne::CouennePSDcon

    Class to represent positive semidefinite constraints //////////////////.

Namespaces

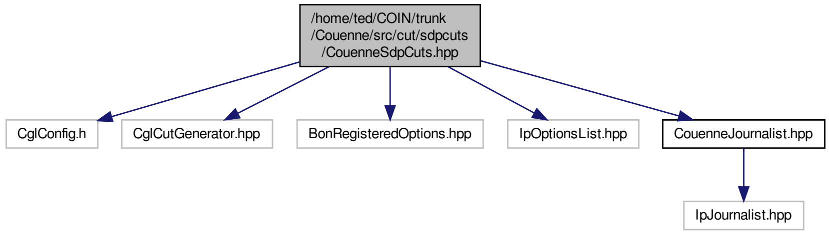
- namespace Couenne

    general include file for different compilers

8.30 /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/CouenneSdpCuts.hpp File Reference

```
#include "CglConfig.h"
#include "CglCutGenerator.hpp"
#include "BonRegisteredOptions.hpp"
#include "IpOptionsList.hpp"
#include "CouenneJournalist.hpp"
```

Include dependency graph for CouenneSdpCuts.hpp:



Classes

- class Couenne::CouenneSdpCuts

  These are cuts of the form.

Namespaces

- namespace Couenne

  general include file for different compilers

8.31 /home/ted/COIN/trunk/Couenne/src/cut/sdpcuts/dsyevx_wrapper.hpp File Reference

Functions

- int dsyevx_interface (int n, double ∗A, int &m, double ∗&w, double ∗&z, double tolerance, double lb_ev, double ub_ev, int firstidx, int lastidx)

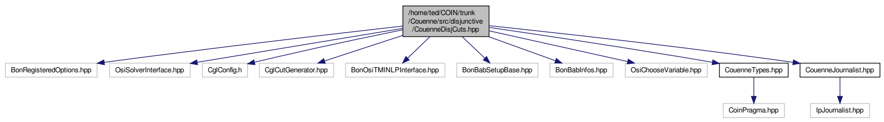
8.31.1 Function Documentation

8.31.1.1 int dsyevx_interface (int *n*, double ∗ *A*, int & *m*, double ∗& *w*, double ∗& *z*, double *tolerance*, double *lb_ev*, double *ub_ev*, int *firstidx*, int *lastidx*)

8.32 /home/ted/COIN/trunk/Couenne/src/disjunctive/CouenneDisjCuts.hpp File Reference

```
#include "BonRegisteredOptions.hpp"
#include "OsiSolverInterface.hpp"
#include "CglConfig.h"
#include "CglCutGenerator.hpp"
#include "BonOsiTMINLPInterface.hpp"
#include "BonBabSetupBase.hpp"
#include "BonBabInfos.hpp"
#include "OsiChooseVariable.hpp"
#include "CouenneTypes.hpp"
#include "CouenneJournalist.hpp"
```

Include dependency graph for CouenneDisjCuts.hpp:



Classes

- class Couenne::CouenneDisjCuts

    Cut Generator for linear convexifications.

Namespaces

- namespace Couenne

    general include file for different compilers

Enumerations

- enum { Couenne::COUENNE_INFEASIBLE, Couenne::COUENNE_TIGHTENED, Couenne::COUENNE_FEASIBLE }

Functions

- void Couenne::CoinInvN (register const double ∗orig, register int n, register double ∗inverted)

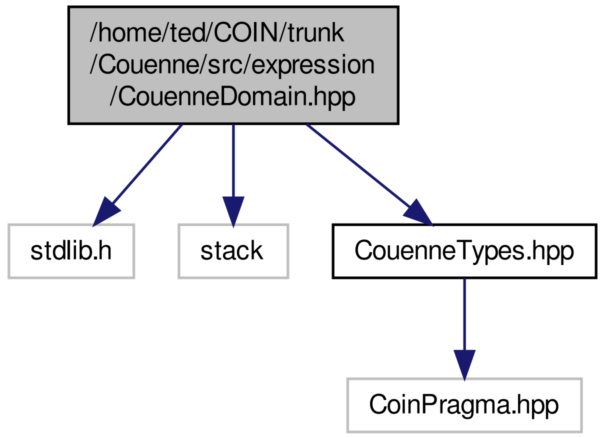
    invert all contents
- void Couenne::CoinCopyDisp (register const int ∗src, register int num, register int ∗dst, register int displacement)

    a CoinCopyN with a += on each element

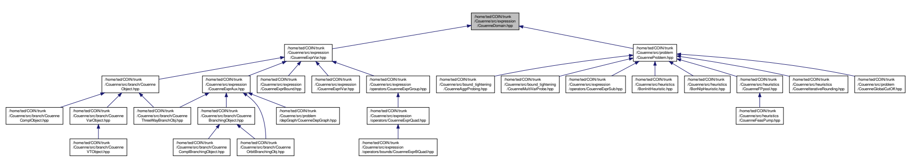
8.33 /home/ted/COIN/trunk/Couenne/src/expression/CouenneDomain.hpp File Reference

```
#include <stdlib.h>
#include <stack>
#include "CouenneTypes.hpp"
```

Include dependency graph for CouenneDomain.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::DomainPoint

  Define a point in the solution space and the bounds around it.
- class Couenne::Domain

  Define a dynamic point+bounds, with a way to save and restore previous points+bounds through a LIFO structure.

Namespaces

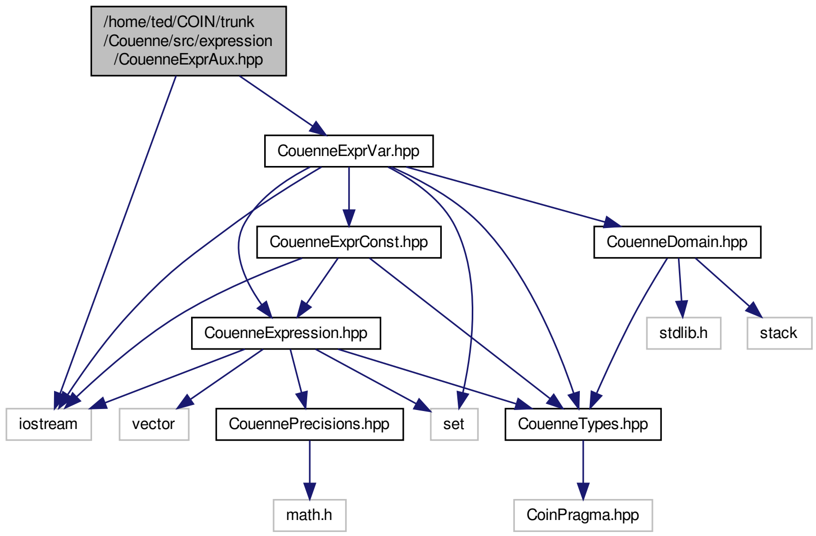
- namespace Osi
- namespace Couenne

  general include file for different compilers

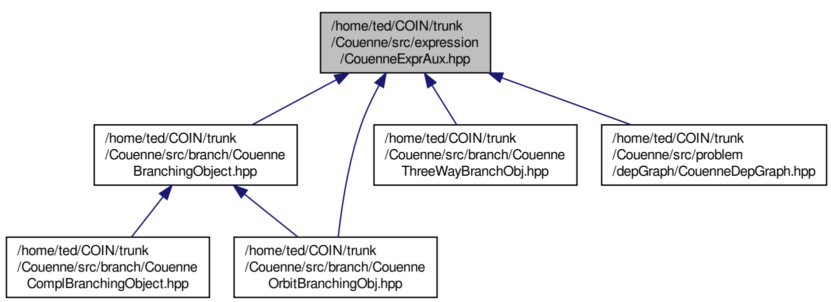
8.34 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprAux.hpp File Reference

```
#include <iostream>
#include "CouenneExprVar.hpp"
```

Include dependency graph for CouenneExprAux.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprAux

    Auxiliary variable.

- struct Couenne::compExpr

    Structure for comparing expressions.

Namespaces

- namespace Couenne

    general include file for different compilers

Functions

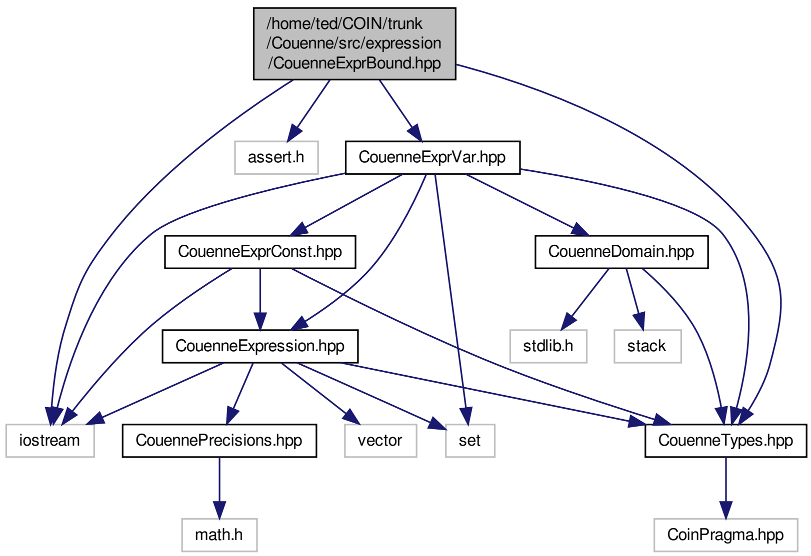
- void Couenne::draw_cuts (OsiCuts &, const CouenneCutGenerator $*$, int, expression $*$, expression $*$)

    allow to draw function within intervals and cuts introduced

8.35 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprBound.hpp File Reference

```
#include <iostream>
#include <assert.h>
#include "CouenneTypes.hpp"
#include "CouenneExprVar.hpp"
```

Include dependency graph for CouenneExprBound.hpp:



Classes

- class Couenne::exprLowerBound

    These are bound expression classes.
- class Couenne::exprUpperBound

    upper bound

Namespaces

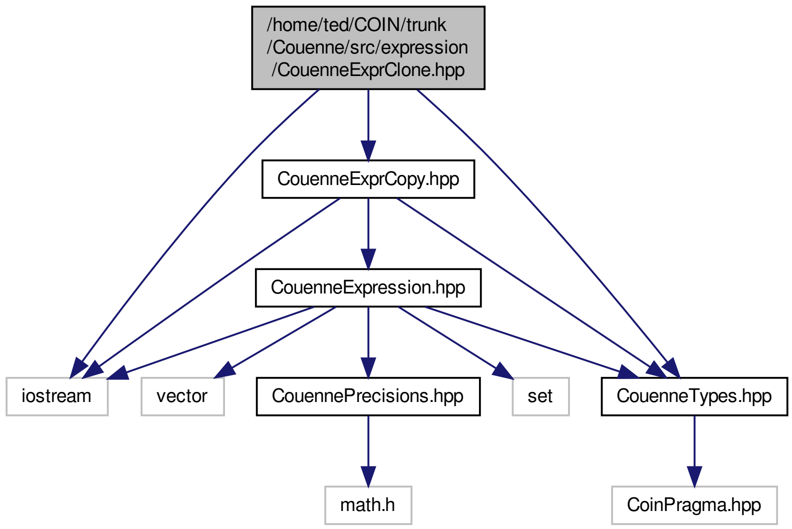
- namespace Couenne

    general include file for different compilers

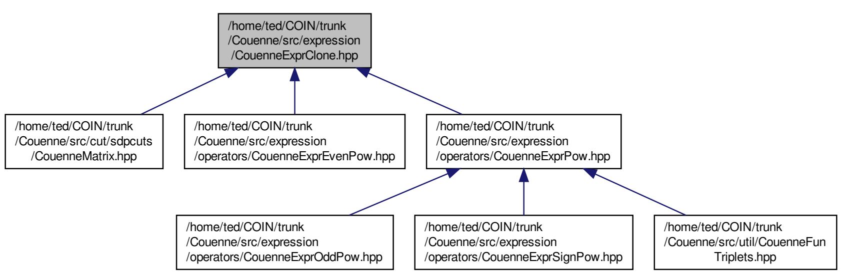
8.36 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprClone.hpp File Reference

```
#include <iostream>
#include "CouenneTypes.hpp"
#include "CouenneExprCopy.hpp"
```

Include dependency graph for CouenneExprClone.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprClone

    expression clone (points to another expression)

Namespaces

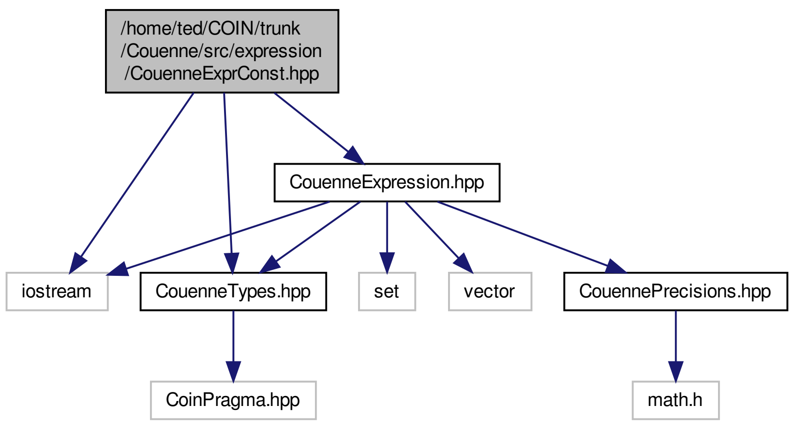
- namespace Couenne

  general include file for different compilers

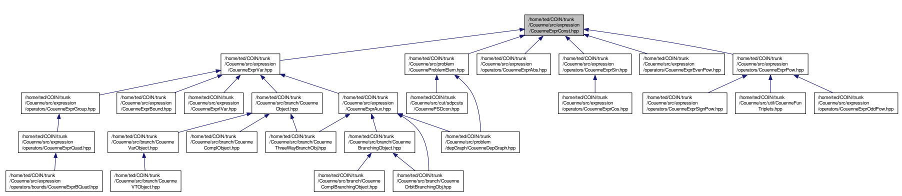
8.37 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprConst.hpp File Reference

```
#include <iostream>
#include "CouenneTypes.hpp"
#include "CouenneExpression.hpp"
```

Include dependency graph for CouenneExprConst.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprConst

  constant-type operator

Namespaces

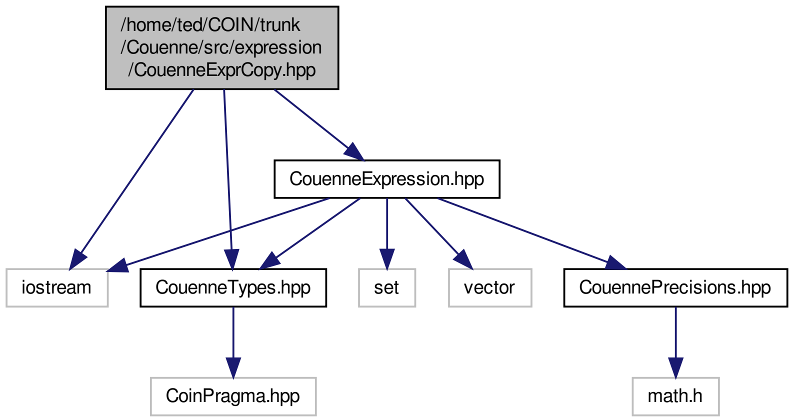
- namespace Couenne

  general include file for different compilers

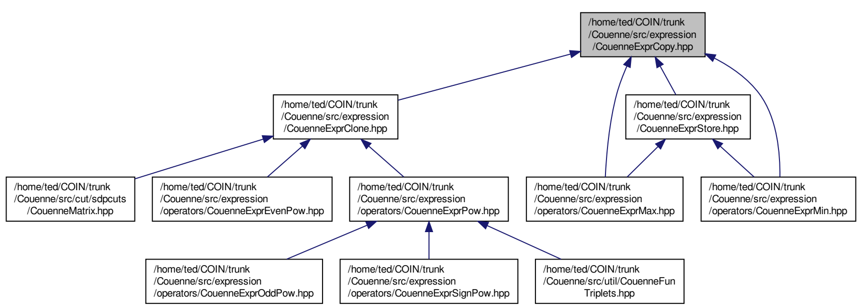
8.38 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprCopy.hpp File Reference

```
#include <iostream>
#include "CouenneTypes.hpp"
#include "CouenneExpression.hpp"
```

Include dependency graph for CouenneExprCopy.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprCopy

Namespaces

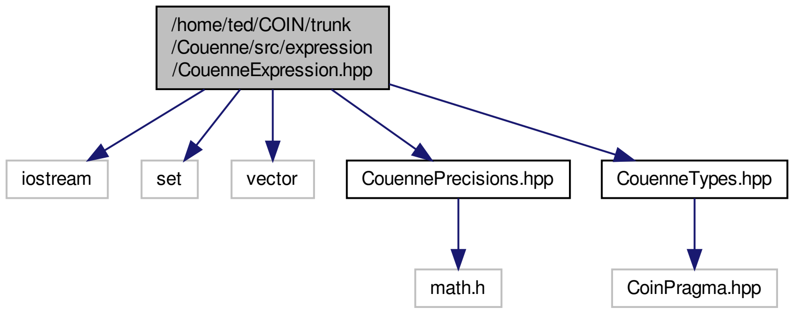
- namespace Couenne

  general include file for different compilers

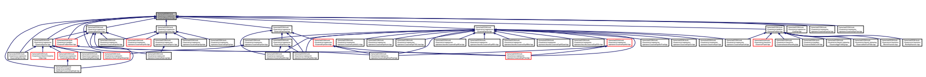
8.39 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExpression.hpp File Reference

```
#include <iostream>
#include <set>
#include <vector>
#include "CouennePrecisions.hpp"
#include "CouenneTypes.hpp"
```

Include dependency graph for CouenneExpression.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::expression

    Expression base class.

Namespaces

- namespace Couenne

    general include file for different compilers

Functions

- bool Couenne::updateBound (register int sign, register CouNumber ∗dst, register CouNumber src)

    updates maximum violation.
- int Couenne::compareExpr (const void ∗e0, const void ∗e1)

    independent comparison
- bool Couenne::isInteger (CouNumber x)

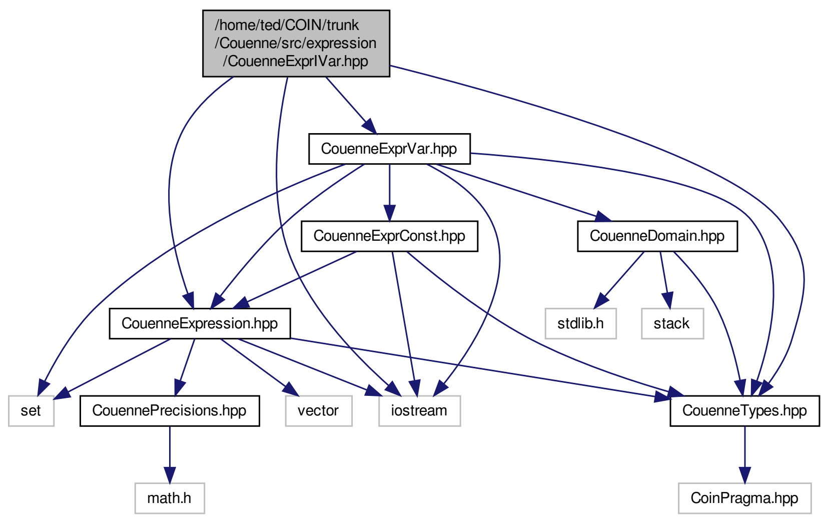
    is this number integer?
- expression ∗ Couenne::getOriginal (expression ∗e)

    get original expression (can't make it an expression method as I need a non-const, what "this" would return)

8.40 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprIVar.hpp File Reference

```
#include <iostream>
#include "CouenneTypes.hpp"
#include "CouenneExpression.hpp"
#include "CouenneExprVar.hpp"
```

Include dependency graph for CouenneExprIVar.hpp:



Classes

- class Couenne::exprIVar

  variable-type operator.

Namespaces

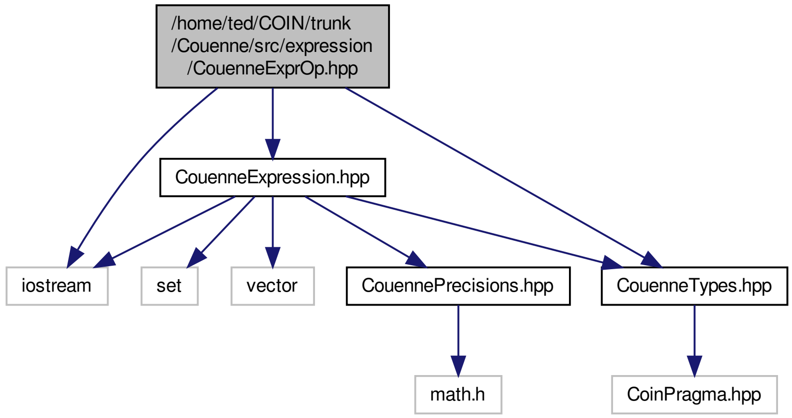
- namespace Couenne

  general include file for different compilers

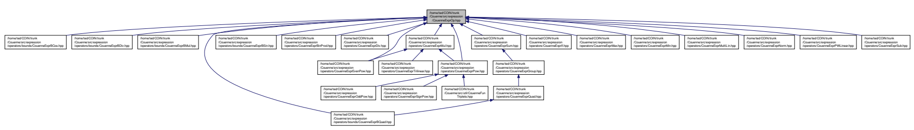
8.41 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprOp.hpp File Reference

```
#include <iostream>
#include "CouenneExpression.hpp"
#include "CouenneTypes.hpp"
```

Include dependency graph for CouenneExprOp.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprOp

  general n-ary operator-type expression: requires argument list.

Namespaces

- namespace Couenne

  general include file for different compilers

Macros

- #define MAX_ARG_LINE 10

8.41.1 Macro Definition Documentation

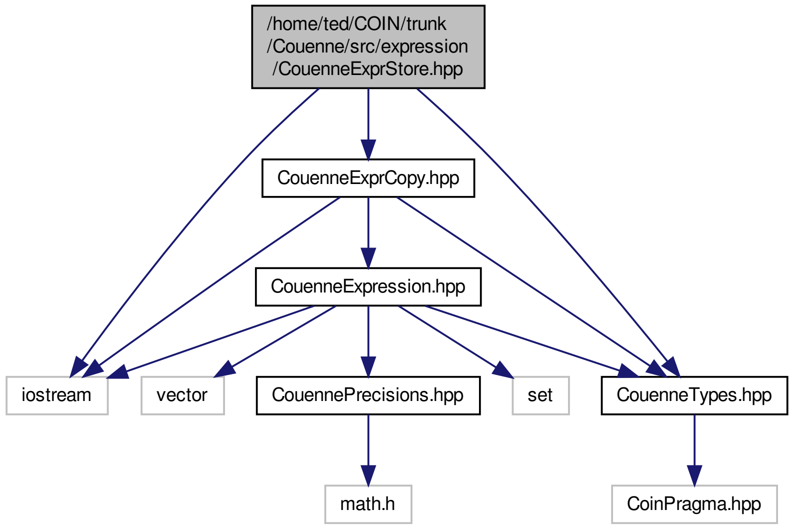
8.41.1.1 #define MAX_ARG_LINE 10

Definition at line 21 of file CouenneExprOp.hpp.

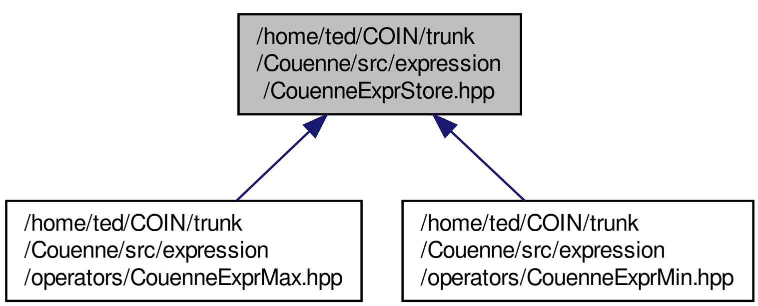
8.42 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprStore.hpp File Reference

```
#include <iostream>
#include "CouenneTypes.hpp"
#include "CouenneExprCopy.hpp"
```

Include dependency graph for CouenneExprStore.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprStore

    storage class for previously evaluated expressions

Namespaces

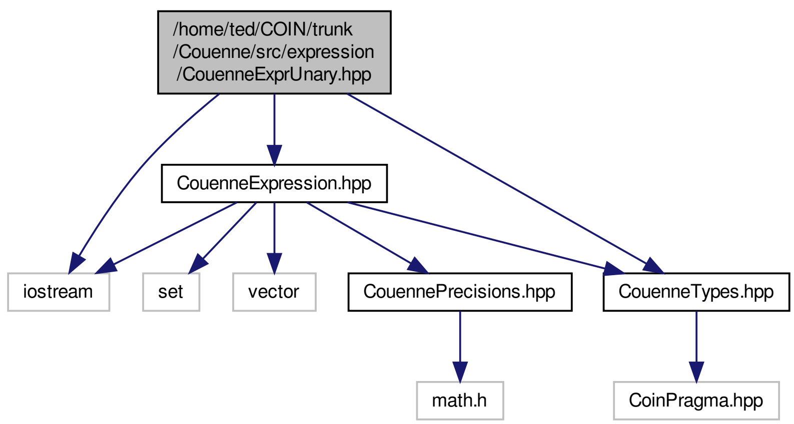
- namespace Couenne

    general include file for different compilers

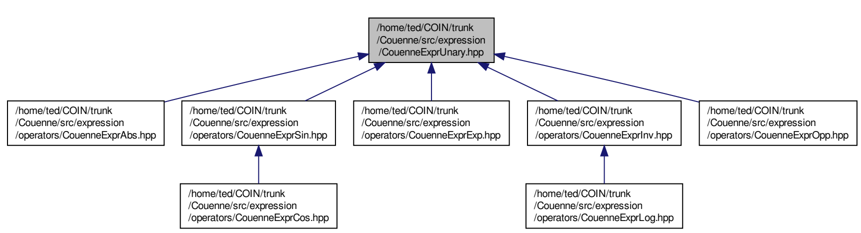
8.43 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprUnary.hpp File Reference

```
#include <iostream>
#include "CouenneExpression.hpp"
#include "CouenneTypes.hpp"
```

Include dependency graph for CouenneExprUnary.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprUnary

    expression class for unary functions (sin, log, etc.)

Namespaces

- namespace Couenne

    general include file for different compilers

Functions

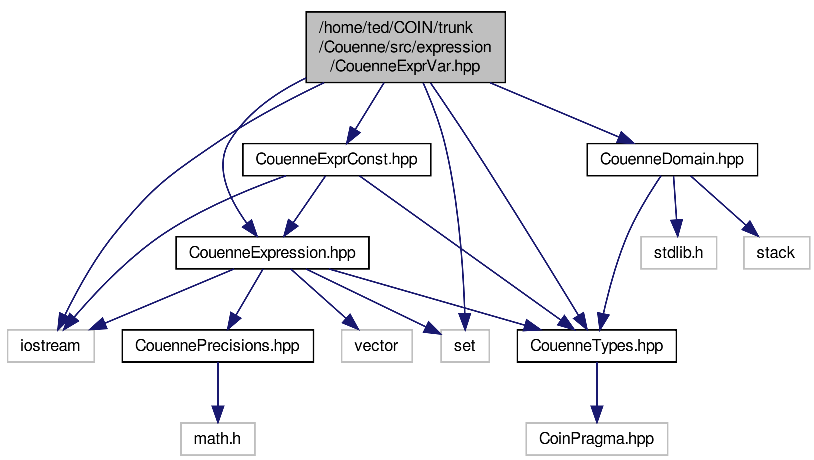
- CouNumber Couenne::zero_fun (CouNumber x)

    zero function (used by default by exprUnary)

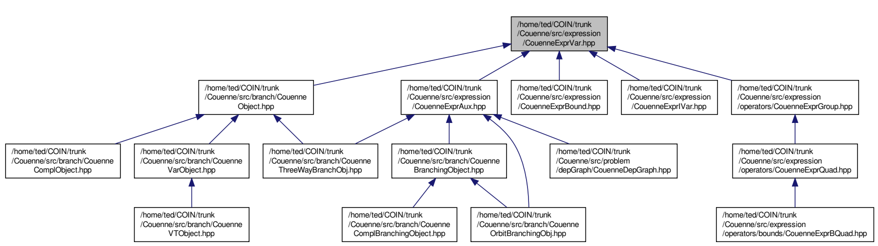
8.44 /home/ted/COIN/trunk/Couenne/src/expression/CouenneExprVar.hpp File Reference

```
#include <iostream>
#include <set>
#include "CouenneTypes.hpp"
#include "CouenneExpression.hpp"
#include "CouenneExprConst.hpp"
#include "CouenneDomain.hpp"
```

Include dependency graph for CouenneExprVar.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprVar
  variable-type operator

Namespaces

- namespace Ipopt
- namespace Bonmin
- namespace Couenne
  general include file for different compilers

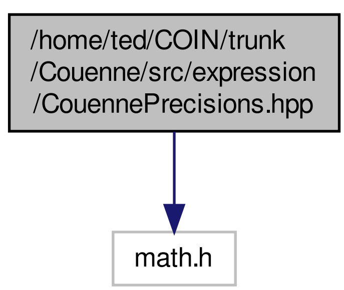
Typedefs

- typedef Ipopt::SmartPtr
  < Ipopt::Journalist > Couenne::JnlstPtr
- typedef Ipopt::SmartPtr< const
  Ipopt::Journalist > Couenne::ConstJnlstPtr

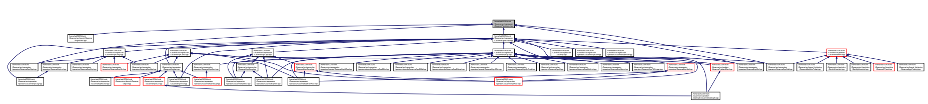
8.45 /home/ted/COIN/trunk/Couenne/src/expression/CouennePrecisions.hpp File Reference

```
#include <math.h>
```

Include dependency graph for CouennePrecisions.hpp:



This graph shows which files directly or indirectly include this file:



Namespaces

- namespace Couenne

  general include file for different compilers

Macros

- #define COUENNE_EPS 1.e-07
- #define COUENNE_BOUND_PREC 1.e-5
- #define COUENNE_EPS_INT 1.e-9
- #define COUENNE_EPS_SIMPL 1.e-20
- #define COUENNE_INFINITY 1.e+50
- #define COU_MAX_COEFF 1.e+9
- #define COU_MIN_COEFF 1.e-9
- #define COUENNE_round(x) ((int) (floor ((x) + 0.5)))
- #define COUENNE_sign(x) ((x) > 0.0 ? 1.0 : -1.0)
- #define MAX_BOUND 1.e45

Variables

- const double Couenne::Couenne_large_bound = 9.999e12

  used to declare LP unbounded

8.45.1 Macro Definition Documentation

8.45.1.1 #define COUENNE_EPS 1.e-07

Definition at line 19 of file CouennePrecisions.hpp.

8.45.1.2 #define COUENNE_BOUND_PREC 1.e-5

Definition at line 22 of file CouennePrecisions.hpp.

8.45.1.3 #define COUENNE_EPS_INT 1.e-9

Definition at line 25 of file CouennePrecisions.hpp.

8.45.1.4 #define COUENNE_EPS_SIMPL 1.e-20

Definition at line 28 of file CouennePrecisions.hpp.

8.45.1.5 #define COUENNE_INFINITY 1.e+50

Definition at line 32 of file CouennePrecisions.hpp.

8.45.1.6 #define COU_MAX_COEFF 1.e+9

Definition at line 36 of file CouennePrecisions.hpp.

8.45.1.7 #define COU_MIN_COEFF 1.e-9

Definition at line 39 of file CouennePrecisions.hpp.

8.45.1.8 #define COUENNE_round(x) ((int) (floor ((x) + 0.5)))

Definition at line 42 of file CouennePrecisions.hpp.

8.45.1.9 #define COUENNE_sign(x) ((x) > 0.0 ? 1.0 : -1.0)

Definition at line 45 of file CouennePrecisions.hpp.

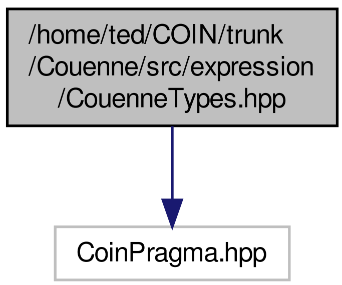
8.45.1.10 #define MAX_BOUND 1.e45

Definition at line 47 of file CouennePrecisions.hpp.

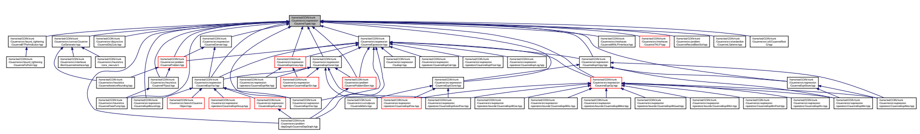
8.46 /home/ted/COIN/trunk/Couenne/src/expression/CouenneTypes.hpp File Reference

```
#include "CoinPragma.hpp"
```

Include dependency graph for CouenneTypes.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::t_chg_bounds

    status of lower/upper bound of a variable, to be checked/modified in bound tightening

Namespaces

- namespace Couenne

    general include file for different compilers

Typedefs

- typedef double Couenne::CouNumber
  main number type in Couenne
- typedef CouNumber(∗ Couenne::unary_function)(CouNumber)
  unary function, used in all exprUnary

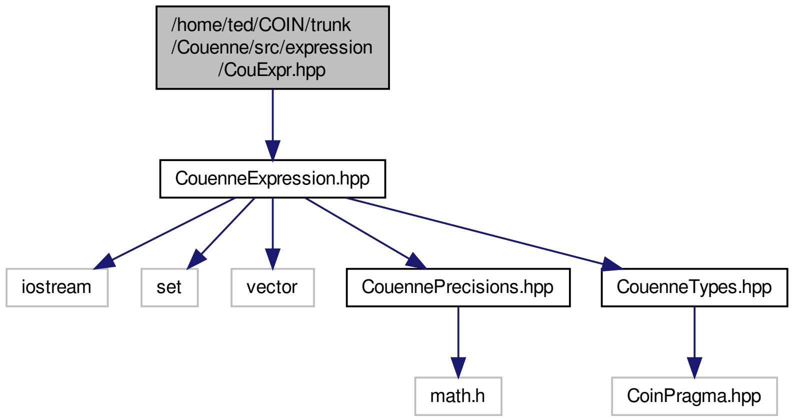
Enumerations

- enum Couenne::nodeType {
  Couenne::CONST = 0, Couenne::VAR, Couenne::UNARY, Couenne::N_ARY,
  Couenne::COPY, Couenne::AUX, Couenne::EMPTY }
  type of a node in an expression tree
- enum Couenne::linearity_type {
  Couenne::ZERO = 0, Couenne::CONSTANT, Couenne::LINEAR, Couenne::QUADRATIC,
  Couenne::NONLINEAR }
  linearity of an expression, as returned by the method Linearity()
- enum Couenne::pos { Couenne::PRE = 0, Couenne::POST, Couenne::INSIDE, Couenne::NONE }
  position where the operator should be printed when printing the expression
- enum Couenne::con_sign { Couenne::COUENNE_EQ, Couenne::COUENNE_LE, Couenne::COUENNE_GE, Couenne::COUENNE_RNG }
  sign of constraint
- enum Couenne::conv_type { Couenne::CURRENT_ONLY, Couenne::UNIFORM_GRID, Couenne::AROUND_C-URPOINT }
  position and number of convexification cuts added for a lower convex (upper concave) envelope
- enum Couenne::expr_type {
  Couenne::COU_EXPRESSION, Couenne::COU_EXPRCONST, Couenne::COU_EXPRVAR, Couenne::COU_E-XPRLBOUND,
  Couenne::COU_EXPRUBOUND, Couenne::COU_EXPROP, Couenne::COU_EXPRSUB, Couenne::COU_EXP-RSUM,
  Couenne::COU_EXPRGROUP, Couenne::COU_EXPRQUAD, Couenne::COU_EXPRMIN, Couenne::COU_EX-PRMUL,
  Couenne::COU_EXPRTRILINEAR, Couenne::COU_EXPRPOW, Couenne::COU_EXPRSIGNPOW, Couenne::-COU_EXPRMAX,
  Couenne::COU_EXPRDIV, Couenne::COU_EXPRUNARY, Couenne::COU_EXPRCOS, Couenne::COU_EXPR-ABS,
  Couenne::COU_EXPREXP, Couenne::COU_EXPRINV, Couenne::COU_EXPRLOG, Couenne::COU_EXPROP-P,
  Couenne::COU_EXPRSIN, Couenne::COU_EXPRFLOOR, Couenne::COU_EXPRCEIL, Couenne::MAX_COU_-EXPR_CODE }
  code returned by the method expression::code()
- enum Couenne::convexity {
  Couenne::UNSET, Couenne::NONCONVEX, Couenne::CONVEX, Couenne::CONCAVE,
  Couenne::AFFINE, Couenne::CONV_LINEAR, Couenne::CONV_CONSTANT, Couenne::CONV_ZERO }
  convexity type of an expression
- enum Couenne::monotonicity {
  Couenne::MON_UNSET, Couenne::NONMONOTONE, Couenne::NDECREAS, Couenne::NINCREAS,
  Couenne::INCLIN, Couenne::DECLIN, Couenne::MON_CONST, Couenne::MON_ZERO }
  monotonicity type of an expression
- enum Couenne::dig_type { Couenne::ORIG_ONLY, Couenne::STOP_AT_AUX, Couenne::TAG_AND_RECURS-IVE, Couenne::COUNT }
  type of digging when filling the dependence list

8.47 /home/ted/COIN/trunk/Couenne/src/expression/CouExpr.hpp File Reference

`#include "CouenneExpression.hpp"`

Include dependency graph for CouExpr.hpp:



Classes

- class Couenne::CouExpr

Namespaces

- namespace Couenne

  general include file for different compilers

Functions

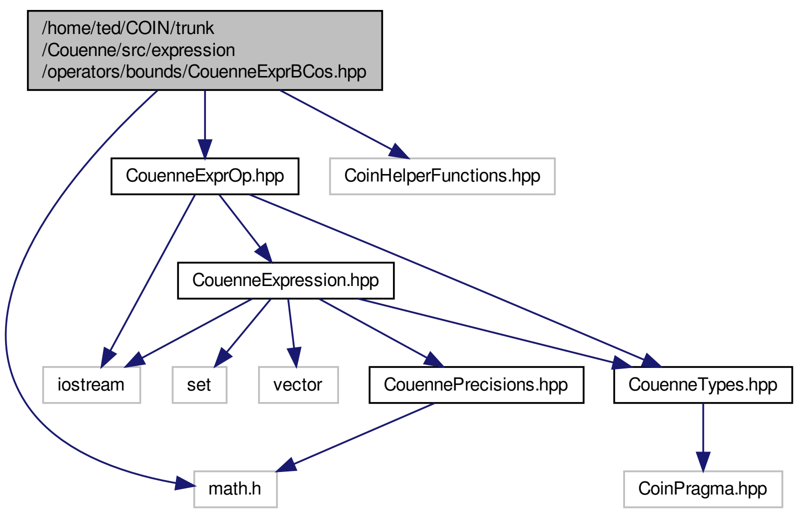
- CouExpr Couenne::operator+ (CouExpr &e1, CouExpr &e2)
- CouExpr & Couenne::operator/ (CouExpr &e1, CouExpr &e2)
- CouExpr & Couenne::operator% (CouExpr &e1, CouExpr &e2)
- CouExpr & Couenne::operator- (CouExpr &e1, CouExpr &e2)
- CouExpr & Couenne::operator* (CouExpr &e1, CouExpr &e2)
- CouExpr & Couenne::operator^ (CouExpr &e1, CouExpr &e2)
- CouExpr & Couenne::sin (CouExpr &e)
- CouExpr & Couenne::cos (CouExpr &e)
- CouExpr & Couenne::log (CouExpr &e)
- CouExpr & Couenne::exp (CouExpr &e)
- CouExpr & Couenne::operator+ (CouNumber &e1, CouExpr &e2)
- CouExpr & Couenne::operator/ (CouNumber &e1, CouExpr &e2)
- CouExpr & Couenne::operator% (CouNumber &e1, CouExpr &e2)
- CouExpr & Couenne::operator- (CouNumber &e1, CouExpr &e2)
- CouExpr & Couenne::operator* (CouNumber &e1, CouExpr &e2)

- CouExpr & Couenne::operator^ (CouNumber &e1, CouExpr &e2)
- CouExpr & Couenne::sin (CouNumber &e)
- CouExpr & Couenne::cos (CouNumber &e)
- CouExpr & Couenne::log (CouNumber &e)
- CouExpr & Couenne::exp (CouNumber &e)
- CouExpr & Couenne::operator+ (CouExpr &e1, CouNumber &e2)
- CouExpr & Couenne::operator/ (CouExpr &e1, CouNumber &e2)
- CouExpr & Couenne::operator% (CouExpr &e1, CouNumber &e2)
- CouExpr & Couenne::operator- (CouExpr &e1, CouNumber &e2)
- CouExpr & Couenne::operator* (CouExpr &e1, CouNumber &e2)
- CouExpr & Couenne::operator^ (CouExpr &e1, CouNumber &e2)

8.48 /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBCos.hpp File Reference

```
#include "CouenneExprOp.hpp"
#include "CoinHelperFunctions.hpp"
#include <math.h>
```

Include dependency graph for CouenneExprBCos.hpp:



Classes

- class Couenne::exprLBCos

    class to compute lower bound of a cosine based on the bounds of its arguments

- class Couenne::exprUBCos

    class to compute lower bound of a cosine based on the bounds of its arguments

Namespaces

- namespace Couenne

    general include file for different compilers

Macros

- #define M_PI 3.14159265358979323846

8.48.1 Macro Definition Documentation

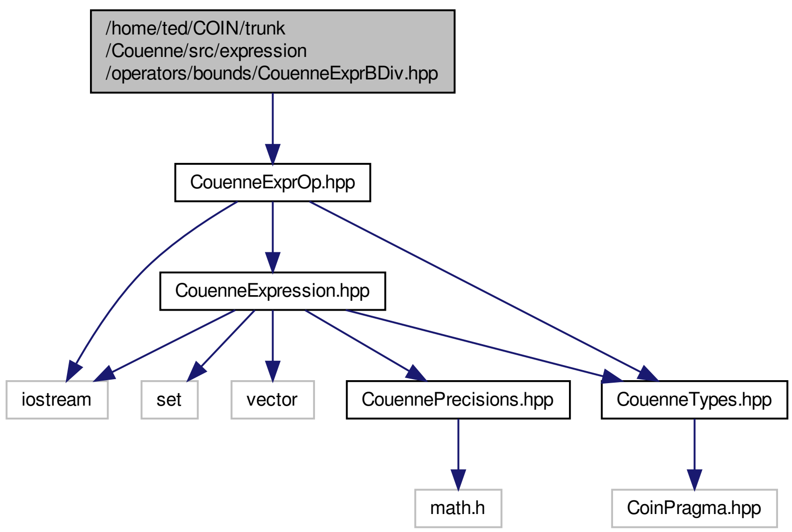
8.48.1.1 #define M_PI 3.14159265358979323846

Definition at line 19 of file CouenneExprBCos.hpp.

8.49 /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBDiv.hpp File Reference

`#include "CouenneExprOp.hpp"`

Include dependency graph for CouenneExprBDiv.hpp:



Classes

- class Couenne::exprLBDiv

    class to compute lower bound of a fraction based on the bounds of both numerator and denominator
- class Couenne::exprUBDiv

    class to compute upper bound of a fraction based on the bounds of both numerator and denominator

Namespaces

- namespace Couenne

  general include file for different compilers

Functions

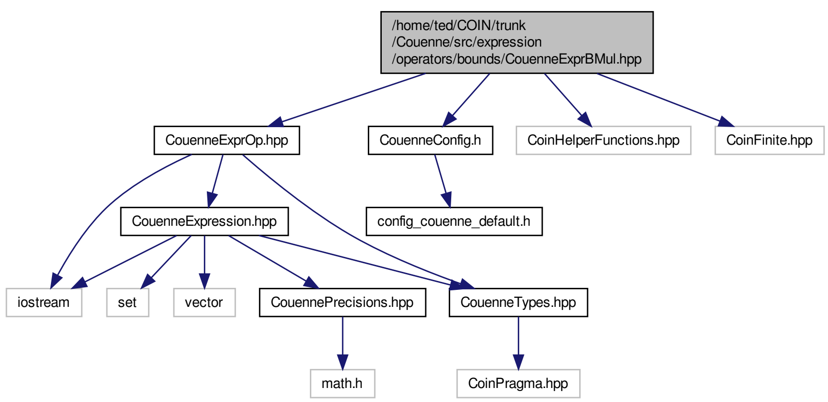
- static CouNumber Couenne::safeDiv (register CouNumber a, register CouNumber b, int sign)

  division that avoids NaN's and considers a sign when returning infinity

8.50 /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBMul.hpp File Reference

```
#include "CouenneExprOp.hpp"
#include "CouenneConfig.h"
#include "CoinHelperFunctions.hpp"
#include "CoinFinite.hpp"
```

Include dependency graph for CouenneExprBMul.hpp:



Classes

- class Couenne::exprLBMul

  class to compute lower bound of a product based on the bounds of both factors
- class Couenne::exprUBMul

  class to compute upper bound of a product based on the bounds of both factors

Namespaces

- namespace Couenne

  general include file for different compilers

Macros

- #define MUL_ZERO 1e-20
- #define MUL_INF sqrt (COIN_DBL_MAX)

Functions

- CouNumber Couenne::safeProd (register CouNumber a, register CouNumber b)

    product that avoids NaN's

8.50.1 Macro Definition Documentation

8.50.1.1 #define MUL_ZERO 1e-20

Definition at line 21 of file CouenneExprBMul.hpp.

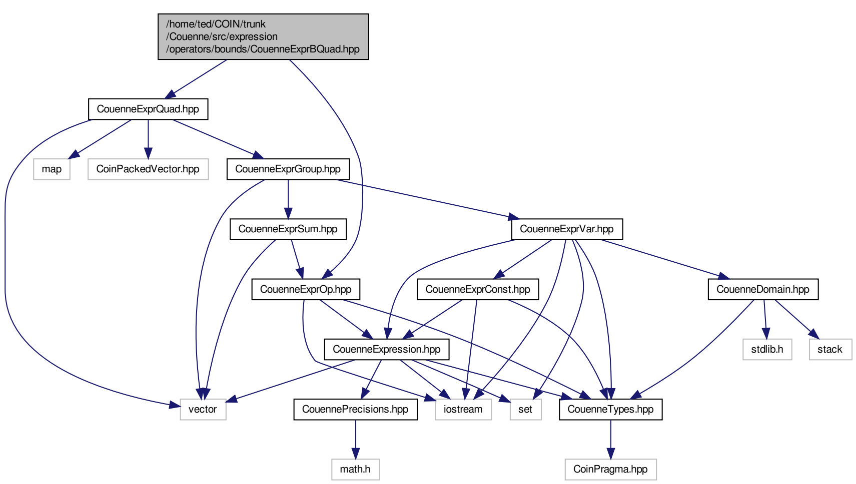
8.50.1.2 #define MUL_INF sqrt (COIN_DBL_MAX)

Definition at line 22 of file CouenneExprBMul.hpp.

8.51 /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBQuad.hpp File Reference

```
#include "CouenneExprOp.hpp"
#include "CouenneExprQuad.hpp"
```

Include dependency graph for CouenneExprBQuad.hpp:



Classes

- class Couenne::exprLBQuad

    class to compute lower bound of a fraction based on the bounds of both numerator and denominator
- class Couenne::exprUBQuad

    class to compute upper bound of a fraction based on the bounds of both numerator and denominator

Namespaces

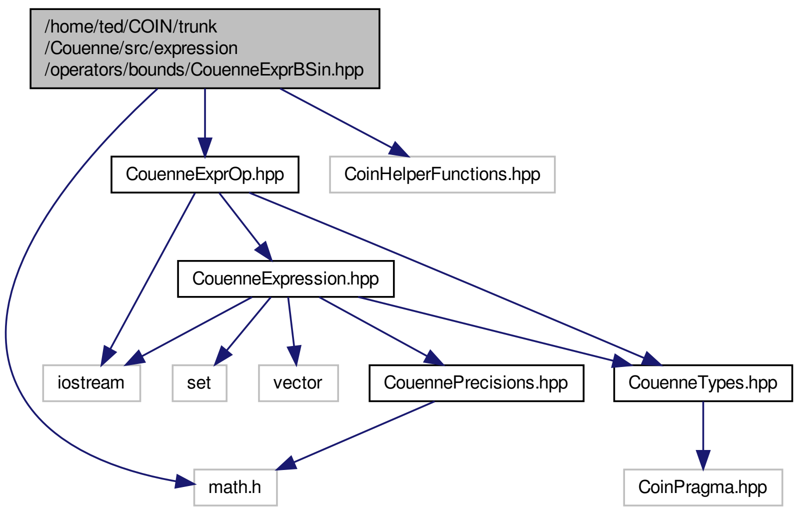
- namespace Couenne

    general include file for different compilers

8.52 /home/ted/COIN/trunk/Couenne/src/expression/operators/bounds/CouenneExprBSin.hpp File Reference

```
#include "CouenneExprOp.hpp"
#include "CoinHelperFunctions.hpp"
#include <math.h>
```

Include dependency graph for CouenneExprBSin.hpp:



Classes

- class Couenne::exprLBSin

    class to compute lower bound of a sine based on the bounds on its arguments
- class Couenne::exprUBSin

    class to compute lower bound of a sine based on the bounds on its arguments

Namespaces

- namespace Couenne

    general include file for different compilers

Macros

- #define M_PI 3.14159265358979323846

8.52.1 Macro Definition Documentation

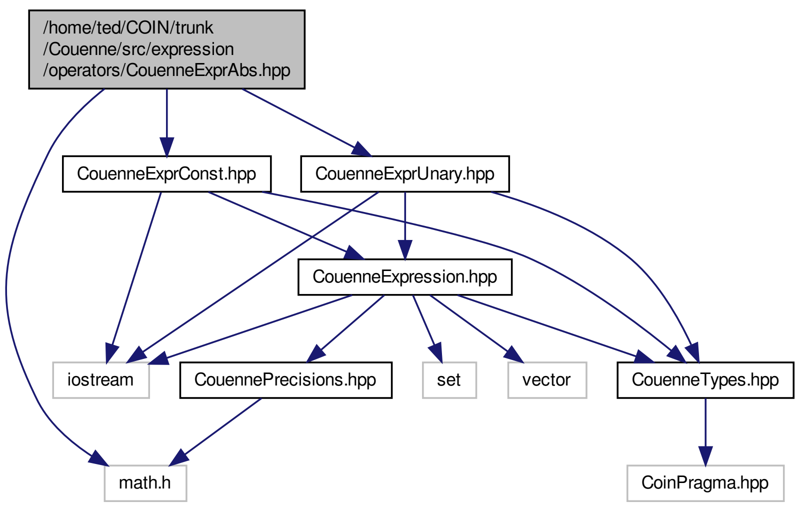
8.52.1.1 #define M_PI 3.14159265358979323846

Definition at line 19 of file CouenneExprBSin.hpp.

8.53 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprAbs.hpp File Reference

```
#include <math.h>
#include "CouenneExprUnary.hpp"
#include "CouenneExprConst.hpp"
```

Include dependency graph for CouenneExprAbs.hpp:



Classes

- class Couenne::exprAbs

  class for $|f(x)|$

Namespaces

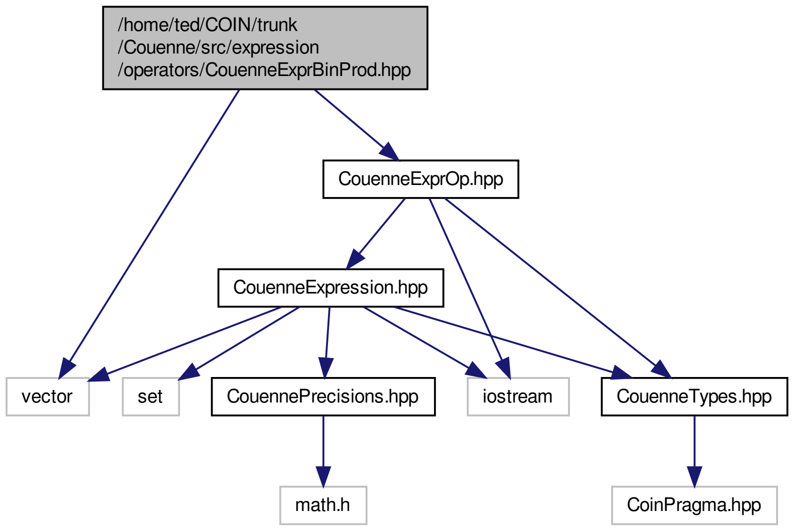
- namespace Couenne

  general include file for different compilers

8.54 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprBinProd.hpp File Reference

```
#include <vector>
#include "CouenneExprOp.hpp"
```

Include dependency graph for CouenneExprBinProd.hpp:



Classes

- class Couenne::exprBinProd

  class for $\prod_{i=1}^n f_i(x)$ with $f_i(x)$ all binary

Namespaces

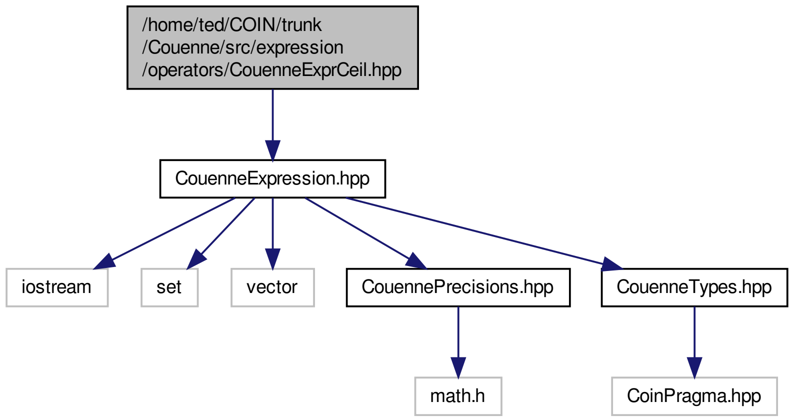
- namespace Couenne

  general include file for different compilers

8.55 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprCeil.hpp File Reference

`#include "CouenneExpression.hpp"`

Include dependency graph for CouenneExprCeil.hpp:



Classes

- class Couenne::exprCeil

    class ceiling, $\lceil f(x) \rceil$

Namespaces

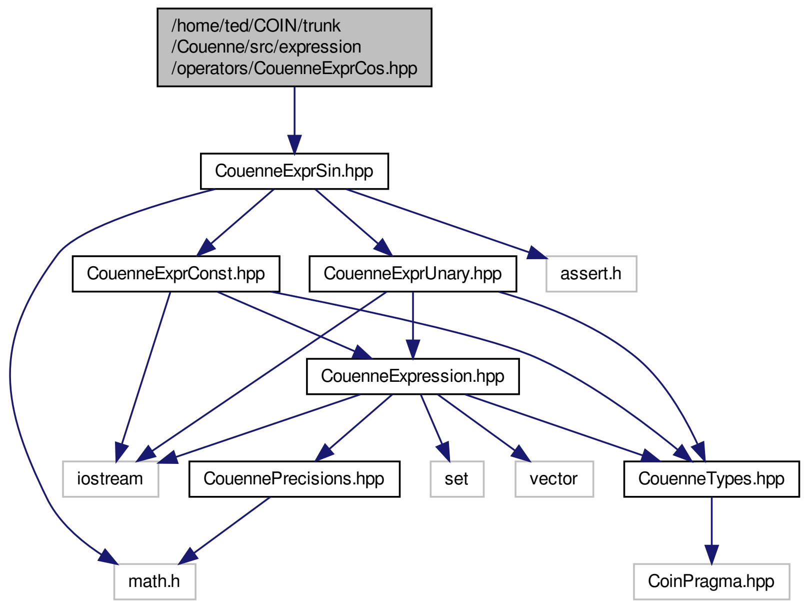
- namespace Couenne

    general include file for different compilers

8.56 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprCos.hpp File Reference

```
#include "CouenneExprSin.hpp"
```

Include dependency graph for CouenneExprCos.hpp:



Classes

- class Couenne::exprCos

  class cosine, $\cos f(x)$

Namespaces

- namespace Couenne

  general include file for different compilers

Functions

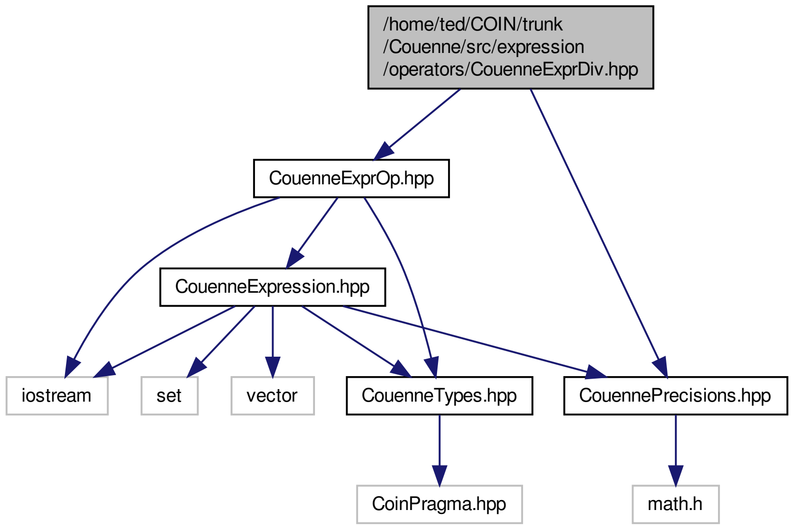
- CouNumber Couenne::trigNewton (CouNumber, CouNumber, CouNumber)

  common convexification method used by both cos and sin

8.57 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprDiv.hpp File Reference

```
#include "CouenneExprOp.hpp"
#include "CouennePrecisions.hpp"
```

Include dependency graph for CouenneExprDiv.hpp:



Classes

- class Couenne::exprDiv

  class for divisions, $\frac{f(x)}{g(x)}$

Namespaces

- namespace Couenne

  general include file for different compilers

Macros

- #define BR_NEXT_ZERO 1e-3
- #define BR_MULT 1e-3
- #define SAFE_COEFFICIENT 1e9

Functions

- bool Couenne::is_boundbox_regular (register CouNumber b1, register CouNumber b2)

  check if bounding box is suitable for a multiplication/division convexification constraint

8.57.1 Macro Definition Documentation

8.57.1.1 #define BR_NEXT_ZERO 1e-3

Definition at line 19 of file CouenneExprDiv.hpp.

8.57.1.2 #define BR_MULT 1e-3

Definition at line 20 of file CouenneExprDiv.hpp.

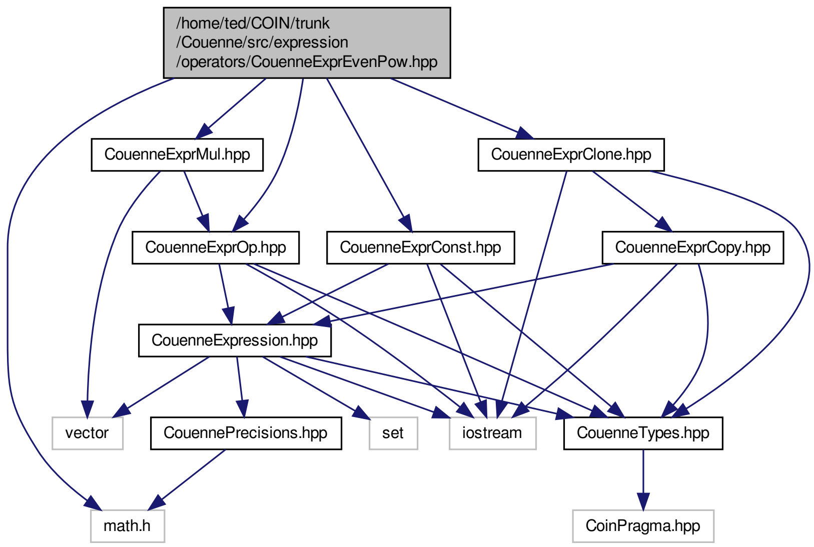
8.57.1.3 #define SAFE_COEFFICIENT 1e9

Definition at line 119 of file CouenneExprDiv.hpp.

8.58 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprEvenPow.hpp File Reference

```
#include <math.h>
#include "CouenneExprOp.hpp"
#include "CouenneExprMul.hpp"
#include "CouenneExprClone.hpp"
#include "CouenneExprConst.hpp"
```

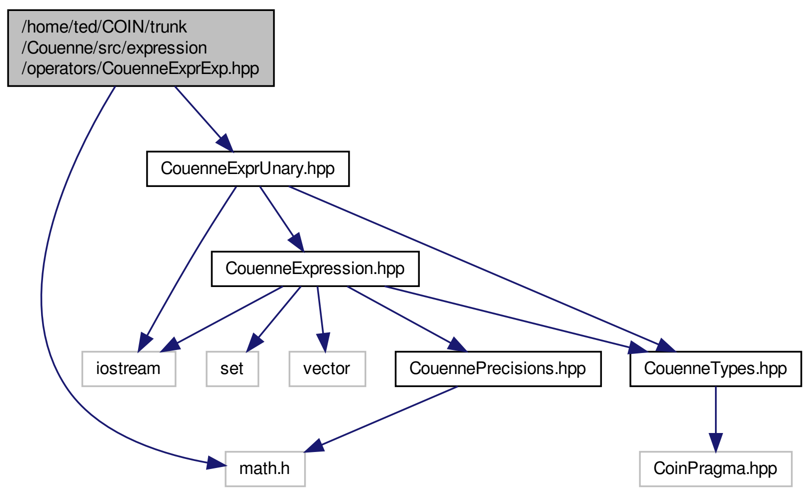
Include dependency graph for CouenneExprEvenPow.hpp:



8.59 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprExp.hpp File Reference

```
#include <math.h>
#include "CouenneExprUnary.hpp"
```

Include dependency graph for CouenneExprExp.hpp:



Classes

- class Couenne::exprExp

    class for the exponential, $e^{f(x)}$

Namespaces

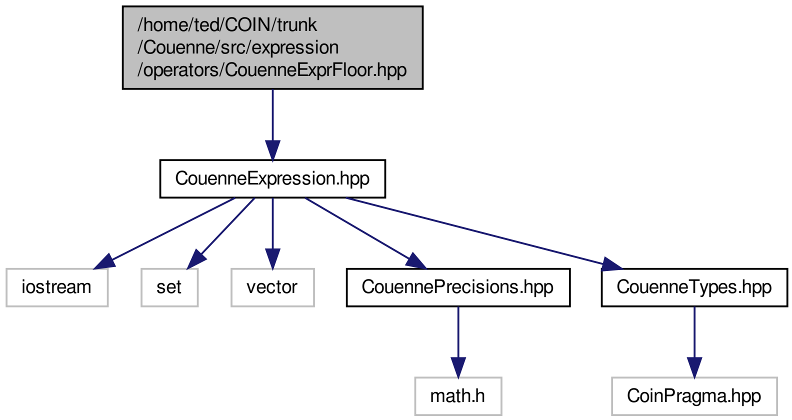
- namespace Couenne

    general include file for different compilers

8.60 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprFloor.hpp File Reference

```
#include "CouenneExpression.hpp"
```

Include dependency graph for CouenneExprFloor.hpp:



Classes

- class Couenne::exprFloor

  class floor, $\lfloor f(x) \rfloor$

Namespaces

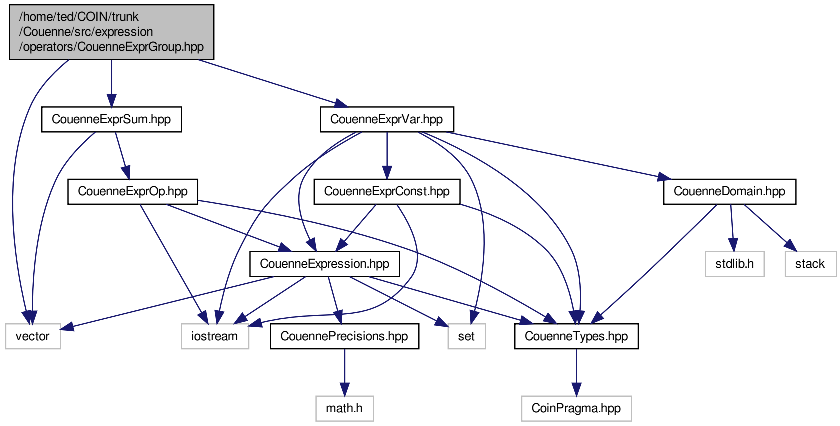
- namespace Couenne

  general include file for different compilers

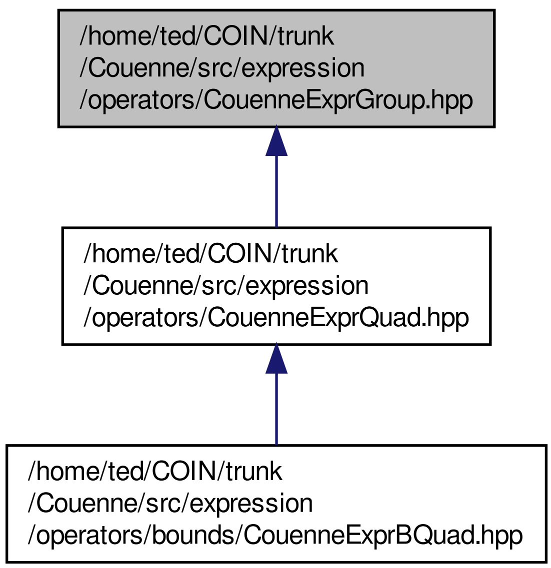
8.61 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprGroup.hpp File Reference

```
#include <vector>
#include "CouenneExprSum.hpp"
#include "CouenneExprVar.hpp"
```

Include dependency graph for CouenneExprGroup.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprGroup

    class Group, with constant, linear and nonlinear terms: $a_0 + \sum_{i=1}^{n} a_i x_i$

Namespaces

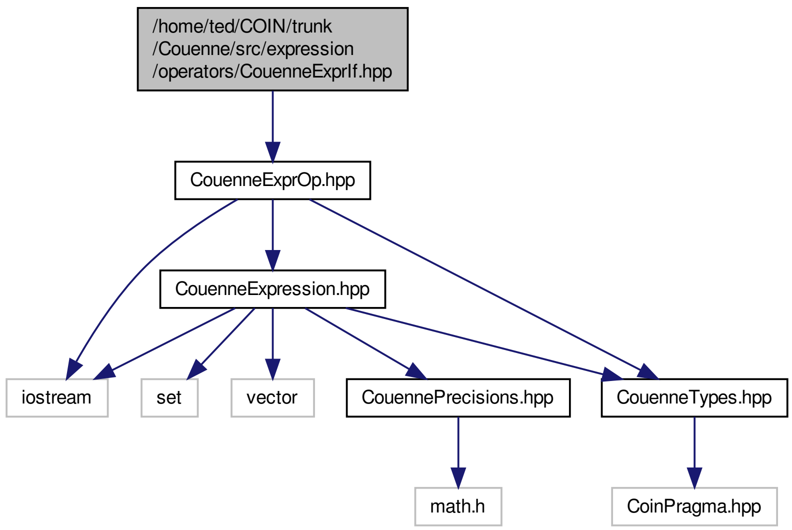
- namespace Couenne

  general include file for different compilers

8.62 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprIf.hpp File Reference

```
#include "CouenneExprOp.hpp"
```

Include dependency graph for CouenneExprIf.hpp:



Classes

- class Couenne::exprIf

Namespaces

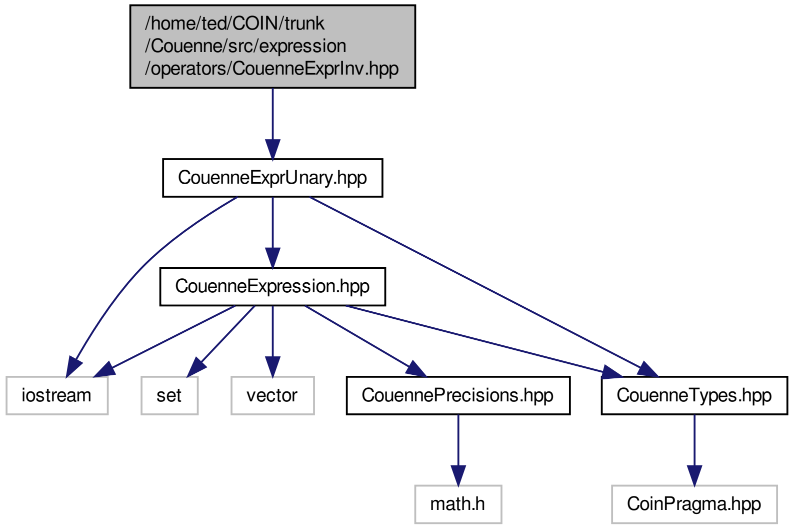
- namespace Couenne

  general include file for different compilers

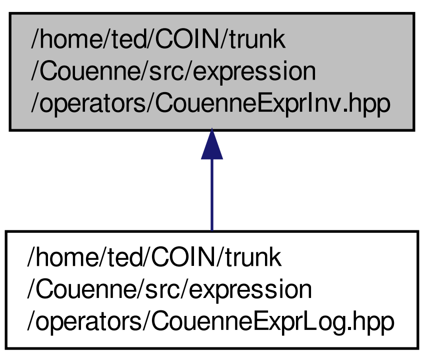
8.63 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprInv.hpp File Reference

```
#include "CouenneExprUnary.hpp"
```

Include dependency graph for CouenneExprInv.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprInv

    class inverse: $1/f(x)$

Namespaces

- namespace Couenne

  general include file for different compilers

Functions

- CouNumber Couenne::inv (register CouNumber arg)

  the operator itself
- CouNumber Couenne::oppInvSqr (register CouNumber x)

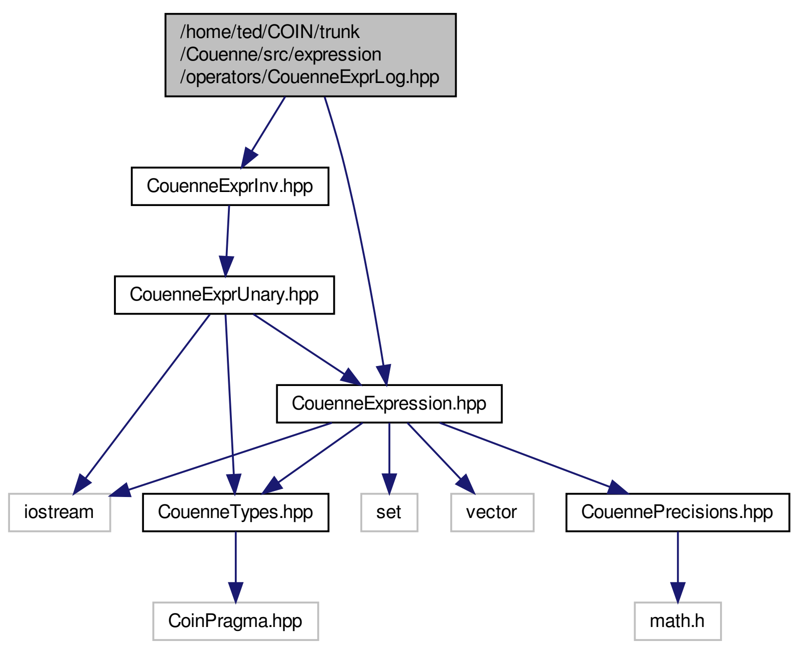
  derivative of inv (x)
- CouNumber Couenne::inv_dblprime (register CouNumber x)

  inv_dblprime, second derivative of inv (x)

8.64 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprLog.hpp File Reference

```
#include "CouenneExprInv.hpp"
#include "CouenneExpression.hpp"
```

Include dependency graph for CouenneExprLog.hpp:



Classes

- class Couenne::exprLog

  class logarithm, $\log f(x)$

Namespaces

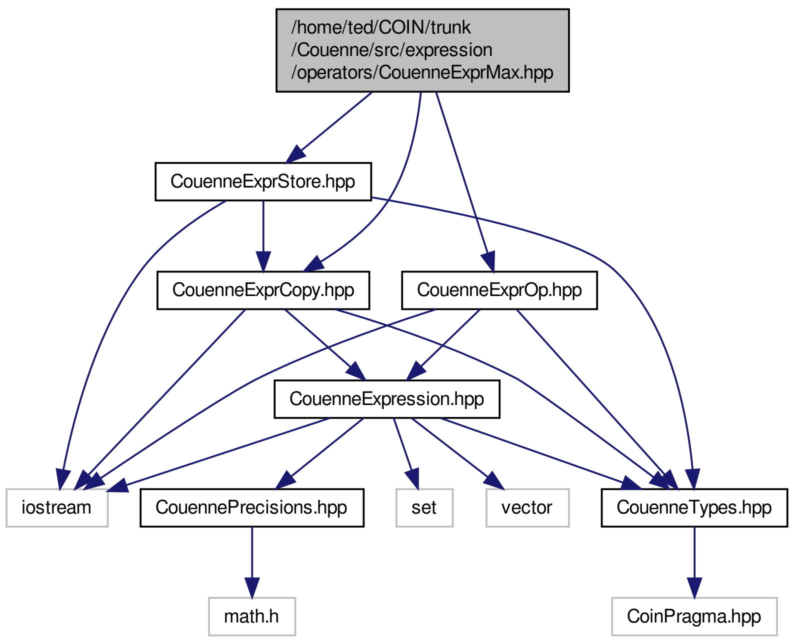
- namespace Couenne

  general include file for different compilers

8.65 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprMax.hpp File Reference

```
#include "CouenneExprOp.hpp"
#include "CouenneExprCopy.hpp"
#include "CouenneExprStore.hpp"
```

Include dependency graph for CouenneExprMax.hpp:



Classes

- class Couenne::exprMax

  class for maxima

Namespaces

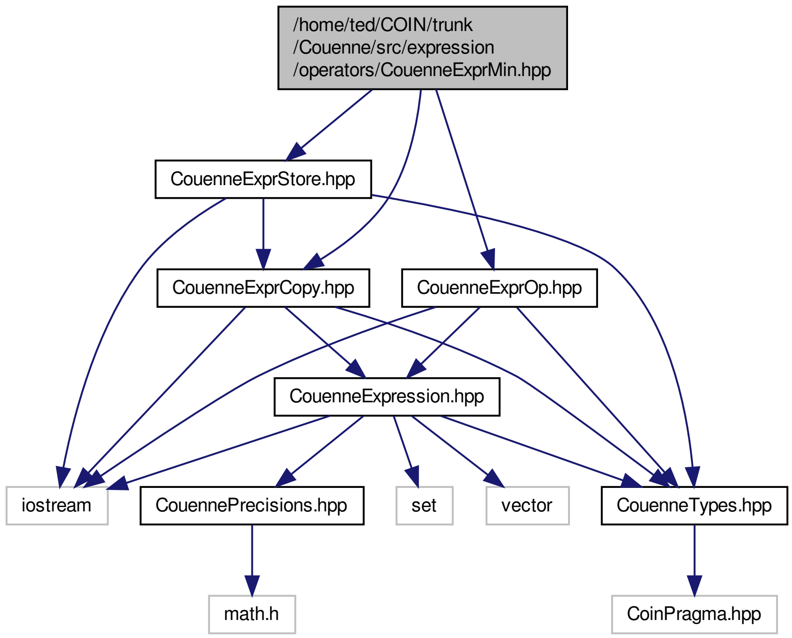
- namespace Couenne

  general include file for different compilers

8.66 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprMin.hpp File Reference

```
#include "CouenneExprOp.hpp"
#include "CouenneExprCopy.hpp"
#include "CouenneExprStore.hpp"
```

Include dependency graph for CouenneExprMin.hpp:



Classes

- class Couenne::exprMin

  class for minima

Namespaces

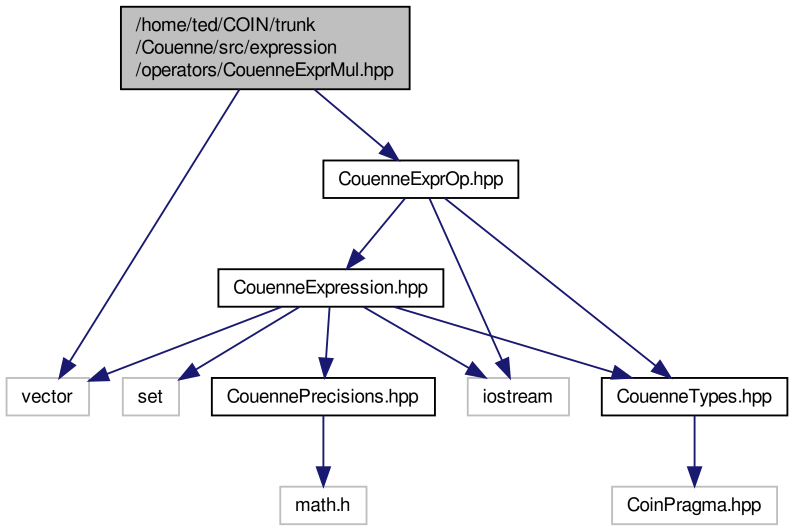
- namespace Couenne

  general include file for different compilers

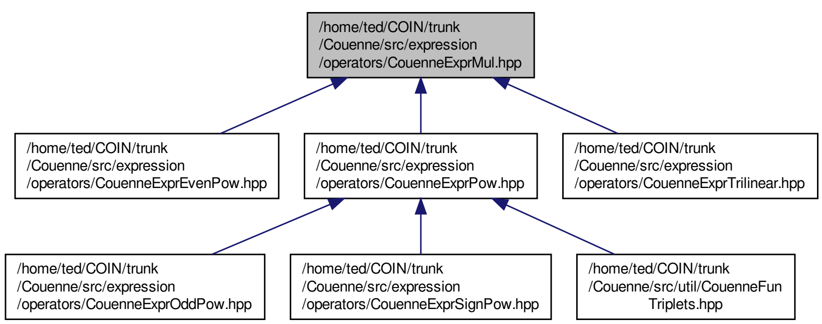
8.67 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprMul.hpp File Reference

```
#include <vector>
#include "CouenneExprOp.hpp"
```

Include dependency graph for CouenneExprMul.hpp:



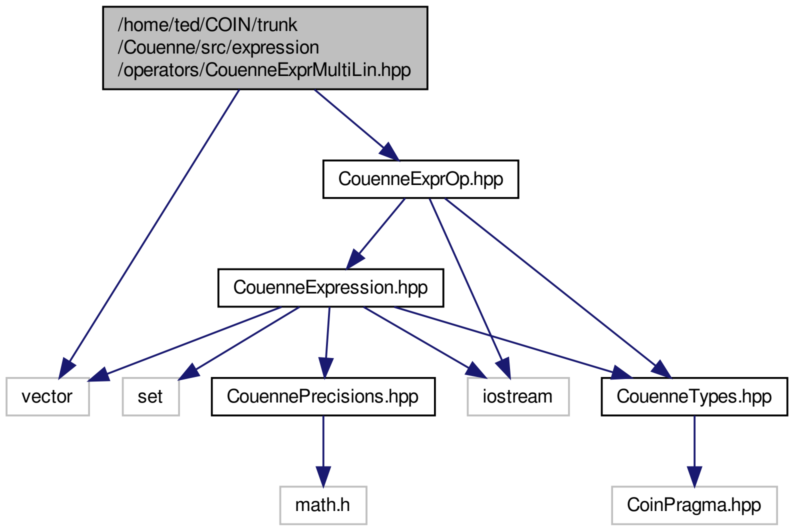
This graph shows which files directly or indirectly include this file:



8.68 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprMultiLin.hpp File Reference

```
#include <vector>
#include "CouenneExprOp.hpp"
```

Include dependency graph for CouenneExprMultiLin.hpp:



Classes

- class Couenne::exprMultiLin
  another class for multiplications, $\prod_{i=1}^{n} f_i(x)$

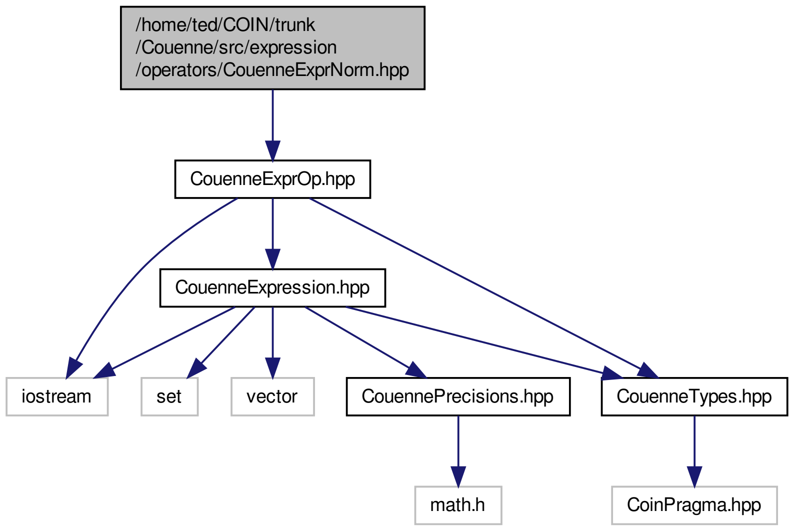
Namespaces

- namespace Couenne
  general include file for different compilers

8.69 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprNorm.hpp File Reference

```
#include "CouenneExprOp.hpp"
```

Include dependency graph for CouenneExprNorm.hpp:



Classes

- class Couenne::exprNorm

    Class for p-norms, $||f(x)||_p = \left(\sum_{i=1}^n f_i(x)^p\right)^{\frac{1}{p}}$.

Namespaces

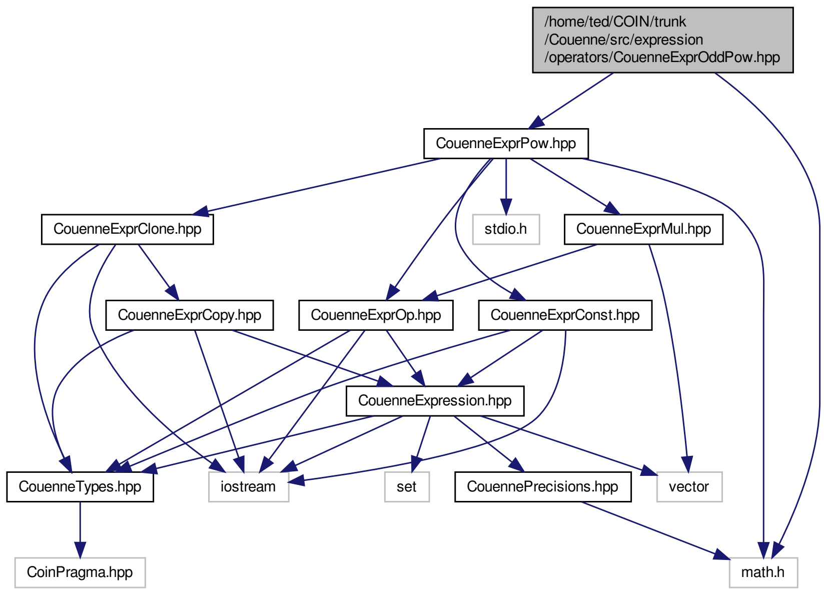
- namespace Couenne

    general include file for different compilers

8.70 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprOddPow.hpp File Reference

```
#include <math.h>
#include "CouenneExprPow.hpp"
```

Include dependency graph for CouenneExprOddPow.hpp:



Classes

- class Couenne::exprOddPow

  Power of an expression (binary operator), $f(x)^k$ with k constant.

Namespaces

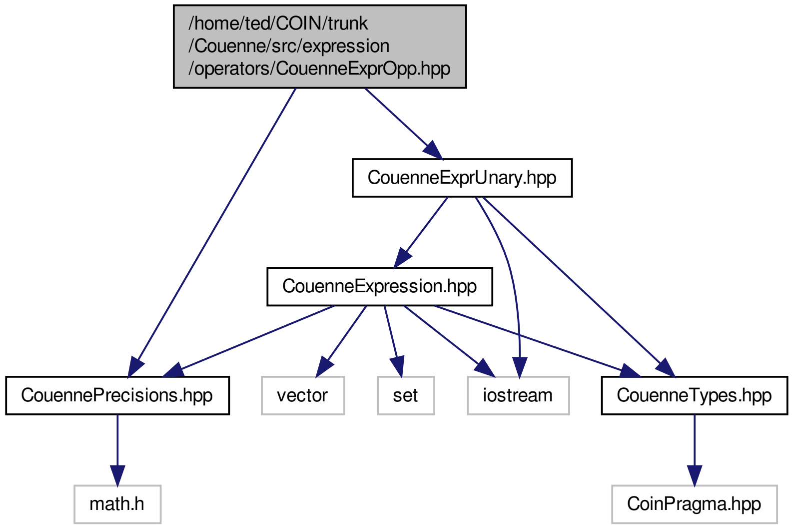
- namespace Couenne

  general include file for different compilers

8.71 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprOpp.hpp File Reference

```
#include "CouennePrecisions.hpp"
#include "CouenneExprUnary.hpp"
```

Include dependency graph for CouenneExprOpp.hpp:



Classes

- class Couenne::exprOpp

  class opposite, $-f(x)$

Namespaces

- namespace Couenne

  general include file for different compilers

Functions

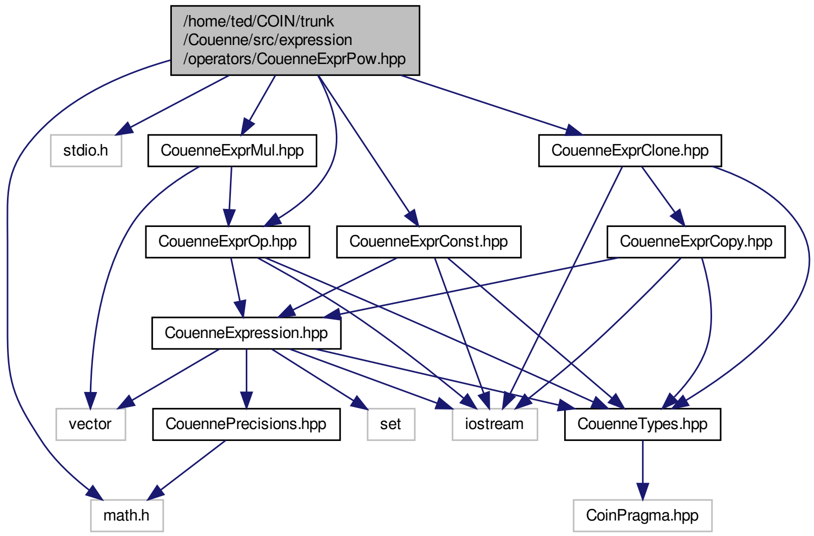
- CouNumber Couenne::opp (register CouNumber arg)

  operator opp: returns the opposite of a number

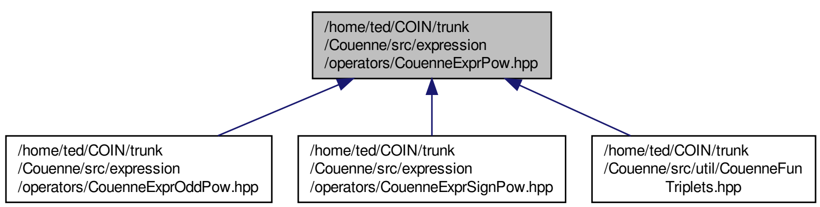
8.72 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprPow.hpp File Reference

```
#include <math.h>
#include <stdio.h>
#include "CouenneExprOp.hpp"
#include "CouenneExprMul.hpp"
#include "CouenneExprClone.hpp"
#include "CouenneExprConst.hpp"
```

Include dependency graph for CouenneExprPow.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprPow

    Power of an expression (binary operator), $f(x)^k$ with k constant.

Namespaces

- namespace Couenne

    general include file for different compilers

Functions

- CouNumber Couenne::safe_pow (CouNumber base, CouNumber exponent, bool signpower=false) *compute power and check for integer-and-odd inverse exponent*

- void Couenne::addPowEnvelope (const CouenneCutGenerator ∗, OsiCuts &, int, int, CouNumber, CouNumber, CouNumber, CouNumber, CouNumber, int, bool=false)

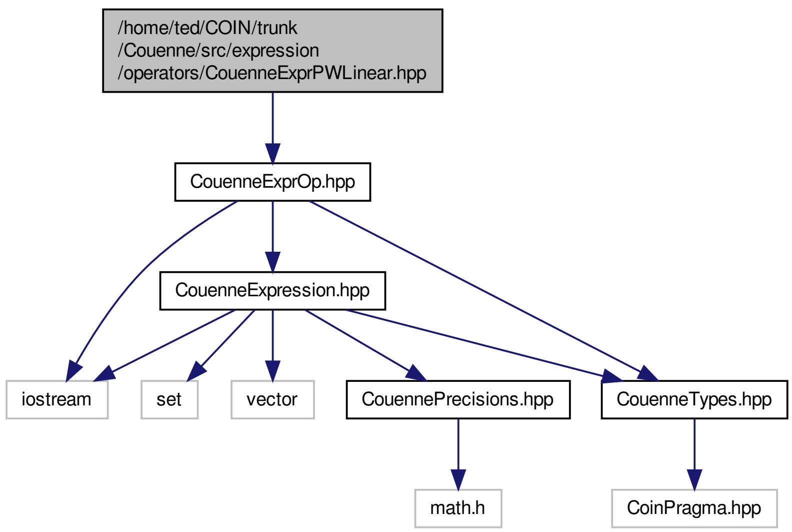
  add upper/lower envelope to power in convex/concave areas
- CouNumber Couenne::powNewton (CouNumber, CouNumber, unary_function, unary_function, unary_function)

  find proper tangent point to add deepest tangent cut
- CouNumber Couenne::powNewton (CouNumber, CouNumber, funtriplet ∗)

  find proper tangent point to add deepest tangent cut

8.73 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprPWLinear.hpp File Reference

`#include "CouenneExprOp.hpp"`
Include dependency graph for CouenneExprPWLinear.hpp:



Classes

- class Couenne::exprPWLinear

Namespaces

- namespace Couenne

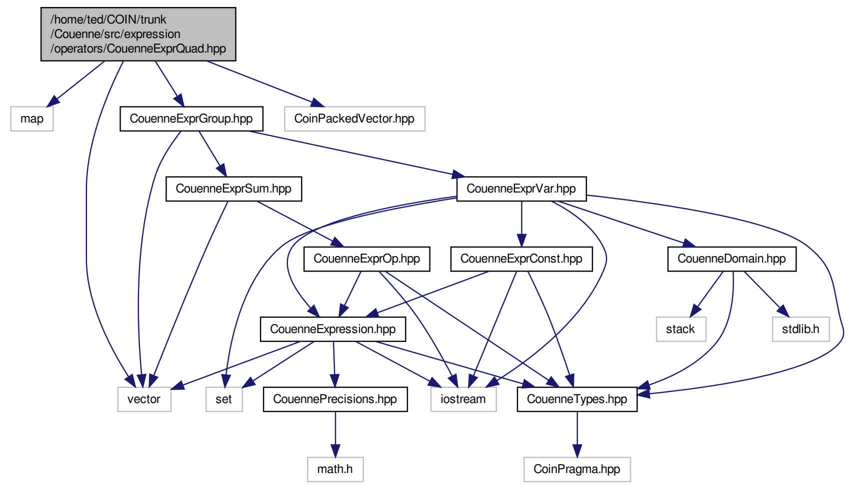
  general include file for different compilers

8.74 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprQuad.hpp File Reference

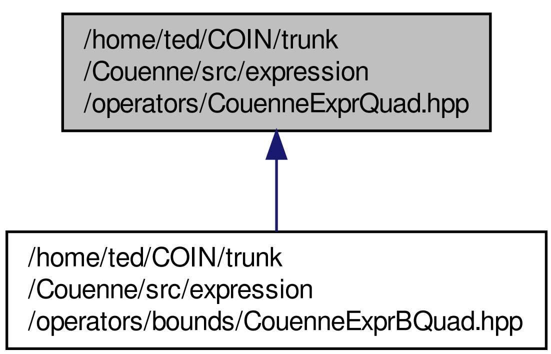
`#include <map>`

```
#include <vector>
#include "CoinPackedVector.hpp"
#include "CouenneExprGroup.hpp"
```

Include dependency graph for CouenneExprQuad.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprQuad

    class exprQuad, with constant, linear and quadratic terms

Namespaces

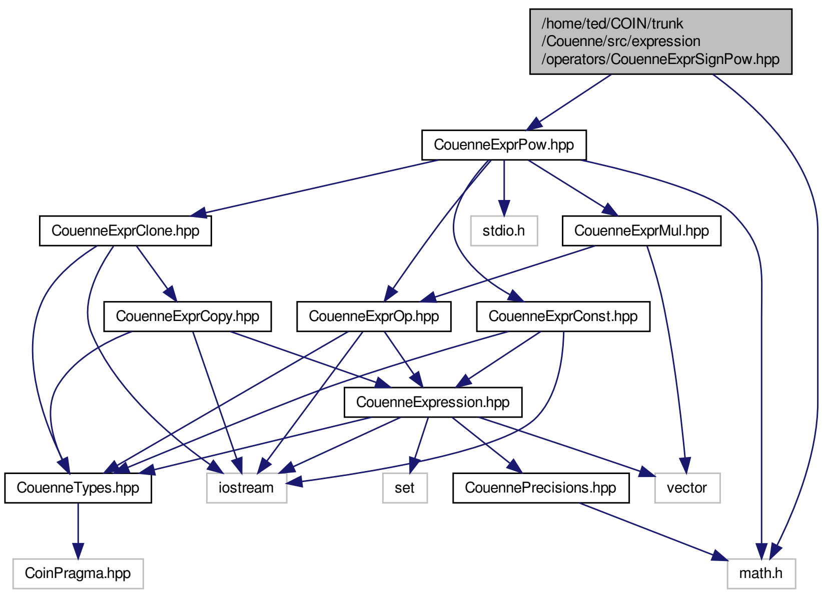
- namespace Couenne

  general include file for different compilers

8.75 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprSignPow.hpp File Reference

```
#include <math.h>
#include "CouenneExprPow.hpp"
```

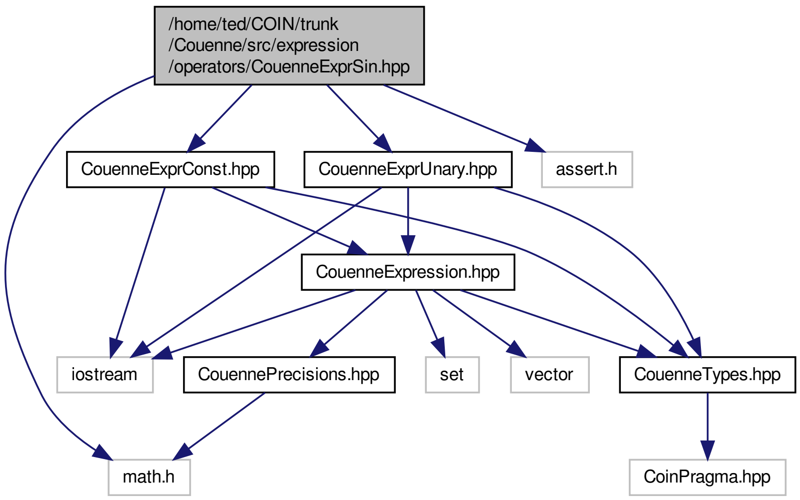
Include dependency graph for CouenneExprSignPow.hpp:



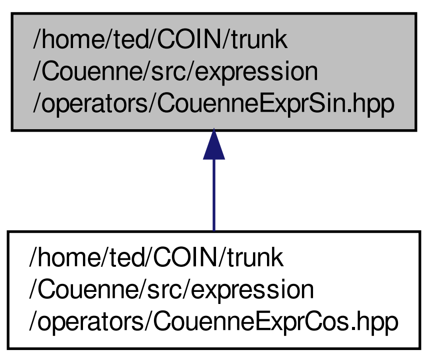
8.76 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprSin.hpp File Reference

```
#include <math.h>
#include <assert.h>
#include "CouenneExprUnary.hpp"
#include "CouenneExprConst.hpp"
```

Include dependency graph for CouenneExprSin.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprSin
  class for $\sin f(x)$

Namespaces

- namespace Couenne

general include file for different compilers

Enumerations

- enum Couenne::cou_trig { Couenne::COU_SINE, Couenne::COU_COSINE }

    specify which trigonometric function is dealt with in trigEnvelope

Functions

- CouNumber Couenne::modulo (register CouNumber a, register CouNumber b)

    normalize angle within [0,b] (typically, pi or 2pi)
- CouNumber Couenne::trigSelBranch (const CouenneObject ∗obj, const OsiBranchingInformation ∗info, expression ∗&var, double ∗&brpts, double ∗&brDist, int &way, enum cou_trig type)

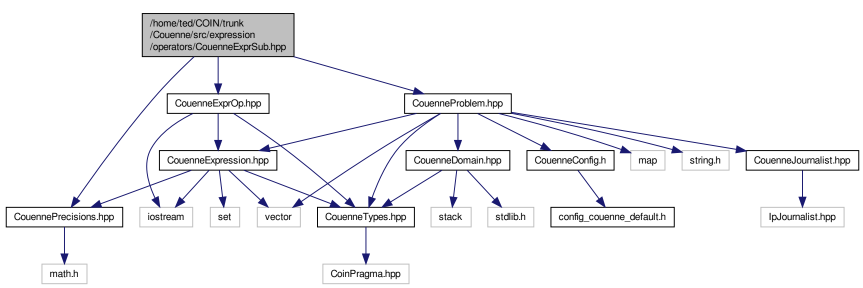
    generalized procedure for both sine and cosine
- bool Couenne::trigImpliedBound (enum cou_trig, int, int, CouNumber ∗, CouNumber ∗, t_chg_bounds ∗)

    generalized implied bound procedure for sine/cosine

8.77 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprSub.hpp File Reference

```
#include "CouenneExprOp.hpp"
#include "CouennePrecisions.hpp"
#include "CouenneProblem.hpp"
```

Include dependency graph for CouenneExprSub.hpp:



Classes

- class Couenne::exprSub

    class for subtraction, $f(x) - g(x)$

Namespaces

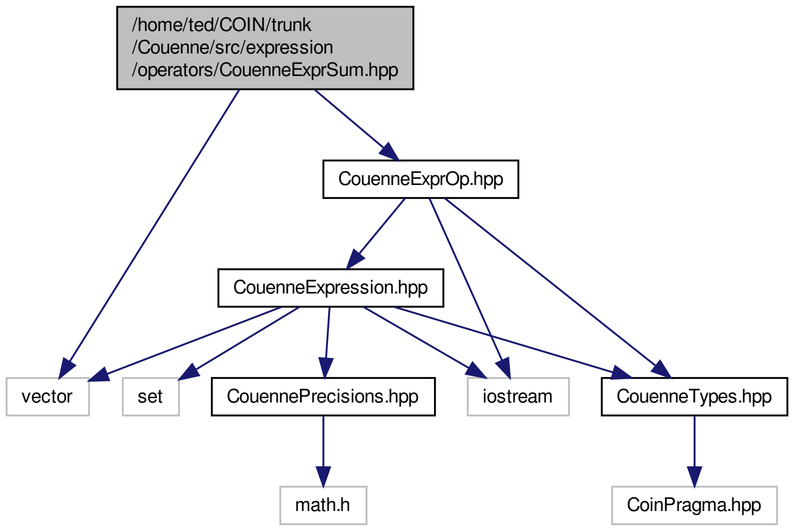
- namespace Couenne

    general include file for different compilers

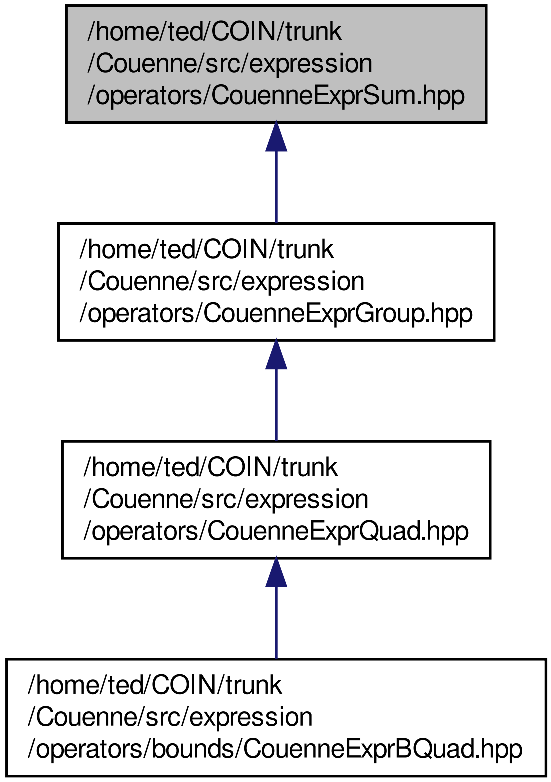
8.78 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprSum.hpp File Reference

```
#include <vector>
#include "CouenneExprOp.hpp"
```

Include dependency graph for CouenneExprSum.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::exprSum

  class sum, $\sum_{i=1}^{n} f_i(x)$

Namespaces

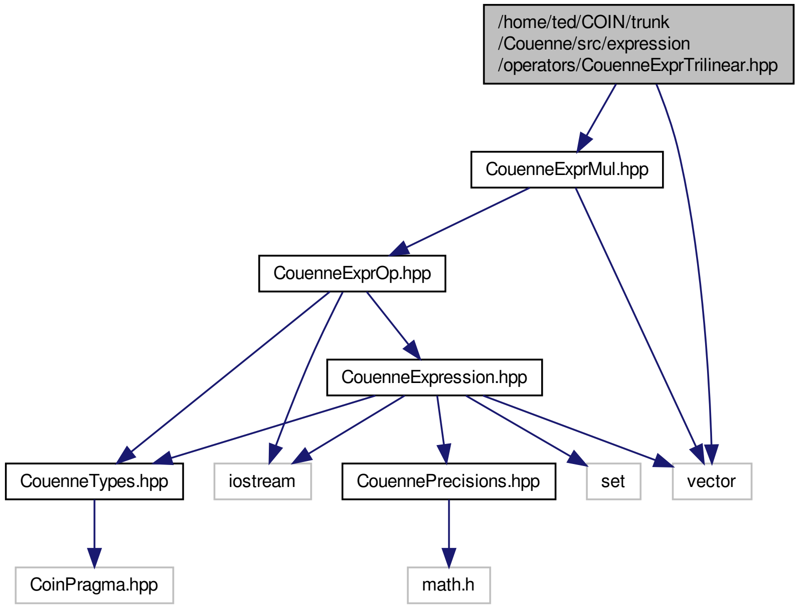
- namespace Couenne

  general include file for different compilers

8.79 /home/ted/COIN/trunk/Couenne/src/expression/operators/CouenneExprTrilinear.hpp File Reference

```
#include <vector>
#include "CouenneExprMul.hpp"
```

Include dependency graph for CouenneExprTrilinear.hpp:



Classes

- class Couenne::exprTrilinear

    class for multiplications

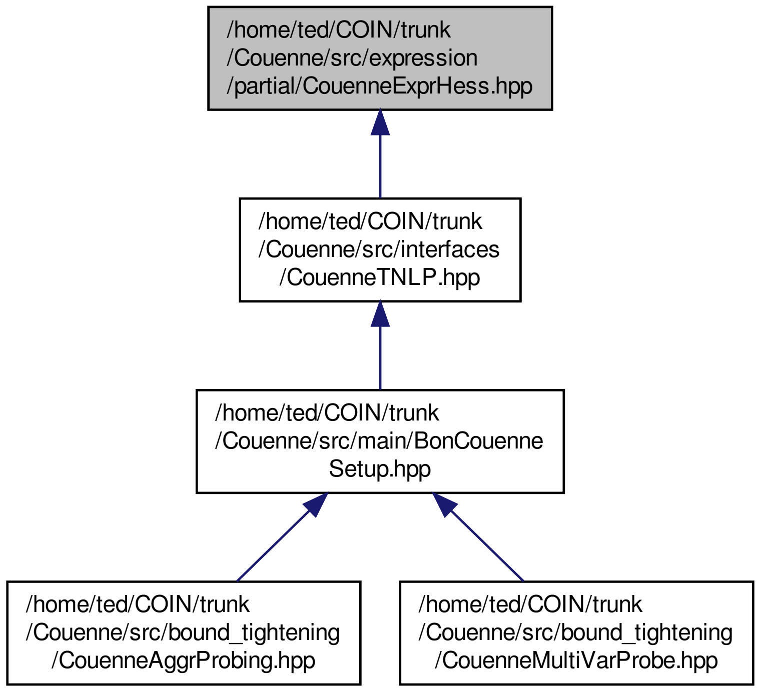
Namespaces

- namespace Couenne

    general include file for different compilers

8.80 /home/ted/COIN/trunk/Couenne/src/expression/partial/CouenneExprHess.hpp File Reference

This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::ExprHess

    expression matrices.

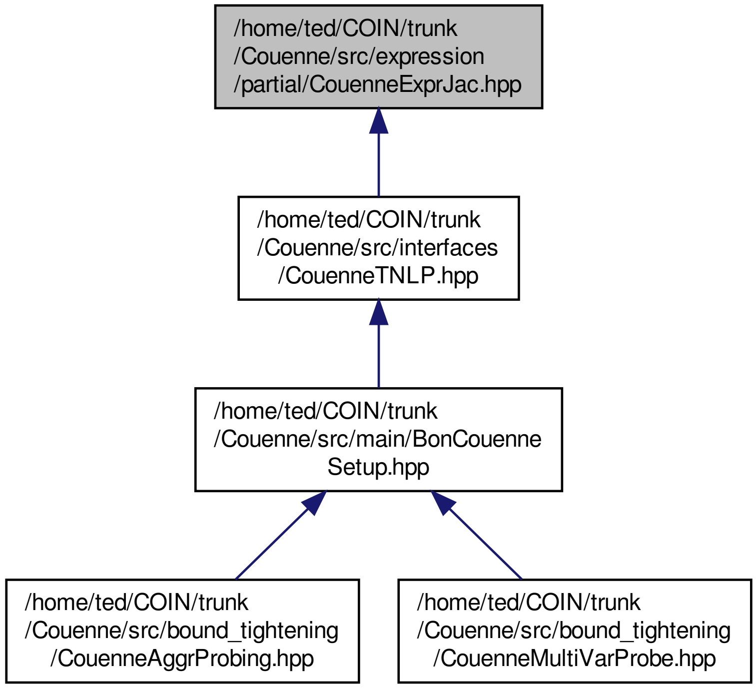
Namespaces

- namespace Couenne

    general include file for different compilers

8.81 /home/ted/COIN/trunk/Couenne/src/expression/partial/CouenneExprJac.hpp File Reference

This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::ExprJac

    Jacobian of the problem (computed through Couenne expression classes).

Namespaces

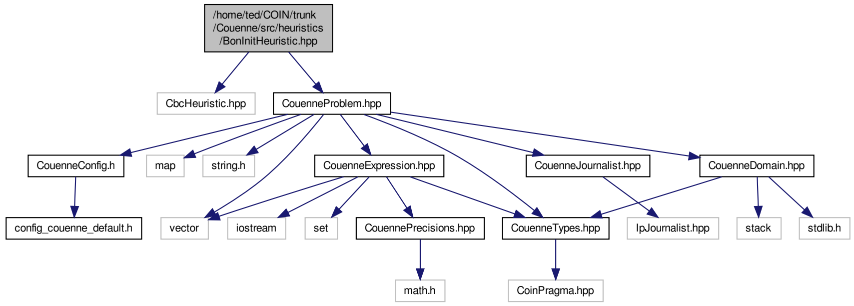
- namespace Couenne

    general include file for different compilers

8.82 /home/ted/COIN/trunk/Couenne/src/heuristics/BonInitHeuristic.hpp File Reference

```
#include "CbcHeuristic.hpp"
#include "CouenneProblem.hpp"
```

Include dependency graph for BonInitHeuristic.hpp:



Classes

- class Couenne::InitHeuristic

    A heuristic that stores the initial solution of the NLP.

Namespaces

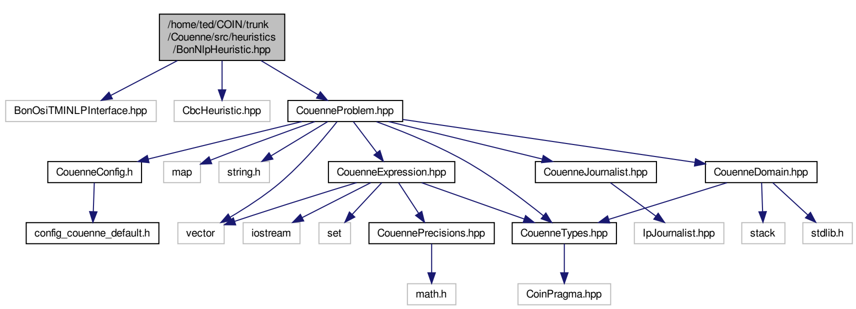
- namespace Couenne

    general include file for different compilers

8.83 /home/ted/COIN/trunk/Couenne/src/heuristics/BonNlpHeuristic.hpp File Reference

```
#include "BonOsiTMINLPInterface.hpp"
#include "CbcHeuristic.hpp"
#include "CouenneProblem.hpp"
```

Include dependency graph for BonNlpHeuristic.hpp:



Classes

- class Couenne::NlpSolveHeuristic

Namespaces

- namespace Couenne

  general include file for different compilers

Variables

- const double Couenne::maxNlpInf_0 = 1e-5

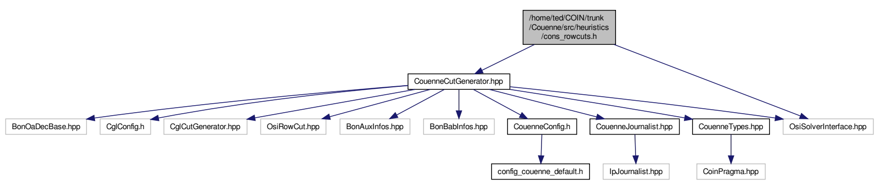
  A heuristic to call an NlpSolver if all CouenneObjects are close to be satisfied (for other integer objects, rounding is performed, if SOS's are not satisfied it does not run).

8.84 /home/ted/COIN/trunk/Couenne/src/heuristics/cons_rowcuts.h File Reference

constraint handler for rowcuts constraints enables separation of convexification cuts during SCIP solution procedure

```
#include "CouenneCutGenerator.hpp"
#include "OsiSolverInterface.hpp"
```

Include dependency graph for cons_rowcuts.h:



8.84.1 Detailed Description

constraint handler for rowcuts constraints enables separation of convexification cuts during SCIP solution procedure

Id:

cons_rowcuts.h 688 2011-06-18 00:30:32Z pbelotti

Author

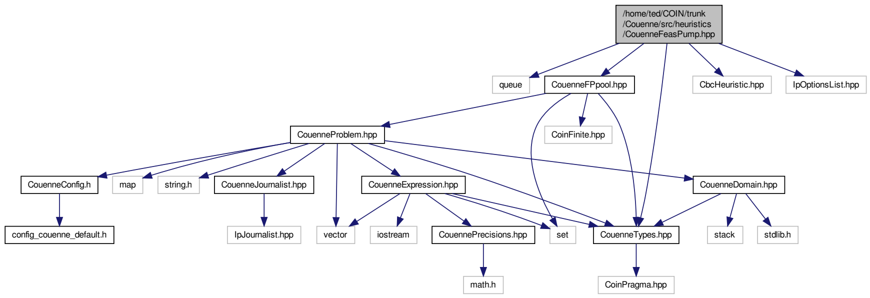
Pietro Belotti
Timo Berthold This file is licensed under the Eclipse Public License (EPL)

Definition in file cons_rowcuts.h.

8.85 /home/ted/COIN/trunk/Couenne/src/heuristics/CouenneFeasPump.hpp File Reference

```
#include <queue>
#include "CouenneTypes.hpp"
#include "CbcHeuristic.hpp"
#include "CouenneFPpool.hpp"
#include "IpOptionsList.hpp"
```

Include dependency graph for CouenneFeasPump.hpp:



Classes

- class Couenne::CouenneFeasPump

    An implementation of the Feasibility pump that uses linearization and Ipopt to find the two sequences of points.

Namespaces

- namespace Ipopt
- namespace Bonmin
- namespace Couenne

    general include file for different compilers

Functions

- double fadingCoeff (double a)

8.85.1 Function Documentation

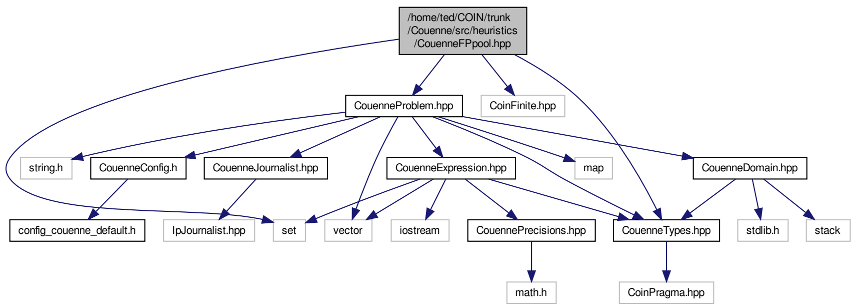
8.85.1.1 double fadingCoeff (double *a*) [inline]

Definition at line 35 of file CouenneFeasPump.hpp.

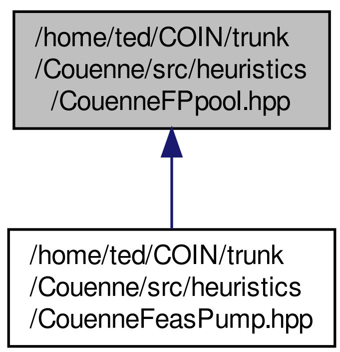
8.86 /home/ted/COIN/trunk/Couenne/src/heuristics/CouenneFPpool.hpp File Reference

```
#include <set>
#include "CouenneTypes.hpp"
#include "CoinFinite.hpp"
#include "CouenneProblem.hpp"
```

Include dependency graph for CouenneFPpool.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::CouenneFPsolution

    Class containing a solution with infeasibility evaluation.
- class Couenne::compareSol

    class for comparing solutions (used in tabu list)
- class Couenne::CouenneFPpool

    Pool of solutions.

Namespaces

- namespace Couenne

    general include file for different compilers

Enumerations

- enum Couenne::what_to_compare {
  Couenne::SUM_NINF = 0, Couenne::SUM_INF, Couenne::OBJVAL, Couenne::ALL_VARS,
  Couenne::INTEGER_VARS }

  what term to compare: the sum of infeasibilities, the sum of numbers of infeasible terms, or the objective function

Functions

- bool Couenne::operator< (const CouenneFPsolution &one, const CouenneFPsolution &two)

  compare, base version

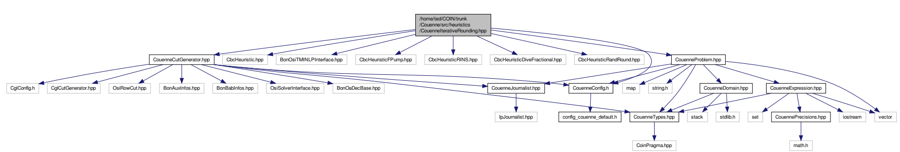
Variables

- static enum
  Couenne::what_to_compare Couenne::comparedTerm_

8.87 /home/ted/COIN/trunk/Couenne/src/heuristics/CouenneIterativeRounding.hpp File Reference

```
#include "CouenneConfig.h"
#include "CbcHeuristic.hpp"
#include "BonOsiTMINLPInterface.hpp"
#include "CbcHeuristicFPump.hpp"
#include "CbcHeuristicRINS.hpp"
#include "CbcHeuristicDiveFractional.hpp"
#include "CbcHeuristicRandRound.hpp"
#include "CouenneCutGenerator.hpp"
#include "CouenneProblem.hpp"
```

Include dependency graph for CouenneIterativeRounding.hpp:



Classes

- class Couenne::CouenneIterativeRounding

  An iterative rounding heuristic, tailored for nonconvex MINLPs.

Namespaces

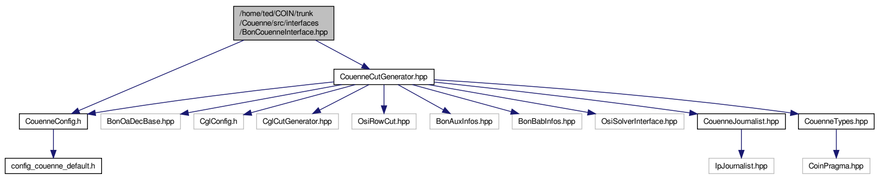
- namespace Couenne

  general include file for different compilers

8.88 /home/ted/COIN/trunk/Couenne/src/interfaces/BonCouenneInterface.hpp File Reference

```
#include "CouenneConfig.h"
#include "CouenneCutGenerator.hpp"
```

Include dependency graph for BonCouenneInterface.hpp:



Classes

- class Couenne::CouenneInterface

Namespaces

- namespace Bonmin
- namespace Couenne

    general include file for different compilers

Macros

- #define AmplInterface OsiTMINLPInterface

8.88.1 Macro Definition Documentation

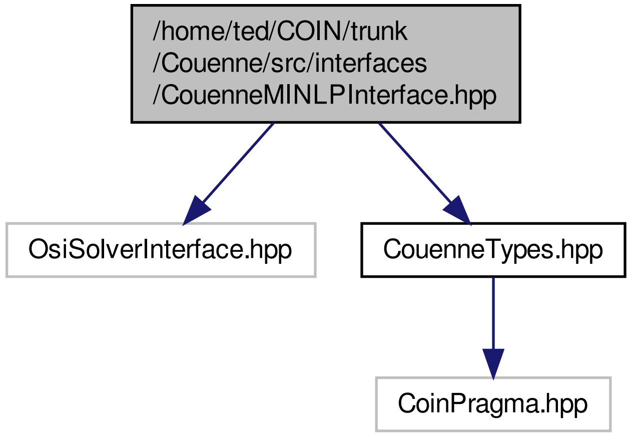
8.88.1.1 #define AmplInterface OsiTMINLPInterface

Definition at line 24 of file BonCouenneInterface.hpp.

8.89 /home/ted/COIN/trunk/Couenne/src/interfaces/CouenneMINLPInterface.hpp File Reference

```
#include "OsiSolverInterface.hpp"
#include "CouenneTypes.hpp"
```

Include dependency graph for CouenneMINLPInterface.hpp:



Classes

- class Couenne::CouenneMINLPInterface

  This is class provides an Osi interface for a Mixed Integer Linear Program expressed as a TMINLP (so that we can use it for example as the continuous solver in Cbc).

Namespaces

- namespace Ipopt
- namespace Couenne

  general include file for different compilers

Enumerations

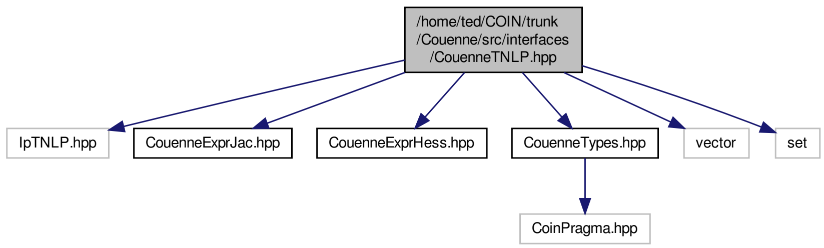
- enum Couenne::Solver { Couenne::EIpopt = 0, Couenne::EFilterSQP, Couenne::EAll }

  Solvers for solving nonlinear programs.

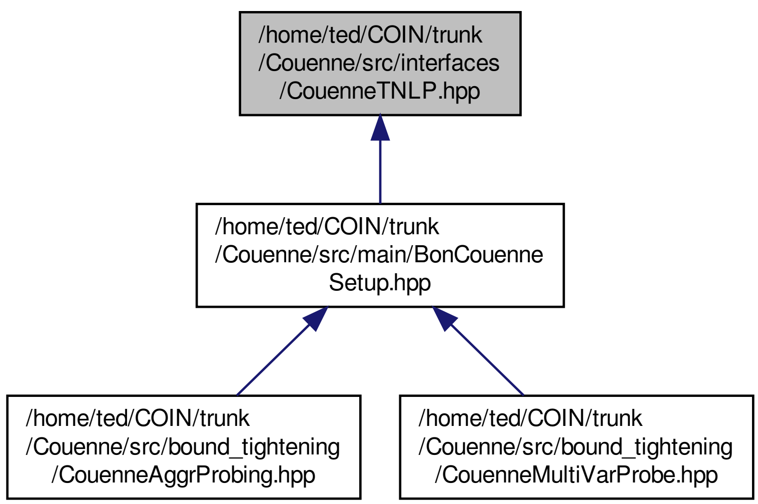
8.90 /home/ted/COIN/trunk/Couenne/src/interfaces/CouenneTNLP.hpp File Reference

```
#include "IpTNLP.hpp"
#include "CouenneExprJac.hpp"
#include "CouenneExprHess.hpp"
#include "CouenneTypes.hpp"
#include <vector>
#include <set>
```

Include dependency graph for CouenneTNLP.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::CouenneTNLP

    Class for handling NLPs using CouenneProblem.

Namespaces

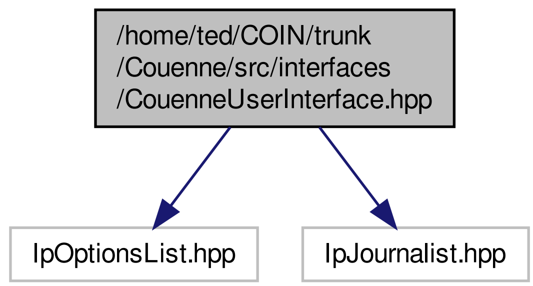
- namespace Couenne

    general include file for different compilers

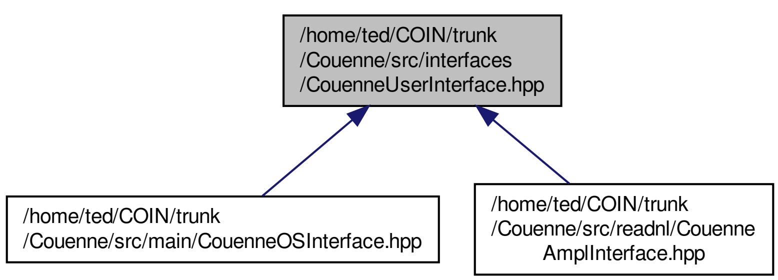
8.91 /home/ted/COIN/trunk/Couenne/src/interfaces/CouenneUserInterface.hpp File Reference

```
#include "IpOptionsList.hpp"
#include "IpJournalist.hpp"
```

Include dependency graph for CouenneUserInterface.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::CouenneUserInterface

Namespaces

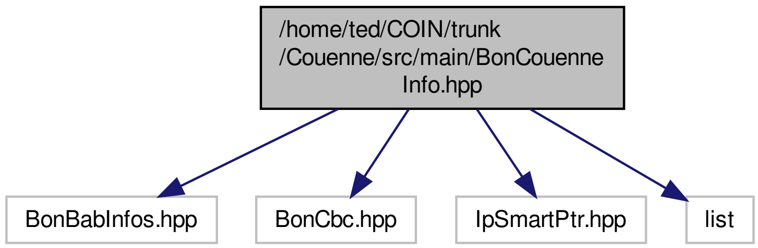
- namespace Bonmin
- namespace Couenne

  general include file for different compilers

8.92 /home/ted/COIN/trunk/Couenne/src/main/BonCouenneInfo.hpp File Reference

```
#include "BonBabInfos.hpp"
#include "BonCbc.hpp"
#include "IpSmartPtr.hpp"
#include <list>
```

Include dependency graph for BonCouenneInfo.hpp:



Classes

- class Couenne::CouenneInfo

    Bonmin class for passing info between components of branch-and-cuts.
- class Couenne::CouenneInfo::NlpSolution

    Class for storing an Nlp Solution.

Namespaces

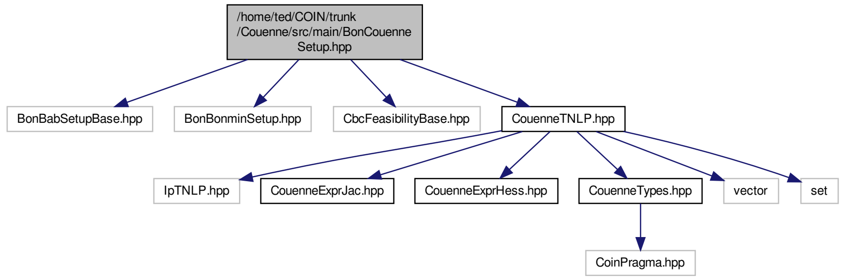
- namespace Couenne

    general include file for different compilers

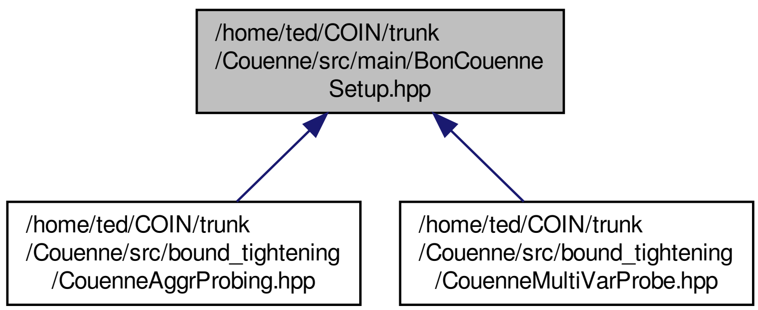
8.93 /home/ted/COIN/trunk/Couenne/src/main/BonCouenneSetup.hpp File Reference

```
#include "BonBabSetupBase.hpp"
#include "BonBonminSetup.hpp"
#include "CbcFeasibilityBase.hpp"
#include "CouenneTNLP.hpp"
```

Include dependency graph for BonCouenneSetup.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::SmartAsl
- class Couenne::CouenneSetup

Namespaces

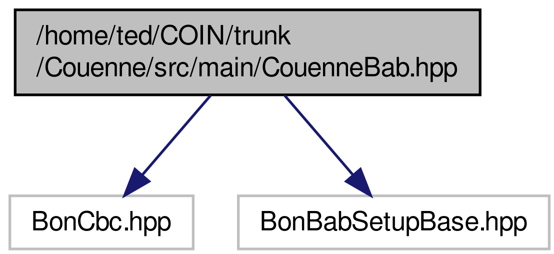
- namespace Bonmin
- namespace Couenne

  general include file for different compilers

8.94 /home/ted/COIN/trunk/Couenne/src/main/CouenneBab.hpp File Reference

```
#include "BonCbc.hpp"
#include "BonBabSetupBase.hpp"
```

Include dependency graph for CouenneBab.hpp:



Classes

- class Couenne::CouenneBab

Namespaces

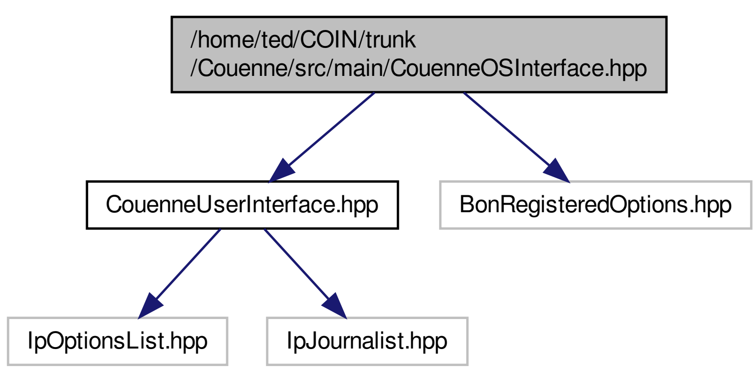
- namespace Couenne

  general include file for different compilers

8.95 /home/ted/COIN/trunk/Couenne/src/main/CouenneOSInterface.hpp File Reference

```
#include "CouenneUserInterface.hpp"
#include "BonRegisteredOptions.hpp"
```

Include dependency graph for CouenneOSInterface.hpp:



Classes

- class Couenne::CouenneOSInterface

Namespaces

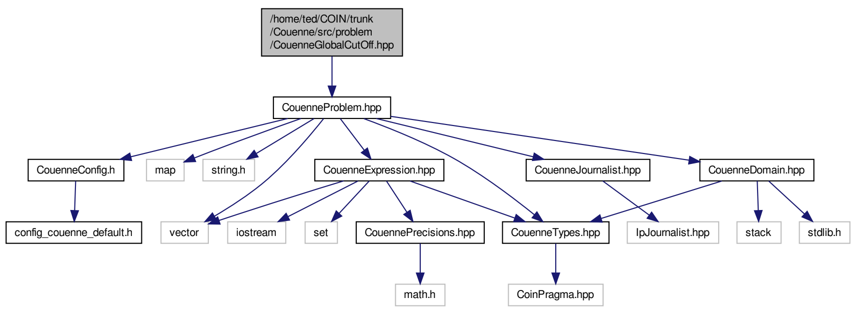
- namespace Bonmin
- namespace Ipopt
- namespace Couenne

  general include file for different compilers

8.96 /home/ted/COIN/trunk/Couenne/src/problem/CouenneGlobalCutOff.hpp File Reference

```
#include "CouenneProblem.hpp"
```

Include dependency graph for CouenneGlobalCutOff.hpp:



Classes

- class Couenne::GlobalCutOff

Namespaces

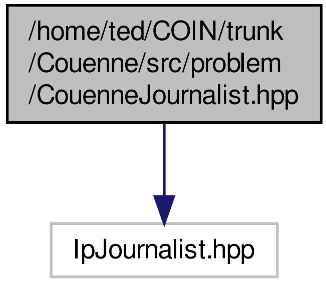
- namespace Couenne

  general include file for different compilers

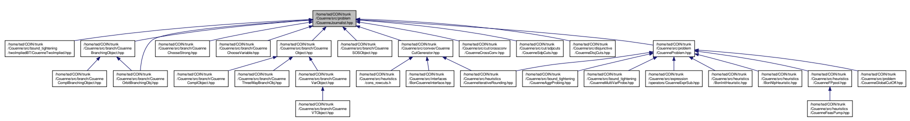
8.97 /home/ted/COIN/trunk/Couenne/src/problem/CouenneJournalist.hpp File Reference

```
#include "IpJournalist.hpp"
```

Include dependency graph for CouenneJournalist.hpp:



This graph shows which files directly or indirectly include this file:



Namespaces

- namespace Couenne

  general include file for different compilers

Functions

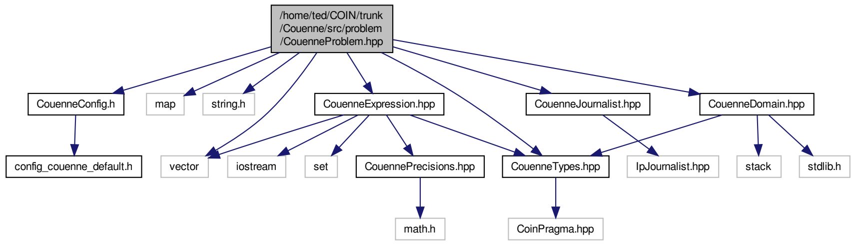
- const Ipopt::EJournalCategory Couenne::J_BRANCHING (Ipopt::J_USER1)
- const Ipopt::EJournalCategory Couenne::J_BOUNDTIGHTENING (Ipopt::J_USER2)
- const Ipopt::EJournalCategory Couenne::J_CONVEXIFYING (Ipopt::J_USER3)
- const Ipopt::EJournalCategory Couenne::J_PROBLEM (Ipopt::J_USER4)
- const Ipopt::EJournalCategory Couenne::J_NLPHEURISTIC (Ipopt::J_USER5)
- const Ipopt::EJournalCategory Couenne::J_DISJCUTS (Ipopt::J_USER6)
- const Ipopt::EJournalCategory Couenne::J_REFORMULATE (Ipopt::J_USER7)
- const Ipopt::EJournalCategory Couenne::J_COUENNE (Ipopt::J_USER8)

8.98 /home/ted/COIN/trunk/Couenne/src/problem/CouenneProblem.hpp File Reference

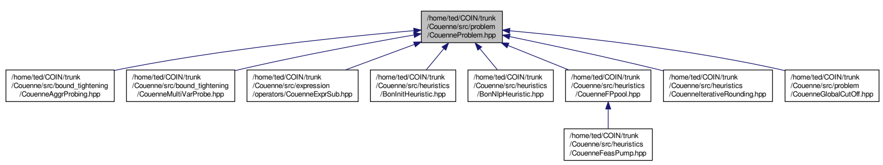
```
#include <vector>
```

```
#include <map>
#include <string.h>
#include "CouenneConfig.h"
#include "CouenneTypes.hpp"
#include "CouenneExpression.hpp"
#include "CouenneJournalist.hpp"
#include "CouenneDomain.hpp"
```

Include dependency graph for CouenneProblem.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Node
- struct myclass0
- struct myclass
- struct less_than_str
- class Couenne::CouenneProblem

    Class for MINLP problems with symbolic information.

Namespaces

- namespace Ipopt
- namespace Bonmin
- namespace Couenne

    general include file for different compilers

Macros

- #define FM_TRACE_OPTSOL

- #define FM_CHECKNLP2
- #define COUENNE_EPS_SYMM 1e-8

Enumerations

- enum Couenne::TrilinDecompType { Couenne::rAI, Couenne::treeDecomp, Couenne::bi_tri, Couenne::tri_bi }

Variables

- const CouNumber Couenne::feas_tolerance_default = 1e-5

8.98.1 Macro Definition Documentation

8.98.1.1 #define FM_TRACE_OPTSOL

Definition at line 15 of file CouenneProblem.hpp.

8.98.1.2 #define FM_CHECKNLP2

Definition at line 16 of file CouenneProblem.hpp.

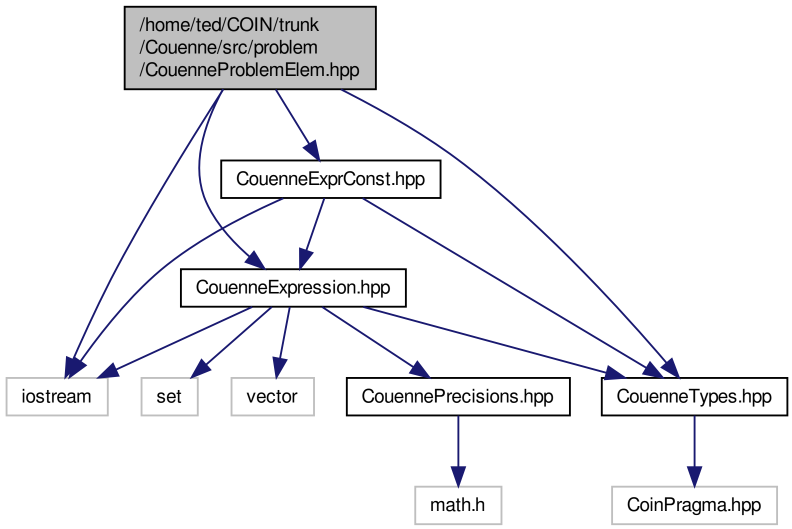
8.98.1.3 #define COUENNE_EPS_SYMM 1e-8

Definition at line 74 of file CouenneProblem.hpp.

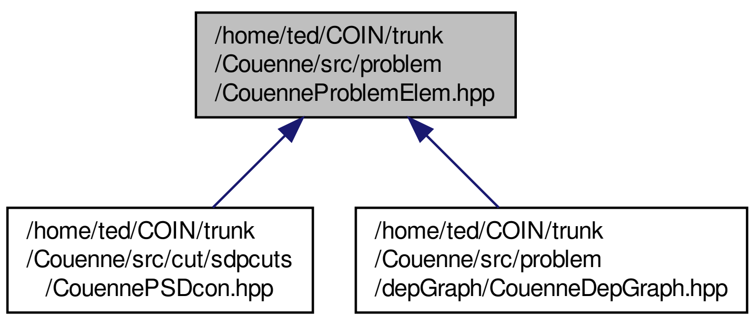
8.99 /home/ted/COIN/trunk/Couenne/src/problem/CouenneProblemElem.hpp File Reference

```
#include <iostream>
#include "CouenneTypes.hpp"
#include "CouenneExpression.hpp"
#include "CouenneExprConst.hpp"
```

Include dependency graph for CouenneProblemElem.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Couenne::CouenneConstraint

    Class to represent nonlinear constraints.
- class Couenne::CouenneObjective

    Objective function.

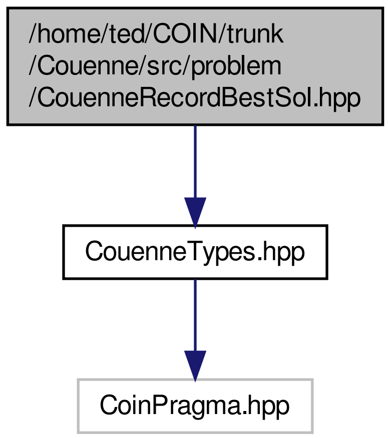
Namespaces

- namespace Couenne

  general include file for different compilers

8.100 /home/ted/COIN/trunk/Couenne/src/problem/CouenneRecordBestSol.hpp File Reference

```
#include "CouenneTypes.hpp"
```
Include dependency graph for CouenneRecordBestSol.hpp:



Classes

- class Couenne::CouenneRecordBestSol

Namespaces

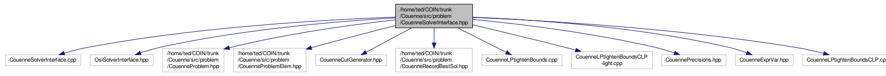
- namespace Couenne

  general include file for different compilers

8.101 /home/ted/COIN/trunk/Couenne/src/problem/CouenneSolverInterface.hpp File Reference

```
#include "CouenneSolverInterface.cpp"
#include "CouenneLPtightenBounds.cpp"
#include "CouenneLPtightenBoundsCLP-light.cpp"
#include "CouenneLPtightenBoundsCLP.cpp"
```

Include dependency graph for CouenneSolverInterface.hpp:



Classes

- class Couenne::CouenneSolverInterface< T >

  Solver interface class with a pointer to a Couenne cut generator.

Namespaces

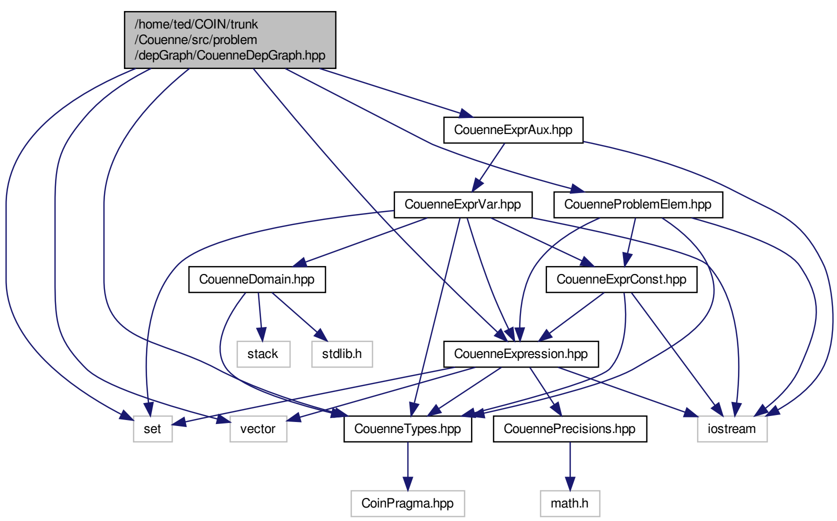
- namespace Couenne

  general include file for different compilers

8.102 /home/ted/COIN/trunk/Couenne/src/problem/depGraph/CouenneDepGraph.hpp File Reference

```
#include <vector>
#include <set>
#include "CouenneTypes.hpp"
#include "CouenneExpression.hpp"
#include "CouenneExprAux.hpp"
#include "CouenneProblemElem.hpp"
```

Include dependency graph for CouenneDepGraph.hpp:



Classes

- struct Couenne::compNode

structure for comparing nodes in the dependence graph

- class Couenne::DepNode

  vertex of a dependence graph.

- class Couenne::DepGraph

  Dependence graph.

Namespaces

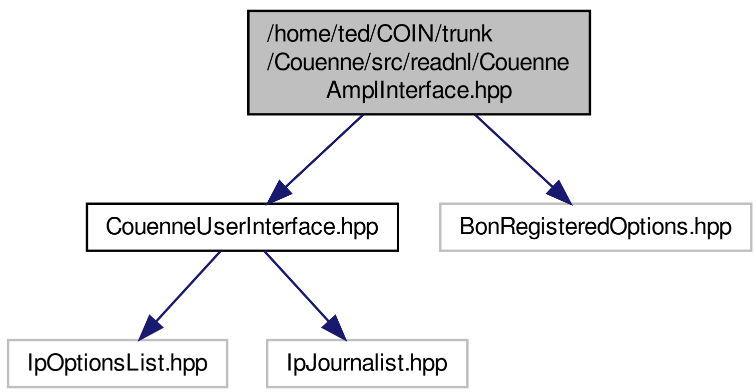
- namespace Couenne

  general include file for different compilers

8.103 /home/ted/COIN/trunk/Couenne/src/readnl/CouenneAmplInterface.hpp File Reference

```
#include "CouenneUserInterface.hpp"
#include "BonRegisteredOptions.hpp"
```

Include dependency graph for CouenneAmplInterface.hpp:



Classes

- class Couenne::CouenneAmplInterface

Namespaces

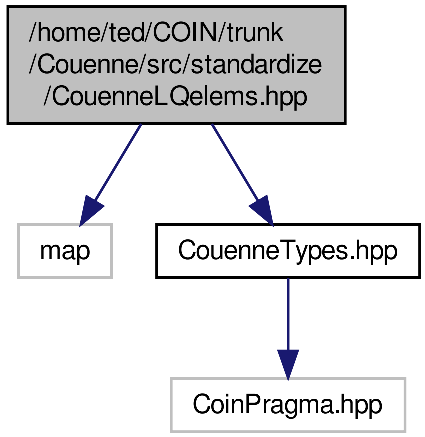
- namespace Couenne

  general include file for different compilers

8.104 /home/ted/COIN/trunk/Couenne/src/standardize/CouenneLQelems.hpp File Reference

```
#include <map>
#include "CouenneTypes.hpp"
```

Include dependency graph for CouenneLQelems.hpp:



Classes

- class Couenne::quadElem
- class Couenne::LinMap
- class Couenne::QuadMap

Namespaces

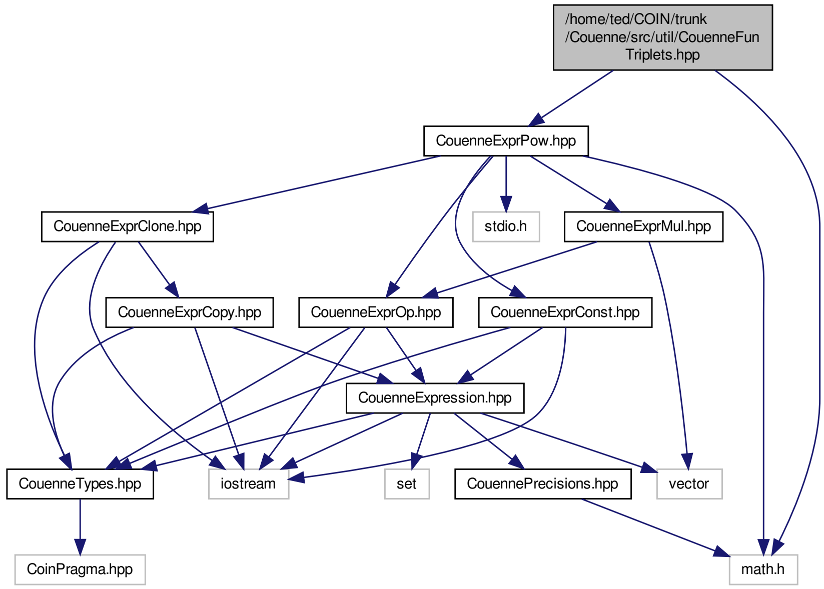
- namespace Couenne

  general include file for different compilers

8.105 /home/ted/COIN/trunk/Couenne/src/util/CouenneFunTriplets.hpp File Reference

```
#include <math.h>
#include "CouenneExprPow.hpp"
```

Include dependency graph for CouenneFunTriplets.hpp:



Classes

- class Couenne::funtriplet
- class Couenne::simpletriplet
- class Couenne::powertriplet
- class Couenne::kpowertriplet

Namespaces

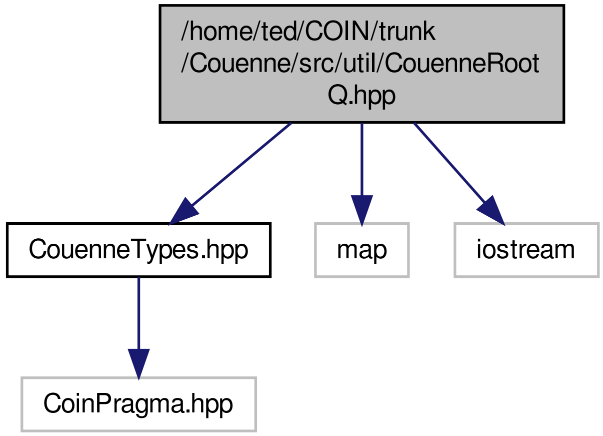
- namespace Couenne

  general include file for different compilers

8.106 /home/ted/COIN/trunk/Couenne/src/util/CouenneRootQ.hpp File Reference

```
#include "CouenneTypes.hpp"
#include <map>
#include <iostream>
```

Include dependency graph for CouenneRootQ.hpp:



Classes

- class Couenne::Qroot

  class that stores result of previous calls to rootQ into a map for faster access

Namespaces

- namespace Couenne

  general include file for different compilers

Functions

- CouNumber Couenne::rootQ (int k)

  Find roots of polynomial $Q^k(x) = $\sum_{i=1}^{2k} ix^{i-1}$.

8.107 /home/ted/COIN/trunk/Couenne/src/util/CouenneSparseMatrix.hpp File Reference

Classes

- class Couenne::CouenneSparseMatrix

  Class for sparse Matrixs (used in modifying distances in FP)

Namespaces

- namespace Couenne

  general include file for different compilers

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