

Clp
1.15

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1 Class Index

1.1 Class Hierarchy

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std::basic_ios< wchar_t >	
std::basic_iostream< char >	
std::basic_iostream< wchar_t >	
std::basic_istream< char >	
std::basic_istream< wchar_t >	
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2.1 Class List

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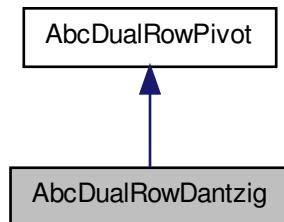
3 Class Documentation

3.1 AbcDualRowDantzig Class Reference

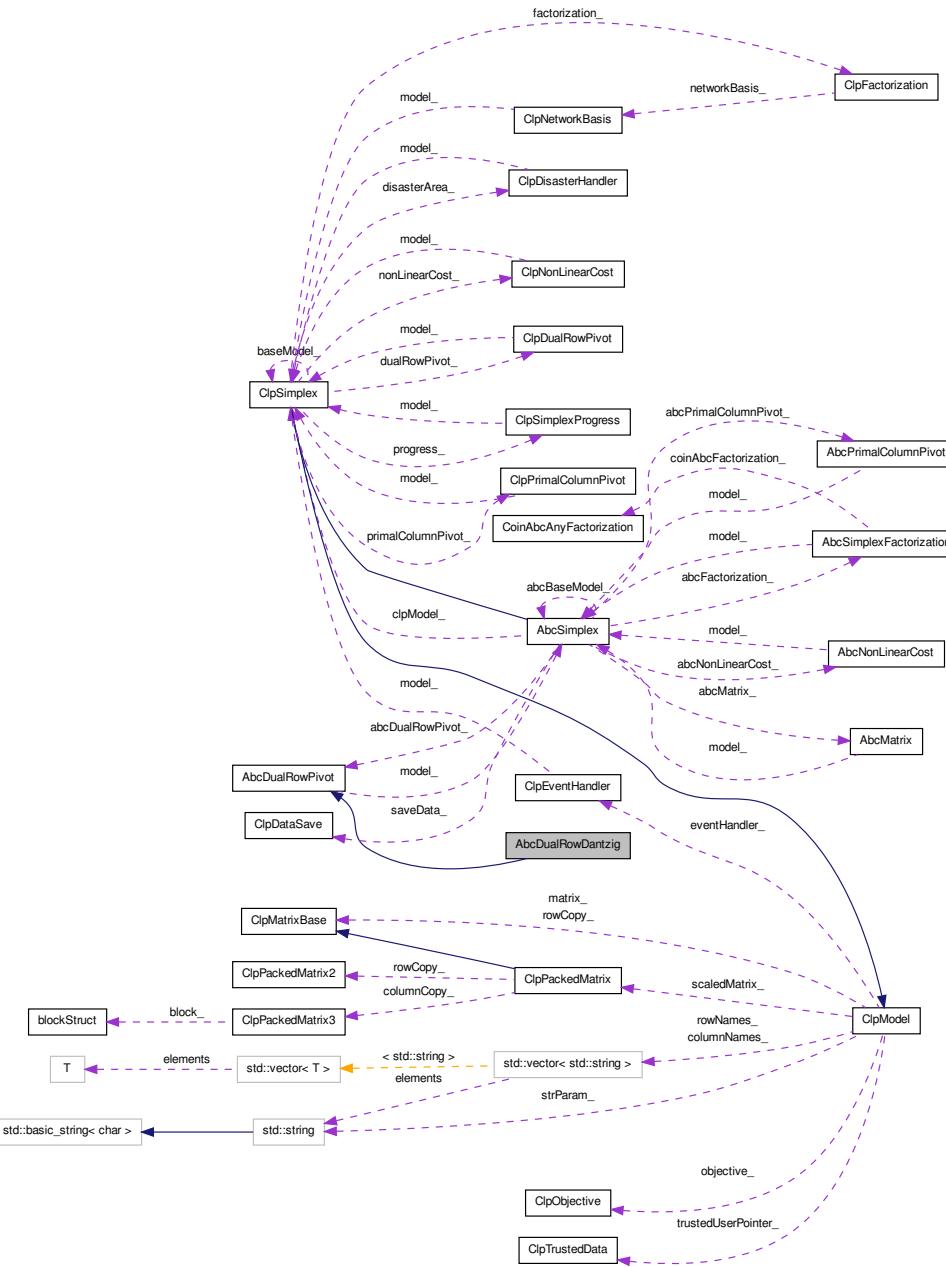
Dual Row Pivot Dantzig Algorithm Class.

```
#include <AbcDualRowDantzig.hpp>
```

Inheritance diagram for AbcDualRowDantzig:



Collaboration diagram for AbcDualRowDantzig:



Public Member Functions

Algorithmic methods

- virtual int **pivotRow** ()

Returns pivot row, -1 if none.
- virtual double **updateWeights** (CoinIndexedVector &input, CoinIndexedVector &updatedColumn)

Updates weights and returns pivot alpha.
- virtual double **updateWeights1** (CoinIndexedVector &input, CoinIndexedVector &updateColumn)

Does most of work for weights and returns pivot alpha.
- virtual void **updateWeightsOnly** (CoinIndexedVector &)
 • virtual void **updateWeights2** (CoinIndexedVector &input, CoinIndexedVector &)

Actually updates weights.
- virtual void **updatePrimalSolution** (CoinIndexedVector &input, double theta)

Updates primal solution (and maybe list of candidates) Uses input vector which it deletes Computes change in objective function.
- virtual void **saveWeights** (AbcSimplex *model, int mode)

Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.
- virtual void **recomputeInfeasibilities** ()

Recompute infeasibilities.

Constructors and destructors

- **AbcDualRowDantzig** ()

Default Constructor.
- **AbcDualRowDantzig** (const **AbcDualRowDantzig** &)

Copy constructor.
- **AbcDualRowDantzig** & **operator=** (const **AbcDualRowDantzig** &rhs)

Assignment operator.
- virtual **~AbcDualRowDantzig** ()

Destructor.

- virtual [AbcDualRowPivot * clone](#) (bool copyData=true) const
Clone.

3.1.1 Detailed Description

Dual Row Pivot Dantzig Algorithm Class. This is simplest choice - choose largest infeasibility

Definition at line 19 of file AbcDualRowDantzig.hpp.

3.1.2 Member Function Documentation

3.1.2.1 virtual double AbcDualRowDantzig::updateWeights (CoinIndexedVector & *input*, CoinIndexedVector & *updatedColumn*) [virtual]

Updates weights and returns pivot alpha.

Also does FT update

Implements [AbcDualRowPivot](#).

3.1.2.2 virtual double AbcDualRowDantzig::updateWeights1 (CoinIndexedVector & *input*, CoinIndexedVector & *updateColumn*) [virtual]

Does most of work for weights and returns pivot alpha.

Also does FT update

Implements [AbcDualRowPivot](#).

3.1.2.3 virtual void AbcDualRowDantzig::saveWeights (AbcSimplex * *model*, int *mode*) [virtual]

Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.

check for infeasible) 4) as 2 but restore weights from previous snapshot 5) for strong branching - initialize , infeasibilities

Reimplemented from [AbcDualRowPivot](#).

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

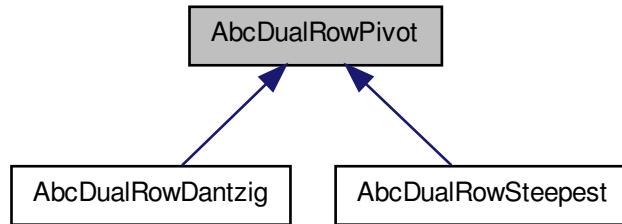
- [AbcDualRowDantzig.hpp](#)

3.2 AbcDualRowPivot Class Reference

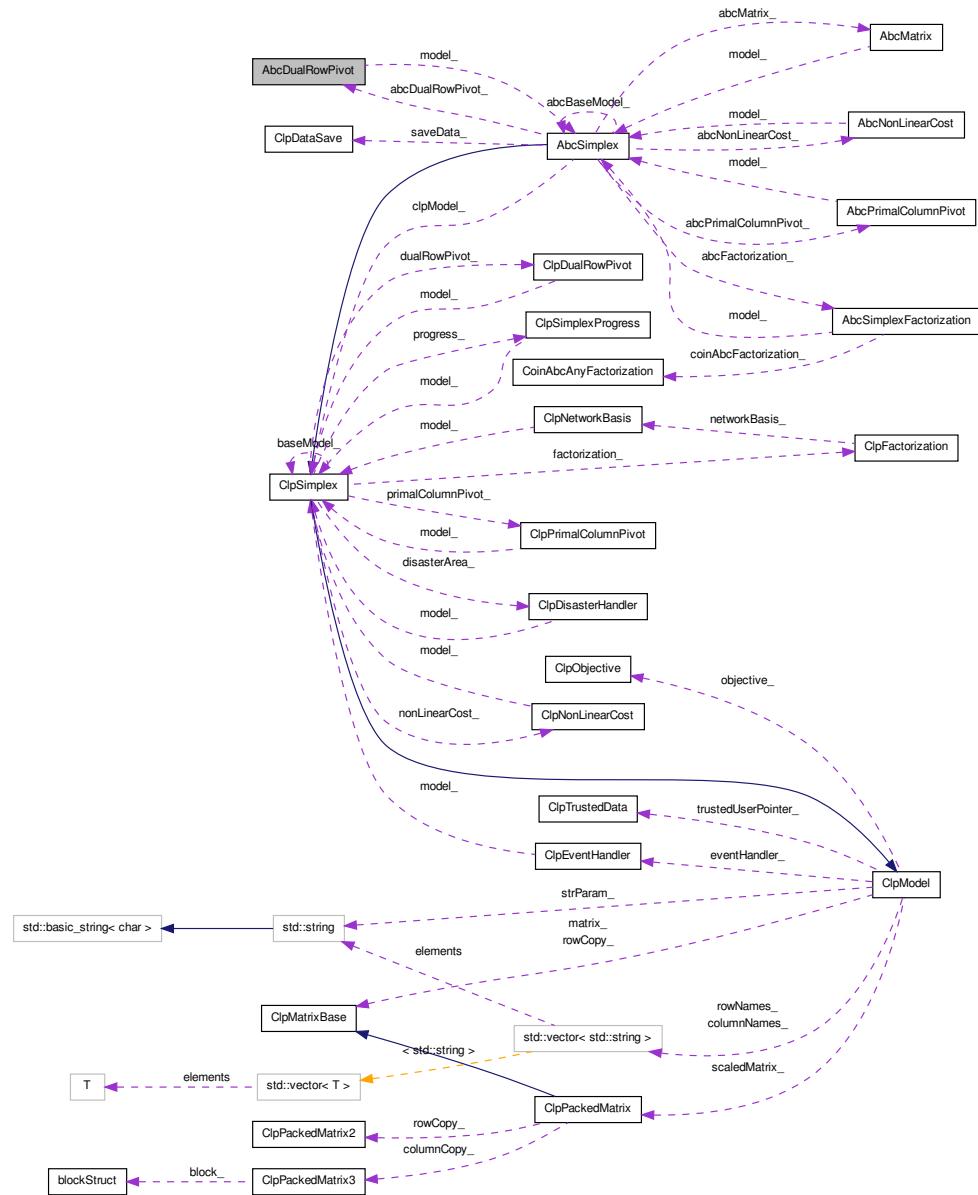
Dual Row Pivot Abstract Base Class.

```
#include <AbcDualRowPivot.hpp>
```

Inheritance diagram for AbcDualRowPivot:



Collaboration diagram for AbcDualRowPivot:



Public Member Functions

Algorithmic methods

- virtual int **pivotRow** ()=0
Returns pivot row, -1 if none.
- virtual double **updateWeights1** (CoinIndexedVector &input, CoinIndexedVector &updateColumn)=0
Does most of work for weights and returns pivot alpha.
- virtual void **updateWeightsOnly** (CoinIndexedVector &input)=0
- virtual double **updateWeights** (CoinIndexedVector &input, CoinIndexedVector &updateColumn)=0
- virtual void **updateWeights2** (CoinIndexedVector &input, CoinIndexedVector &updateColumn)=0
Actually updates weights.
- virtual void **updatePrimalSolution** (CoinIndexedVector &updateColumn, double theta)=0
Updates primal solution (and maybe list of candidates) Uses input vector which it deletes Would be faster if we kept basic regions, but on other hand it means everything is always in sync.
- virtual void **updatePrimalSolutionAndWeights** (CoinIndexedVector &weightsVector, CoinIndexedVector &updateColumn, double theta)
Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.
- virtual void **recomputeInfeasibilities** ()
Recompute infeasibilities.
- virtual void **checkAccuracy** ()
checks accuracy and may re-initialize (may be empty)
- virtual void **clearArrays** ()
Gets rid of all arrays (may be empty).
- virtual bool **looksOptimal** () const
Returns true if would not find any row.

Constructors and destructors

- **AbcDualRowPivot ()**
Default Constructor.
- **AbcDualRowPivot (const AbcDualRowPivot &)**
Copy constructor.
- **AbcDualRowPivot & operator= (const AbcDualRowPivot &rhs)**
Assignment operator.
- **virtual ~AbcDualRowPivot ()**
Destructor.
- **virtual AbcDualRowPivot * clone (bool copyData=true) const =0**
Clone.

Other

- **AbcSimplex * model ()**
Returns model.
- **void setModel (AbcSimplex *newmodel)**
Sets model (normally to NULL).
- **int type ()**
Returns type (above 63 is extra information).

Protected Attributes

Protected member data

- **AbcSimplex * model_**
Pointer to model.
- **int type_**
Type of row pivot algorithm.

3.2.1 Detailed Description

Dual Row Pivot Abstract Base Class. Abstract Base Class for describing an interface to an algorithm to choose row pivot in dual simplex algorithm. For some algorithms e.g. Dantzig choice then some functions may be null.

Definition at line 23 of file AbcDualRowPivot.hpp.

3.2.2 Member Function Documentation

3.2.2.1 virtual double AbcDualRowPivot::updateWeights1 (
 CoinIndexedVector & *input*, CoinIndexedVector & *updateColumn*)
[pure virtual]

Does most of work for weights and returns pivot alpha.

Also does FT update

Implemented in [AbcDualRowDantzig](#), and [AbcDualRowSteepest](#).

3.2.2.2 virtual void AbcDualRowPivot::saveWeights (AbcSimplex * *model*,
int *mode*) [virtual]

Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.

check for infeasible) 4) as 2 but restore weights from previous snapshot 5) for strong branching - initialize , infeasibilities

Reimplemented in [AbcDualRowDantzig](#), and [AbcDualRowSteepest](#).

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

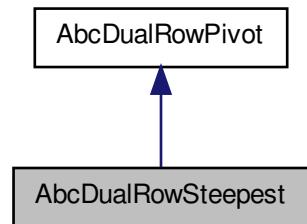
- AbcDualRowPivot.hpp

3.3 AbcDualRowSteepest Class Reference

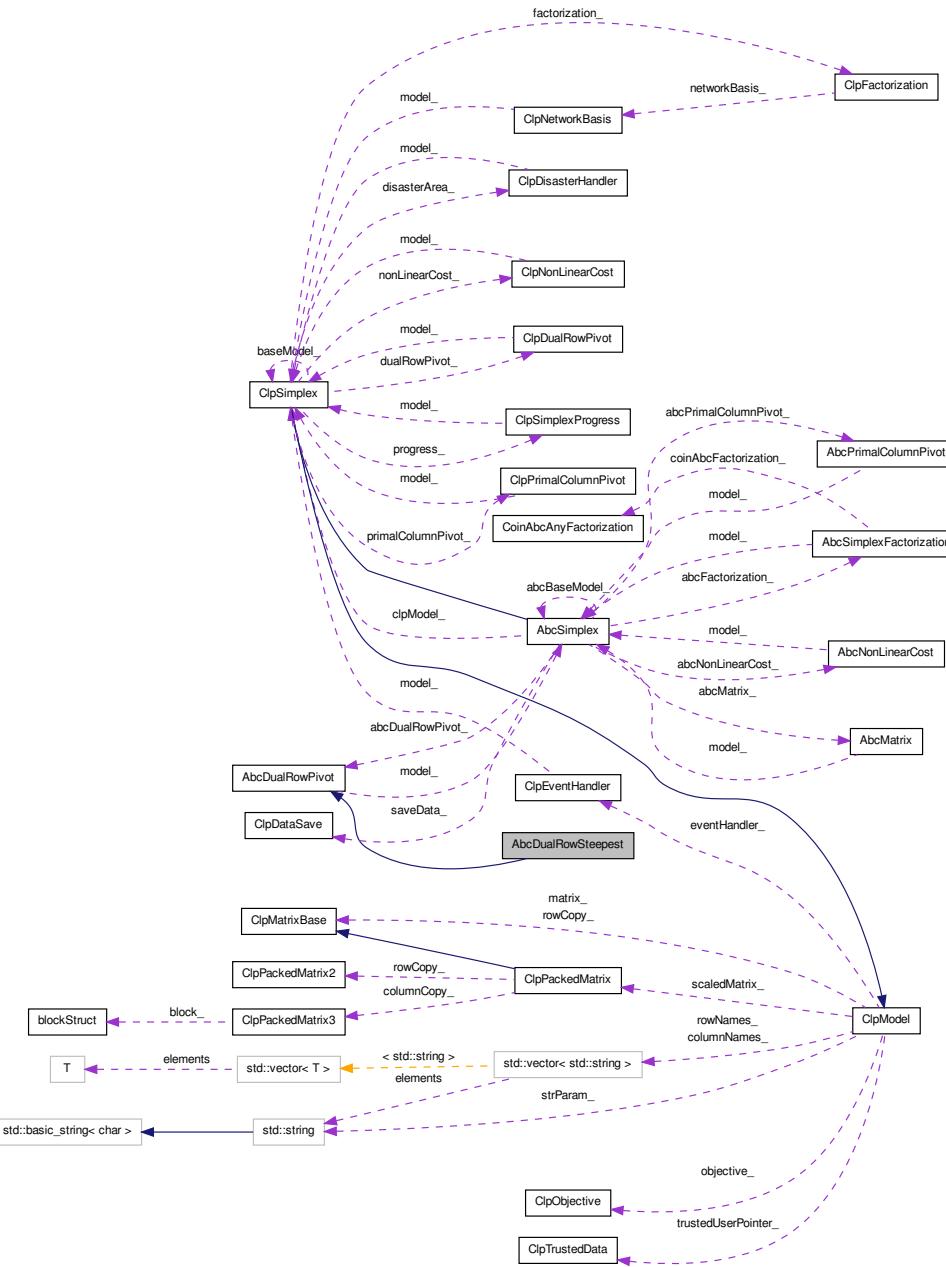
Dual Row Pivot Steepest Edge Algorithm Class.

```
#include <AbcDualRowSteepest.hpp>
```

Inheritance diagram for AbcDualRowSteepest:



Collaboration diagram for AbcDualRowSteepest:



Public Types

- enum **Persistence**
enums for persistence

Public Member Functions

Algorithmic methods

- virtual int **pivotRow** ()
Returns pivot row, -1 if none.
- virtual double **updateWeights** (CoinIndexedVector &input, CoinIndexedVector &updatedColumn)
Updates weights and returns pivot alpha.
- virtual double **updateWeights1** (CoinIndexedVector &input, CoinIndexedVector &updateColumn)
Does most of work for weights and returns pivot alpha.
- virtual void **updateWeightsOnly** (CoinIndexedVector &input)
- virtual void **updateWeights2** (CoinIndexedVector &input, CoinIndexedVector &updateColumn)
Actually updates weights.
- virtual void **updatePrimalSolution** (CoinIndexedVector &input, double theta)
Updates primal solution (and maybe list of candidates) Uses input vector which it deletes.
- virtual void **updatePrimalSolutionAndWeights** (CoinIndexedVector &weightsVector, CoinIndexedVector &updateColumn, double theta)
- virtual void **saveWeights** (AbcSimplex *model, int mode)
Saves any weights round factorization as pivot rows may change Save model May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.
- virtual void **recomputeInfeasibilities** ()
Recompute infeasibilities.
- virtual void **clearArrays** ()
Gets rid of all arrays.
- virtual bool **looksOptimal** () const
Returns true if would not find any row.

Constructors and destructors

- `AbcDualRowSteepest (int mode=3)`
Default Constructor 0 is uninitialized, 1 full, 2 is partial uninitialized, 3 starts as 2 but may switch to 1.
- `AbcDualRowSteepest (const AbcDualRowSteepest &)`
Copy constructor.
- `AbcDualRowSteepest & operator= (const AbcDualRowSteepest &rhs)`
Assignment operator.
- `void fill (const AbcDualRowSteepest &rhs)`
Fill most values.
- `virtual ~AbcDualRowSteepest ()`
Destructor.
- `virtual AbcDualRowPivot * clone (bool copyData=true) const`
Clone.

gets and sets

- `int mode () const`
Mode.
- `void setPersistence (Persistence life)`
Set/ get persistence.
- `Persistence persistence () const`
- `CoinIndexedVector * infeasible () const`
Infeasible vector.
- `CoinIndexedVector * weights () const`
Weights vector.
- `AbcSimplex * model () const`
Model.

3.3.1 Detailed Description

Dual Row Pivot Steepest Edge Algorithm Class. See Forrest-Goldfarb paper for algorithm

Definition at line 21 of file AbcDualRowSteepest.hpp.

3.3.2 Constructor & Destructor Documentation

3.3.2.1 AbcDualRowSteepest::AbcDualRowSteepest (int mode = 3)

Default Constructor 0 is uninitialized, 1 full, 2 is partial uninitialized, 3 starts as 2 but may switch to 1.

By partial is meant that the weights are updated as normal but only part of the infeasible basic variables are scanned. This can be faster on very easy problems.

3.3.3 Member Function Documentation

3.3.3.1 virtual double AbcDualRowSteepest::updateWeights (CoinIndexedVector & input, CoinIndexedVector & updatedColumn) [virtual]

Updates weights and returns pivot alpha.

Also does FT update

Implements [AbcDualRowPivot](#).

3.3.3.2 virtual double AbcDualRowSteepest::updateWeights1 (CoinIndexedVector & input, CoinIndexedVector & updateColumn) [virtual]

Does most of work for weights and returns pivot alpha.

Also does FT update

Implements [AbcDualRowPivot](#).

3.3.3.3 virtual void AbcDualRowSteepest::saveWeights (AbcSimplex * model, int mode) [virtual]

Saves any weights round factorization as pivot rows may change Save model May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g. check for infeasible) 4) as 2 but restore weights from previous snapshot 5) for strong branching - initialize (uninitialized), infeasibilities

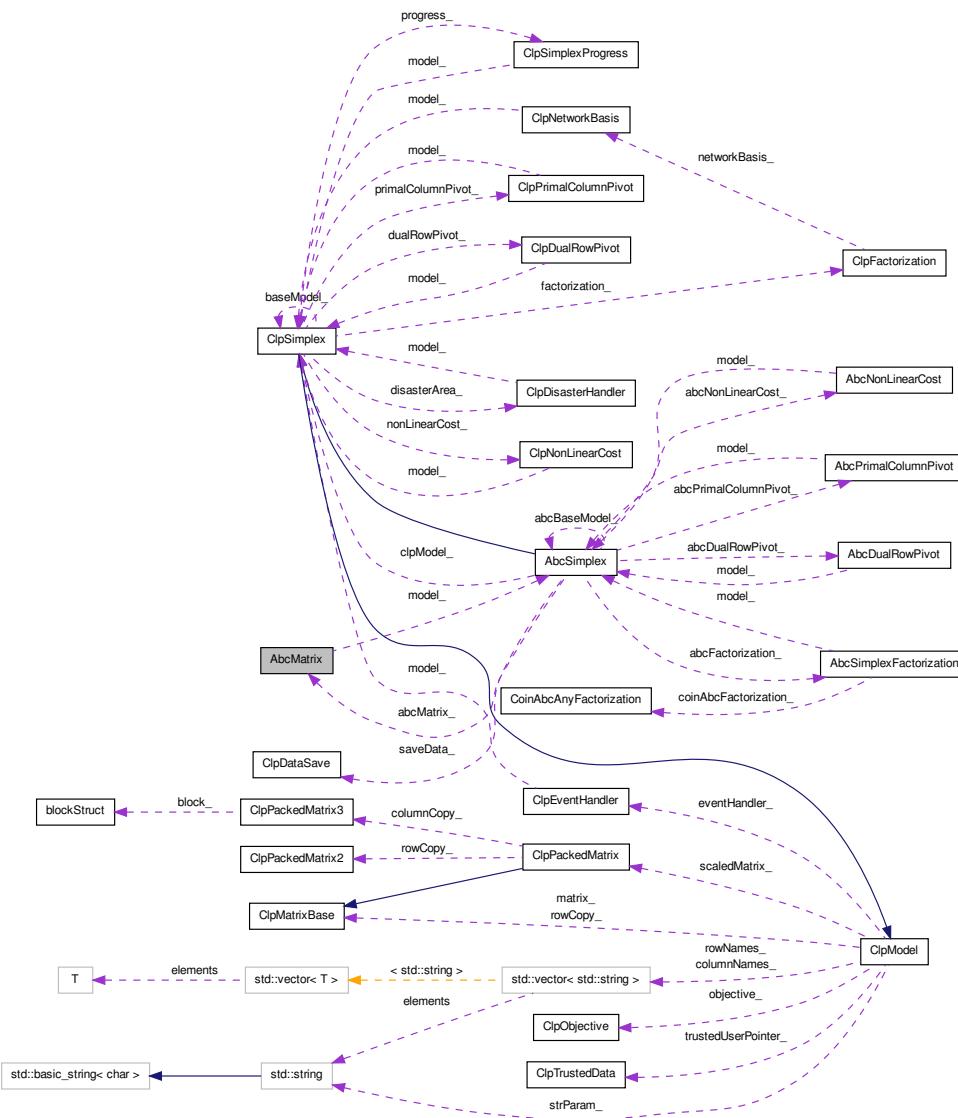
Reimplemented from [AbcDualRowPivot](#).

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

- [AbcDualRowSteepest.hpp](#)

3.4 AbcMatrix Class Reference

Collaboration diagram for AbcMatrix:



Public Member Functions

Useful methods

- `CoinPackedMatrix * getPackedMatrix () const`
Return a complete CoinPackedMatrix.
- `bool isColOrdered () const`
Whether the packed matrix is column major ordered or not.
- `CoinBigIndexgetNumElements () const`
Number of entries in the packed matrix.
- `intgetNumCols () const`
Number of columns.
- `intgetNumRows () const`
Number of rows.
- `void setModel (AbcSimplex *model)`
Sets model.
- `const double * getElements () const`
A vector containing the elements in the packed matrix.
- `double * getMutableElements () const`
Mutable elements.
- `const int * getIndices () const`
A vector containing the minor indices of the elements in the packed matrix.
- `int * getMutableIndices () const`
A vector containing the minor indices of the elements in the packed matrix.
- `const CoinBigIndex * getVectorStarts () const`
Starts.
- `CoinBigIndex * getMutableVectorStarts () const`
- `const int * getVectorLengths () const`
The lengths of the major-dimension vectors.
- `int * getMutableVectorLengths () const`
The lengths of the major-dimension vectors.
- `CoinBigIndex * rowStart () const`
Row starts.

- `CoinBigIndex * rowEnd () const`
Row ends.
- `double * rowElements () const`
Row elements.
- `CoinSimplexInt * rowColumns () const`
Row columns.
- `CoinPackedMatrix * reverseOrderedCopy () const`
Returns a new matrix in reverse order without gaps.
- `CoinBigIndex countBasis (const int *whichColumn, int &numberColumnBasic)`
Returns number of elements in column part of basis.
- `void fillBasis (const int *whichColumn, int &numberColumnBasic, int *row, int *start, int *rowCount, int *columnCount, CoinSimplexDouble *element)`
Fills in column part of basis.
- `void fillBasis (const int *whichColumn, int &numberColumnBasic, int *row, int *start, int *rowCount, int *columnCount, long double *element)`
Fills in column part of basis.
- `void scale (int numberOfRowsAlreadyScaled)`
Scales and creates row copy.
- `void createRowCopy ()`
Creates row copy.
- `void takeOutOfUseful (int sequence, CoinIndexedVector &spare)`
Take out of useful.
- `void putIntofUseful (int sequence, CoinIndexedVector &spare)`
Put into useful.
- `void inOutUseful (int sequenceIn, int sequenceOut)`
Put in and out for useful.
- `void makeAllUseful (CoinIndexedVector &spare)`
Make all useful.
- `void sortUseful (CoinIndexedVector &spare)`
Sort into useful.

- void **moveLargestToStart** ()

Move largest in column to beginning (not used as doesn't help factorization).
- void **unpack** (CoinIndexedVector &rowArray, int column) const

Unpacks a column into an CoinIndexedVector.
- void **add** (CoinIndexedVector &rowArray, int column, double multiplier) const

Adds multiple of a column (or slack) into an CoinIndexedvector You can use quick-Add to add to vector.

Matrix times vector methods

- void **timesModifyExcludingSlacks** (double scalar, const double *x, double *y) const

*Return $y + A * scalar * x$ in y.*
- void **timesModifyIncludingSlacks** (double scalar, const double *x, double *y) const

*Return $y + A * scalar(-1) * x$ in y.*
- void **timesIncludingSlacks** (double scalar, const double *x, double *y) const

*Return $A * scalar(-1) * x$ in y.*
- void **transposeTimesNonBasic** (double scalar, const double *x, double *y) const

*Return $A * scalar(-1) * x + y$ in y.*
- void **transposeTimesAll** (const double *x, double *y) const

*Return $y - A * x$ in y.*
- void **transposeTimesBasic** (double scalar, const double *x, double *y) const

*Return $y + A * scalar(-1) * x$ in y.*
- int **transposeTimesNonBasic** (double scalar, const CoinIndexedVector &x, CoinIndexedVector &z) const

*Return $x * scalar * A$ in z.*
- double **dualColumn1** (const CoinIndexedVector &update, CoinPartitionedVector &tableauRow, CoinPartitionedVector &candidateList) const

gets sorted tableau row and a possible value of theta
- double **dualColumn1Row** (int iBlock, double upperThetaSlack, int &freeSequence, const CoinIndexedVector &update, CoinPartitionedVector &tableauRow, CoinPartitionedVector &candidateList) const

gets sorted tableau row and a possible value of theta

- double `dualColumn1RowFew` (int iBlock, double upperThetaSlack, int &freeSequence, const CoinIndexedVector &update, CoinPartitionedVector &tableauRow, CoinPartitionedVector &candidateList) const

gets sorted tableau row and a possible value of theta

- double `dualColumn1Row2` (double upperThetaSlack, int &freeSequence, const CoinIndexedVector &update, CoinPartitionedVector &tableauRow, CoinPartitionedVector &candidateList) const

gets sorted tableau row and a possible value of theta

- double `dualColumn1Row1` (double upperThetaSlack, int &freeSequence, const CoinIndexedVector &update, CoinPartitionedVector &tableauRow, CoinPartitionedVector &candidateList) const

gets sorted tableau row and a possible value of theta

- void `dualColumn1Part` (int iBlock, int &sequenceIn, double &upperTheta, const CoinIndexedVector &update, CoinPartitionedVector &tableauRow, CoinPartitionedVector &candidateList) const

gets sorted tableau row and a possible value of theta On input first,last give what to scan On output is number in tableauRow and candidateList

- void `rebalance` () const

rebalance for parallel

- int `pivotColumnDantzig` (const CoinIndexedVector &updates, CoinPartitionedVector &spare) const

Get sequenceIn when Dantzig.

- int `pivotColumnDantzig` (int iBlock, bool doByRow, const CoinIndexedVector &updates, CoinPartitionedVector &spare, double &bestValue) const

Get sequenceIn when Dantzig (One block).

- int `primalColumnRow` (int iBlock, bool doByRow, const CoinIndexedVector &update, CoinPartitionedVector &tableauRow) const

gets tableau row - returns number of slacks in block

- int `primalColumnRowAndDjs` (int iBlock, const CoinIndexedVector &updateTableau, const CoinIndexedVector &updateDjs, CoinPartitionedVector &tableauRow) const

gets tableau row and dj row - returns number of slacks in block

- int `chooseBestDj` (int iBlock, const CoinIndexedVector &infeasibilities, const double *weights) const

Chooses best weighted dj.

- int **primalColumnDouble** (int iBlock, CoinPartitionedVector &updateForTableauRow, CoinPartitionedVector &updateForDjs, const CoinIndexedVector &updateForWeights, CoinPartitionedVector &spareColumn1, double *infeasibilities, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor) const

does steepest edge double or triple update If scaleFactor!=0 then use with tableau row to update djs otherwise use updateForDjs Returns best sequence
- int **primalColumnSparseDouble** (int iBlock, CoinPartitionedVector &updateForTableauRow, CoinPartitionedVector &updateForDjs, const CoinIndexedVector &updateForWeights, CoinPartitionedVector &spareColumn1, double *infeasibilities, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor) const

does steepest edge double or triple update If scaleFactor!=0 then use with tableau row to update djs otherwise use updateForDjs Returns best sequence
- int **primalColumnDouble** (CoinPartitionedVector &updateForTableauRow, CoinPartitionedVector &updateForDjs, const CoinIndexedVector &updateForWeights, CoinPartitionedVector &spareColumn1, CoinIndexedVector &infeasible, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor) const

does steepest edge double or triple update If scaleFactor!=0 then use with tableau row to update djs otherwise use updateForDjs Returns best sequence
- void **primalColumnSubset** (int iBlock, const CoinIndexedVector &update, const CoinPartitionedVector &tableauRow, CoinPartitionedVector &weights) const

gets subset updates
- void **partialPricing** (double startFraction, double endFraction, int &bestSequence, int &numberWanted)

Partial pricing.
- void **subsetTransposeTimes** (const CoinIndexedVector &x, CoinIndexedVector &z) const

*Return x *A in z but just for indices Already in z.*
- void **transposeTimes** (const CoinIndexedVector &x, CoinIndexedVector &z) const

*Return -x *A in z*

Other

- CoinPackedMatrix * **matrix** () const

Returns CoinPackedMatrix (non const).

- int **minimumObjectsScan** () const
Partial pricing tuning parameter - minimum number of "objects" to scan.
- void **setMinimumObjectsScan** (int value)
- int **minimumGoodReducedCosts** () const
Partial pricing tuning parameter - minimum number of negative reduced costs to get.
- void **setMinimumGoodReducedCosts** (int value)
- double **startFraction** () const
Current start of search space in matrix (as fraction).
- void **setStartFraction** (double value)
- double **endFraction** () const
Current end of search space in matrix (as fraction).
- void **setEndFraction** (double value)
- double **savedBestDj** () const
Current best reduced cost.
- void **setSavedBestDj** (double value)
- int **originalWanted** () const
Initial number of negative reduced costs wanted.
- void **setOriginalWanted** (int value)
- int **currentWanted** () const
Current number of negative reduced costs which we still need.
- void **setCurrentWanted** (int value)
- int * **savedBestSequence** () const
Current best sequence.
- void **setSavedBestSequence** (int value)
- int * **startColumnBlock** () const
Start of each column block.
- const int * **blockStart** () const
Start of each block (in stored).
- bool **gotRowCopy** () const
- int **blockStart** (int block) const
Start of each block (in stored).
- int **numberColumnBlocks** () const

Number of actual column blocks.

- int **numberRowBlocks** () const

Number of actual row blocks.

Constructors, destructor

- **AbcMatrix** ()

Default constructor.

- **~AbcMatrix** ()

Destructor.

Copy method

- **AbcMatrix** (const **AbcMatrix** &)

The copy constructor.

- **AbcMatrix** (const CoinPackedMatrix &)

The copy constructor from an CoinPackedMatrix.

- **AbcMatrix** (const **AbcMatrix** &wholeModel, int numberOfRows, const int *whichRows, int numberColumns, const int *whichColumns)

Subset constructor (without gaps).

- **AbcMatrix** (const CoinPackedMatrix &wholeModel, int numberOfRows, const int *whichRows, int numberColumns, const int *whichColumns)

- **AbcMatrix** & **operator=** (const **AbcMatrix** &)

- void **copy** (const **AbcMatrix** *from)

Copy contents - resizing if necessary - otherwise re-use memory.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- CoinPackedMatrix * **matrix_**

Data.

- **AbcSimplex** * **model_**

Model.

- CoinBigIndex * **rowStart_**

Start of each row (per block) - last lot are useless first all row starts for block 0, then for block2 so NUMBER_ROW_BLOCKS+2 times number rows.

- double * **element_**
Values by row.
- int * **column_**
Columns.
- int **startColumnBlock_** [NUMBER_COLUMN_BLOCKS+1]
Start of each column block.
- int **blockStart_** [NUMBER_ROW_BLOCKS+1]
Start of each block (in stored).
- int **numberColumnBlocks_**
Number of actual column blocks.
- int **numberRowBlocks_**
Number of actual row blocks.
- double **startFraction_**
Special row copy.
- double **endFraction_**
Current end of search space in matrix (as fraction).
- double **savedBestDj_**
Best reduced cost so far.
- int **originalWanted_**
Initial number of negative reduced costs wanted.
- int **currentWanted_**
Current number of negative reduced costs which we still need.
- int **savedBestSequence_**
Saved best sequence in pricing.
- int **minimumObjectsScan_**
Partial pricing tuning parameter - minimum number of "objects" to scan.
- int **minimumGoodReducedCosts_**
Partial pricing tuning parameter - minimum number of negative reduced costs to get.

3.4.1 Detailed Description

Definition at line 22 of file AbcMatrix.hpp.

3.4.2 Constructor & Destructor Documentation

3.4.2.1 AbcMatrix::AbcMatrix()

Default constructor.

3.4.2.2 AbcMatrix::AbcMatrix(const AbcMatrix &)

The copy constructor.

3.4.2.3 AbcMatrix::AbcMatrix(const CoinPackedMatrix &)

The copy constructor from an CoinPackedMatrix.

3.4.2.4 AbcMatrix::AbcMatrix(const AbcMatrix & *wholeModel*, int *numberRows*, const int * *whichRows*, int *numberColumns*, const int * *whichColumns*)

Subset constructor (without gaps).

Duplicates are allowed and order is as given

3.4.3 Member Function Documentation

3.4.3.1 bool AbcMatrix::isColOrdered() const [inline]

Whether the packed matrix is column major ordered or not.

Definition at line 32 of file AbcMatrix.hpp.

3.4.3.2 CoinBigIndex AbcMatrix::getNumElements () const [inline]

Number of entries in the packed matrix.

Definition at line 36 of file AbcMatrix.hpp.

3.4.3.3 int AbcMatrix::getNumCols () const [inline]

Number of columns.

Definition at line 40 of file AbcMatrix.hpp.

3.4.3.4 int AbcMatrix::getNumRows () const [inline]

Number of rows.

Definition at line 44 of file AbcMatrix.hpp.

3.4.3.5 const int* AbcMatrix::getVectorLengths () const [inline]

The lengths of the major-dimension vectors.

Definition at line 73 of file AbcMatrix.hpp.

3.4.3.6 int* AbcMatrix::getMutableVectorLengths () const [inline]

The lengths of the major-dimension vectors.

Definition at line 77 of file AbcMatrix.hpp.

3.4.3.7 void AbcMatrix::timesModifyExcludingSlacks (double scalar, const double * x, double * y) const

Return $y + A * scalar * x$ in y .

Precondition

x must be of size numColumns()
y must be of size numRows()

3.4.3.8 void AbcMatrix::timesModifyIncludingSlacks (double scalar, const double * x, double * y) const

Return $y + A * \text{scalar}^{(\pm 1)} * x$ in y.

Precondition

x must be of size numColumns() + numRows()
y must be of size numRows()

3.4.3.9 void AbcMatrix::timesIncludingSlacks (double scalar, const double * x, double * y) const

Return $A * \text{scalar}^{(\pm 1)} * x$ in y.

Precondition

x must be of size numColumns() + numRows()
y must be of size numRows()

3.4.3.10 void AbcMatrix::transposeTimesNonBasic (double scalar, const double * x, double * y) const

Return $A * \text{scalar}^{(\pm 1)} * x + y$ in y.

Precondition

x must be of size numRows()
y must be of size numRows() + numColumns()

3.4.3.11 void AbcMatrix::transposeTimesAll (const double * x, double * y) const

Return $y - A * x$ in y .

Precondition

x must be of size numRows ()
 y must be of size numRows () +numColumns ()

3.4.3.12 void AbcMatrix::transposeTimesBasic (double scalar, const double * x, double * y) const

Return $y + A * \text{scalar} (+-1) * x$ in y .

Precondition

x must be of size numRows ()
 y must be of size numRows ()

3.4.3.13 int AbcMatrix::transposeTimesNonBasic (double scalar, const CoinIndexedVector & x, CoinIndexedVector & z) const

Return $x * \text{scalar} * A$ in z .

Note - x unpacked mode - z packed mode including slacks All these return atLo/atUp first then free/superbasic number of first set returned pivotVariable is extended to have that order reversePivotVariable used to update that list free/superbasic only stored in normal format can use spare array to get this effect may put djs alongside atLo/atUp Squashes small elements and knows about [AbcSimplex](#)

3.4.3.14 void AbcMatrix::subsetTransposeTimes (const CoinIndexedVector & x, CoinIndexedVector & z) const

Return $x * A$ in z but just for indices Already in z .

Note - z always packed mode

3.4.3.15 int AbcMatrix::minimumObjectsScan() const [inline]

Partial pricing tuning parameter - minimum number of "objects" to scan.

e.g. number of Gub sets but could be number of variables

Definition at line 294 of file AbcMatrix.hpp.

3.4.4 Member Data Documentation**3.4.4.1 double AbcMatrix::startFraction_ [protected]**

Special row copy.

Special column copy Current start of search space in matrix (as fraction)

Definition at line 453 of file AbcMatrix.hpp.

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

- AbcMatrix.hpp

3.5 AbcMatrix2 Class Reference**Public Member Functions****Useful methods**

- void **transposeTimes** (const [AbcSimplex](#) *model, const CoinPackedMatrix *rowCopy, const CoinIndexedVector &x, CoinIndexedVector &spareArray, CoinIndexedVector &z) const

*Return x * -1 * A in z.*

- bool **usefullInfo** () const

Returns true if copy has useful information.

Constructors, destructor

- [AbcMatrix2](#) ()

Default constructor.

- [AbcMatrix2](#) ([AbcSimplex](#) *model, const CoinPackedMatrix *rowCopy)

Constructor from copy.

- `~AbcMatrix2 ()`

Destructor.

Copy method

- `AbcMatrix2 (const AbcMatrix2 &)`
The copy constructor.
- `AbcMatrix2 & operator= (const AbcMatrix2 &)`

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- int `numberBlocks_`
Number of blocks.
- int `numberRows_`
Number of rows.
- int * `offset_`
Column offset for each block (plus one at end).
- unsigned short * `count_`
Counts of elements in each part of row.
- CoinBigIndex * `rowStart_`
Row starts.
- unsigned short * `column_`
columns within block
- double * `work_`
work arrays

3.5.1 Detailed Description

Definition at line 495 of file AbcMatrix.hpp.

3.5.2 Constructor & Destructor Documentation

3.5.2.1 AbcMatrix2::AbcMatrix2()

Default constructor.

3.5.2.2 AbcMatrix2::AbcMatrix2(*AbcSimplex * model*, *const CoinPackedMatrix * rowCopy*)

Constructor from copy.

3.5.2.3 AbcMatrix2::AbcMatrix2(*const AbcMatrix2 &*)

The copy constructor.

3.5.3 Member Function Documentation

3.5.3.1 void AbcMatrix2::transposeTimes(*const AbcSimplex * model*, *const CoinPackedMatrix * rowCopy*, *const CoinIndexedVector & x*, *CoinIndexedVector & spareArray*, *CoinIndexedVector & z*) const

Return $x * -1 * A$ in z .

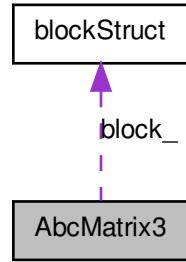
Note - x packed and z will be packed mode Squashes small elements and knows about
[AbcSimplex](#)

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

- AbcMatrix.hpp

3.6 AbcMatrix3 Class Reference

Collaboration diagram for AbcMatrix3:



Public Member Functions

Useful methods

- void [transposeTimes](#) (const [AbcSimplex](#) *model, const double *pi, CoinIndexedVector &output) const
*Return $x * -1 * A$ in z .*
- void [transposeTimes2](#) (const [AbcSimplex](#) *model, const double *pi, CoinIndexedVector &dj1, const double *piWeight, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor)
Updates two arrays for steepest.

Constructors, destructor

- [AbcMatrix3](#) ()
Default constructor.
- [AbcMatrix3](#) ([AbcSimplex](#) *model, const CoinPackedMatrix *columnCopy)
Constructor from copy.
- [~AbcMatrix3](#) ()
Destructor.

Copy method

- `AbcMatrix3 (const AbcMatrix3 &)`
The copy constructor.
- `AbcMatrix3 & operator= (const AbcMatrix3 &)`

Sort methods

- `void sortBlocks (const AbcSimplex *model)`
Sort blocks.
- `void swapOne (const AbcSimplex *model, const AbcMatrix *matrix, int iColumn)`
Swap one variable.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `int numberBlocks_`
Number of blocks.
- `int numberColumns_`
Number of columns.
- `int * column_`
Column indices and reverse lookup (within block).
- `CoinBigIndex * start_`
Starts for odd/long vectors.
- `int * row_`
Rows.
- `double * element_`
Elements.
- `blockStruct * block_`
Blocks (ordinary start at 0 and go to first block).

3.6.1 Detailed Description

Definition at line 564 of file AbcMatrix.hpp.

3.6.2 Constructor & Destructor Documentation

3.6.2.1 AbcMatrix3::AbcMatrix3()

Default constructor.

3.6.2.2 AbcMatrix3::AbcMatrix3(AbcSimplex * *model*, const CoinPackedMatrix * *columnCopy*)

Constructor from copy.

3.6.2.3 AbcMatrix3::AbcMatrix3(const AbcMatrix3 &)

The copy constructor.

3.6.3 Member Function Documentation

3.6.3.1 void AbcMatrix3::transposeTimes(const AbcSimplex * *model*, const double * *pi*, CoinIndexedVector & *output*) const

Return $x * -1 * A$ in z .

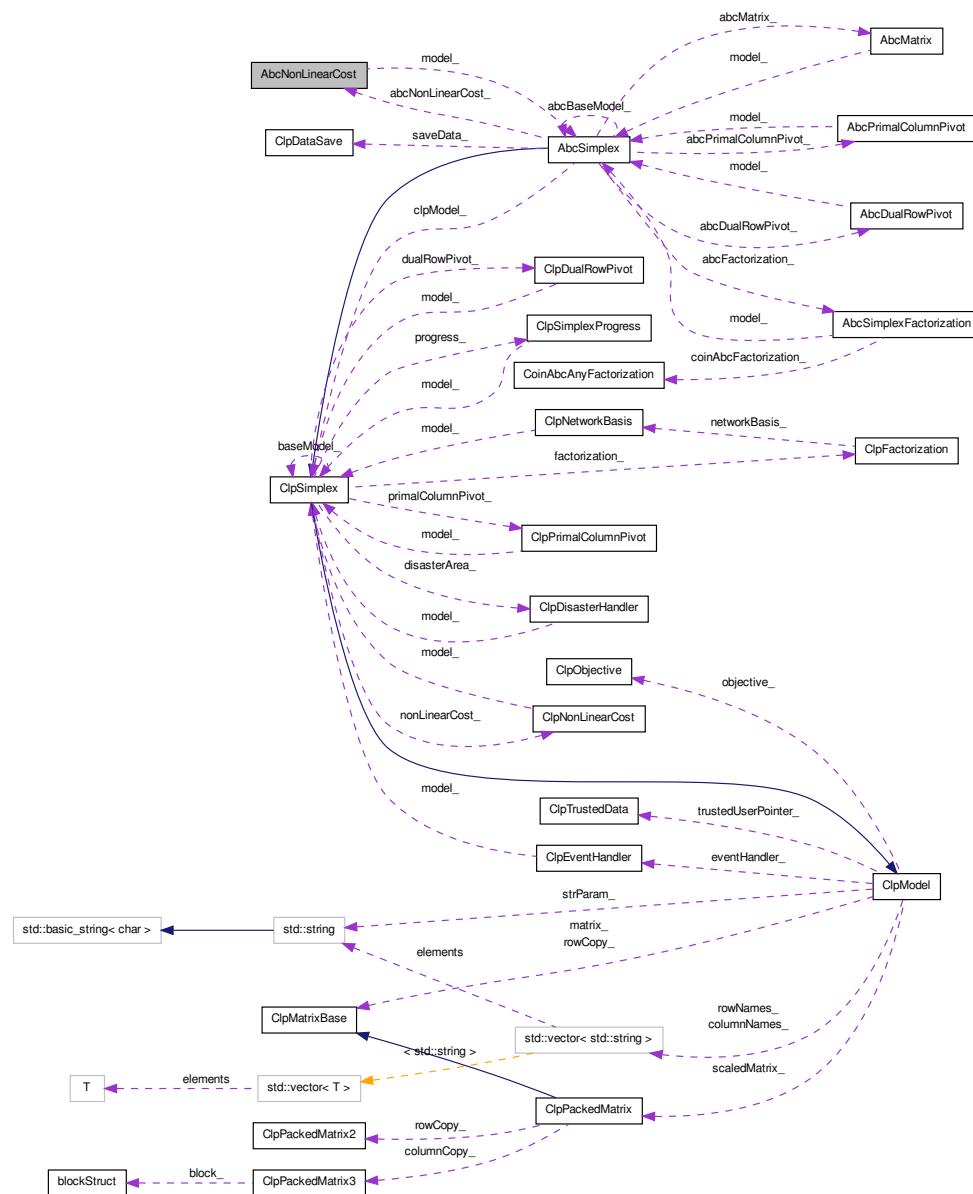
Note - x packed and z will be packed mode Squashes small elements and knows about [AbcSimplex](#)

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

- AbcMatrix.hpp

3.7 AbcNonLinearCost Class Reference

Collaboration diagram for AbcNonLinearCost:



Public Member Functions

Constructors, destructor

- `AbcNonLinearCost ()`
Default constructor.
- `AbcNonLinearCost (AbcSimplex *model)`
Constructor from simplex.
- `~AbcNonLinearCost ()`
Destructor.
- `AbcNonLinearCost (const AbcNonLinearCost &)`
- `AbcNonLinearCost & operator= (const AbcNonLinearCost &)`

Actual work in primal

- `void checkInfeasibilities (double oldTolerance=0.0)`
*Changes infeasible costs and computes number and cost of infeas Puts all non-basic (non free) variables to bounds and all free variables to zero if oldTolerance is non-zero
– but does not move those <= oldTolerance away.*
- `void checkInfeasibilities (int numberInArray, const int *index)`
Changes infeasible costs for each variable The indices are row indices and need converting to sequences.
- `void checkChanged (int numberInArray, CoinIndexedVector *update)`
Puts back correct infeasible costs for each variable The input indices are row indices and need converting to sequences for costs.
- `void goThru (int numberInArray, double multiplier, const int *index, const double *work, double *rhs)`
Goes through one bound for each variable.
- `void goBack (int numberInArray, const int *index, double *rhs)`
Takes off last iteration (i.e.
- `void goBackAll (const CoinIndexedVector *update)`
Puts back correct infeasible costs for each variable The input indices are row indices and need converting to sequences for costs.
- `void zapCosts ()`
Temporary zeroing of feasible costs.
- `void refreshCosts (const double *columnCosts)`

Refreshes costs always makes row costs zero.

- void **feasibleBounds** ()

Puts feasible bounds into lower and upper.
- void **refresh** ()

Refresh - assuming regions OK.
- void **refreshFromPerturbed** (double tolerance)

Refresh - from original.
- double **setOne** (int sequence, double solutionValue)

Sets bounds and cost for one variable Returns change in cost May need to be inline for speed.
- double **setOneBasic** (int iRow, double solutionValue)

Sets bounds and cost for one variable Returns change in cost May need to be inline for speed.
- int **setOneOutgoing** (int sequence, double &solutionValue)

Sets bounds and cost for outgoing variable may change value Returns direction.
- double **nearest** (int iRow, double solutionValue)

Returns nearest bound.
- double **changeInCost** (int, double alpha) const

Returns change in cost - one down if alpha >0.0, up if <0.0 Value is current - new.
- double **changeUpInCost** (int) const
- double **changeDownInCost** (int) const
- double **changeInCost** (int iRow, double alpha, double &rhs)

This also updates next bound.

Gets and sets

- int **numberInfeasibilities** () const

Number of infeasibilities.
- double **changeInCost** () const

Change in cost.
- double **feasibleCost** () const

Feasible cost.
- double **feasibleReportCost** () const

Feasible cost with offset and direction (i.e. for reporting).

- double **sumInfeasibilities** () const
Sum of infeasibilities.
- double **largestInfeasibility** () const
Largest infeasibility.
- double **averageTheta** () const
Average theta.
- void **setAverageTheta** (double value)
- void **setChangeInCost** (double value)

Private functions to deal with infeasible regions

- unsigned char * **statusArray** () const
- int **getCurrentStatus** (int sequence)
- void **validate** ()
For debug.

3.7.1 Detailed Description

Definition at line 70 of file AbcNonLinearCost.hpp.

3.7.2 Constructor & Destructor Documentation

3.7.2.1 AbcNonLinearCost::AbcNonLinearCost (*AbcSimplex * model*)

Constructor from simplex.

This will just set up wasteful arrays for linear, but later may do dual analysis and even finding duplicate columns .

3.7.3 Member Function Documentation

3.7.3.1 void AbcNonLinearCost::checkChanged (*int numberInArray,* *CoinIndexedVector * update*)

Puts back correct infeasible costs for each variable The input indices are row indices and need converting to sequences for costs.

On input array is empty (but indices exist). On exit just changed costs will be stored as normal CoinIndexedVector

3.7.3.2 void AbcNonLinearCost::goThru (int *numberInArray*, double *multiplier*, const int * *index*, const double * *work*, double * *rhs*)

Goes through one bound for each variable.

If multiplier*work[iRow]>0 goes down, otherwise up. The indices are row indices and need converting to sequences Temporary offsets may be set Rhs entries are increased

3.7.3.3 void AbcNonLinearCost::goBack (int *numberInArray*, const int * *index*, double * *rhs*)

Takes off last iteration (i.e.

offsets closer to 0)

3.7.3.4 void AbcNonLinearCost::goBackAll (const CoinIndexedVector * *update*)

Puts back correct infeasible costs for each variable The input indices are row indices and need converting to sequences for costs.

At the end of this all temporary offsets are zero

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

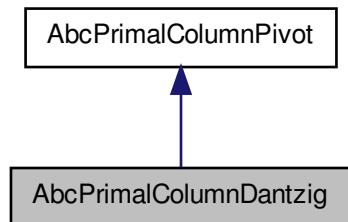
- AbcNonLinearCost.hpp

3.8 AbcPrimalColumnDantzig Class Reference

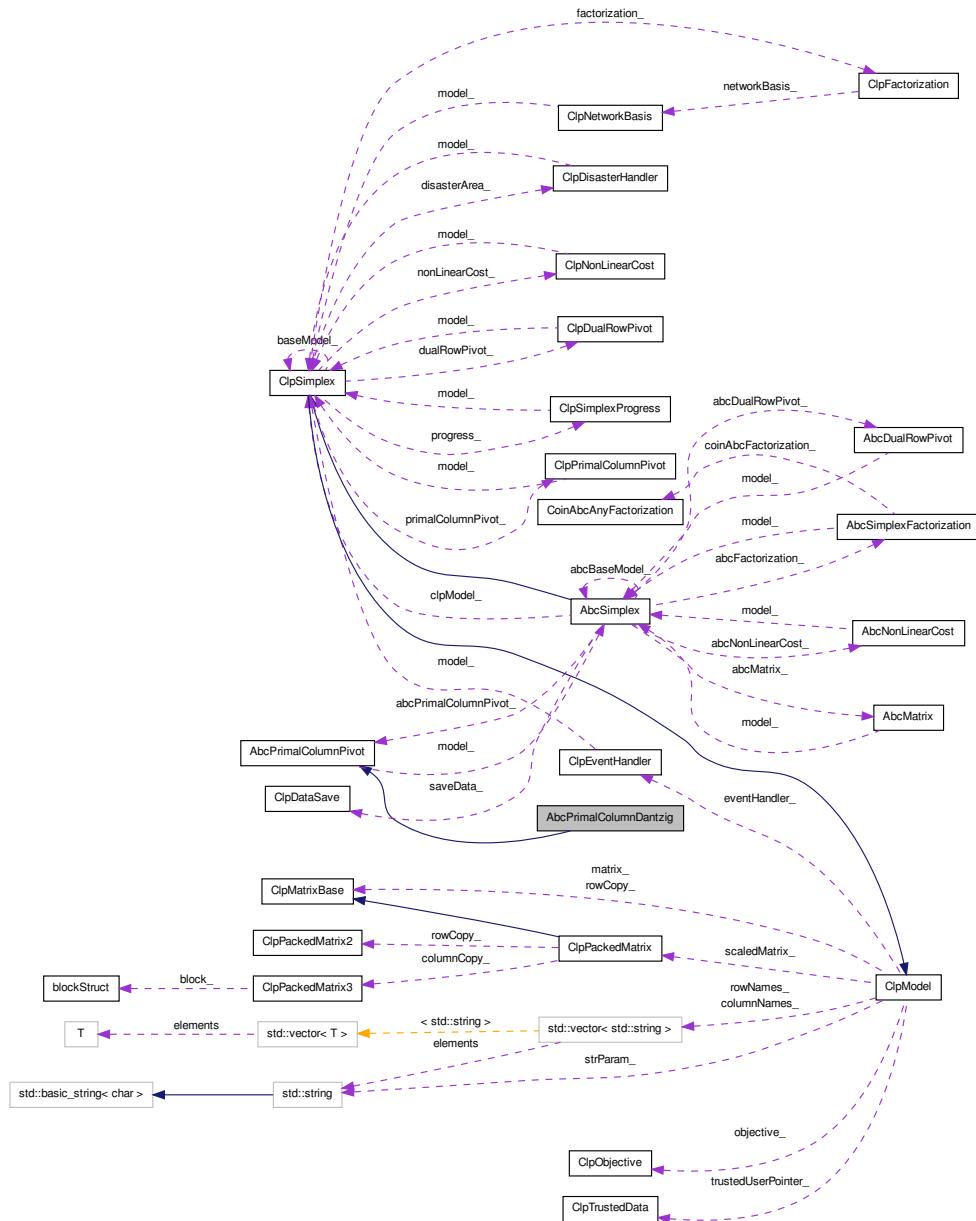
Primal Column Pivot Dantzig Algorithm Class.

```
#include <AbcPrimalColumnDantzig.hpp>
```

Inheritance diagram for AbcPrimalColumnDantzig:



Collaboration diagram for AbcPrimalColumnDantzig:



Public Member Functions

Algorithmic methods

- virtual int `pivotColumn` (CoinPartitionedVector **updates*, CoinPartitionedVector **spareRow2*, CoinPartitionedVector **spareColumn1*)
Returns pivot column, -1 if none.
- virtual void `saveWeights` (AbcSimplex **model*, int)
Just sets model.

Constructors and destructors

- `AbcPrimalColumnDantzig ()`
Default Constructor.
- `AbcPrimalColumnDantzig (const AbcPrimalColumnDantzig &)`
Copy constructor.
- `AbcPrimalColumnDantzig & operator= (const AbcPrimalColumnDantzig &rhs)`
Assignment operator.
- virtual `~AbcPrimalColumnDantzig ()`
Destructor.
- virtual `AbcPrimalColumnPivot * clone (bool copyData=true) const`
Clone.

3.8.1 Detailed Description

Primal Column Pivot Dantzig Algorithm Class. This is simplest choice - choose largest infeasibility

Definition at line 19 of file AbcPrimalColumnDantzig.hpp.

3.8.2 Member Function Documentation

3.8.2.1 virtual int AbcPrimalColumnDantzig::pivotColumn (

```
CoinPartitionedVector * updates, CoinPartitionedVector * spareRow2,
CoinPartitionedVector * spareColumn1 ) [virtual]
```

Returns pivot column, -1 if none.

Lumbers over all columns - slow The Packed CoinIndexedVector updates has cost updates - for normal LP that is just +weight where a feasibility changed. It also has reduced cost from last iteration in pivot row Can just do full price if you really want to be slow

Implements [AbcPrimalColumnPivot](#).

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

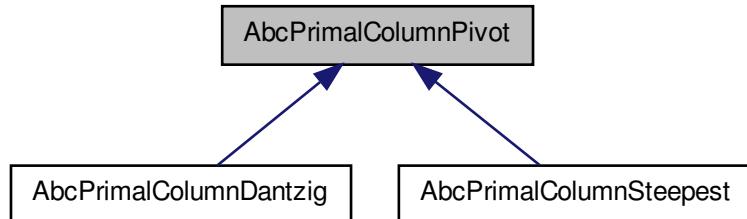
- AbcPrimalColumnDantzig.hpp

3.9 AbcPrimalColumnPivot Class Reference

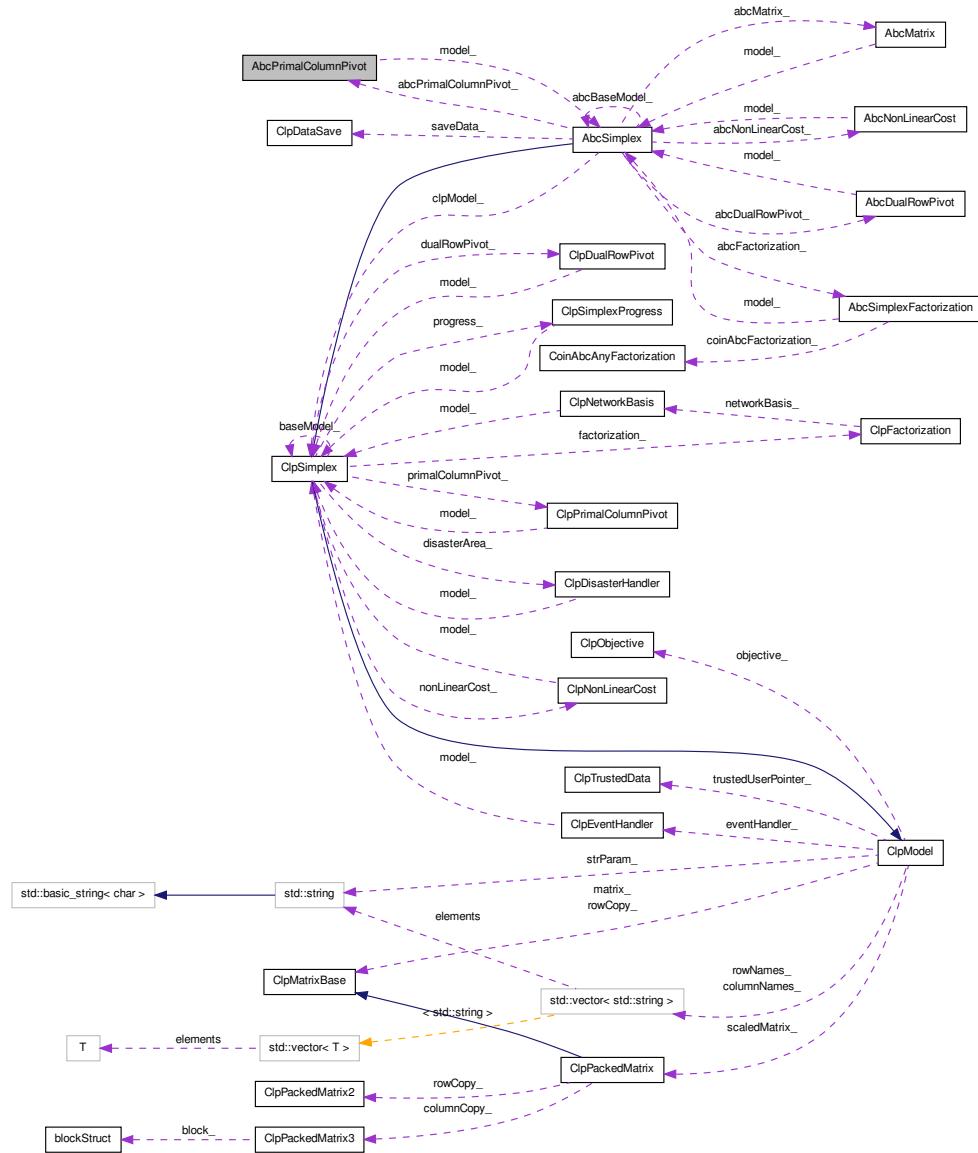
Primal Column Pivot Abstract Base Class.

```
#include <AbcPrimalColumnPivot.hpp>
```

Inheritance diagram for AbcPrimalColumnPivot:



Collaboration diagram for AbcPrimalColumnPivot:



Public Member Functions

Algorithmic methods

- virtual int `pivotColumn` (CoinPartitionedVector *updates, CoinPartitionedVector *spareRow2, CoinPartitionedVector *spareColumn1)=0
Returns pivot column, -1 if none.
- virtual void `updateWeights` (CoinIndexedVector *input)
Updates weights - part 1 (may be empty).
- virtual void `saveWeights` (AbcSimplex *model, int mode)=0
Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.
- virtual int `pivotRow` (double &way)
Signals pivot row choice: -2 (default) - use normal pivot row choice -1 to numberRows-1 - use this (will be checked) way should be -1 to go to lower bound, +1 to upper bound.
- virtual void `clearArrays` ()
Gets rid of all arrays (may be empty).
- virtual bool `looksOptimal` () const
Returns true if would not find any column.
- virtual void `setLooksOptimal` (bool flag)
Sets optimality flag (for advanced use).

Constructors and destructors

- `AbcPrimalColumnPivot` ()
Default Constructor.
- `AbcPrimalColumnPivot` (const `AbcPrimalColumnPivot` &)
Copy constructor.
- `AbcPrimalColumnPivot` & `operator=` (const `AbcPrimalColumnPivot` &rhs)
Assignment operator.
- virtual `~AbcPrimalColumnPivot` ()
Destructor.

- virtual `AbcPrimalColumnPivot * clone` (bool copyData=true) const =0
Clone.

Other

- `AbcSimplex * model()`
Returns model.
- `void setModel (AbcSimplex *newmodel)`
Sets model.
- `int type()`
Returns type (above 63 is extra information).
- virtual int `numberSprintColumns` (int &numberIterations) const
Returns number of extra columns for sprint algorithm - 0 means off.
- virtual void `switchOffSprint()`
Switch off sprint idea.
- virtual void `maximumPivotsChanged()`
Called when maximum pivots changes.

Protected Attributes

Protected member data

- `AbcSimplex * model_`
Pointer to model.
- `int type_`
Type of column pivot algorithm.
- `bool looksOptimal_`
Says if looks optimal (normally computed).

3.9.1 Detailed Description

Primal Column Pivot Abstract Base Class. Abstract Base Class for describing an interface to an algorithm to choose column pivot in primal simplex algorithm. For some algorithms e.g. Dantzig choice then some functions may be null. For Dantzig the only one of any importance is pivotColumn.

If you wish to inherit from this look at AbcPrimalColumnDantzig.cpp as that is simplest version.

Definition at line 26 of file AbcPrimalColumnPivot.hpp.

3.9.2 Member Function Documentation

3.9.2.1 virtual int AbcPrimalColumnPivot::pivotColumn (
CoinPartitionedVector * *updates*, CoinPartitionedVector * *spareRow2*,
CoinPartitionedVector * *spareColumn1*) [pure virtual]

Returns pivot column, -1 if none.

Normally updates reduced costs using result of last iteration before selecting incoming column.

The Packed CoinIndexedVector updates has cost updates - for normal LP that is just +-weight where a feasibility changed. It also has reduced cost from last iteration in pivot row

Inside pivotColumn the pivotRow_ and reduced cost from last iteration are also used.

So in the simplest case i.e. feasible we compute the row of the tableau corresponding to last pivot and add a multiple of this to current reduced costs.

We can use other arrays to help updates

Implemented in [AbcPrimalColumnDantzig](#), and [AbcPrimalColumnSteepest](#).

3.9.2.2 virtual void AbcPrimalColumnPivot::saveWeights (AbcSimplex *
***model*, int *mode*) [pure virtual]**

Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.

check for infeasible) 4) as 2 but restore weights from previous snapshot 5) forces some initialization e.g. weights Also sets model

Implemented in [AbcPrimalColumnDantzig](#), and [AbcPrimalColumnSteepest](#).

3.9.2.3 virtual int AbcPrimalColumnPivot::numberSprintColumns (int & numberIterations) const [virtual]

Returns number of extra columns for sprint algorithm - 0 means off.

Also number of iterations before recompute

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

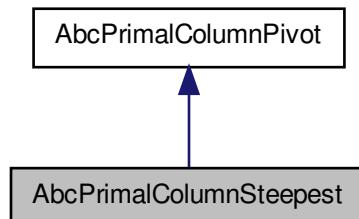
- AbcPrimalColumnPivot.hpp

3.10 AbcPrimalColumnSteepest Class Reference

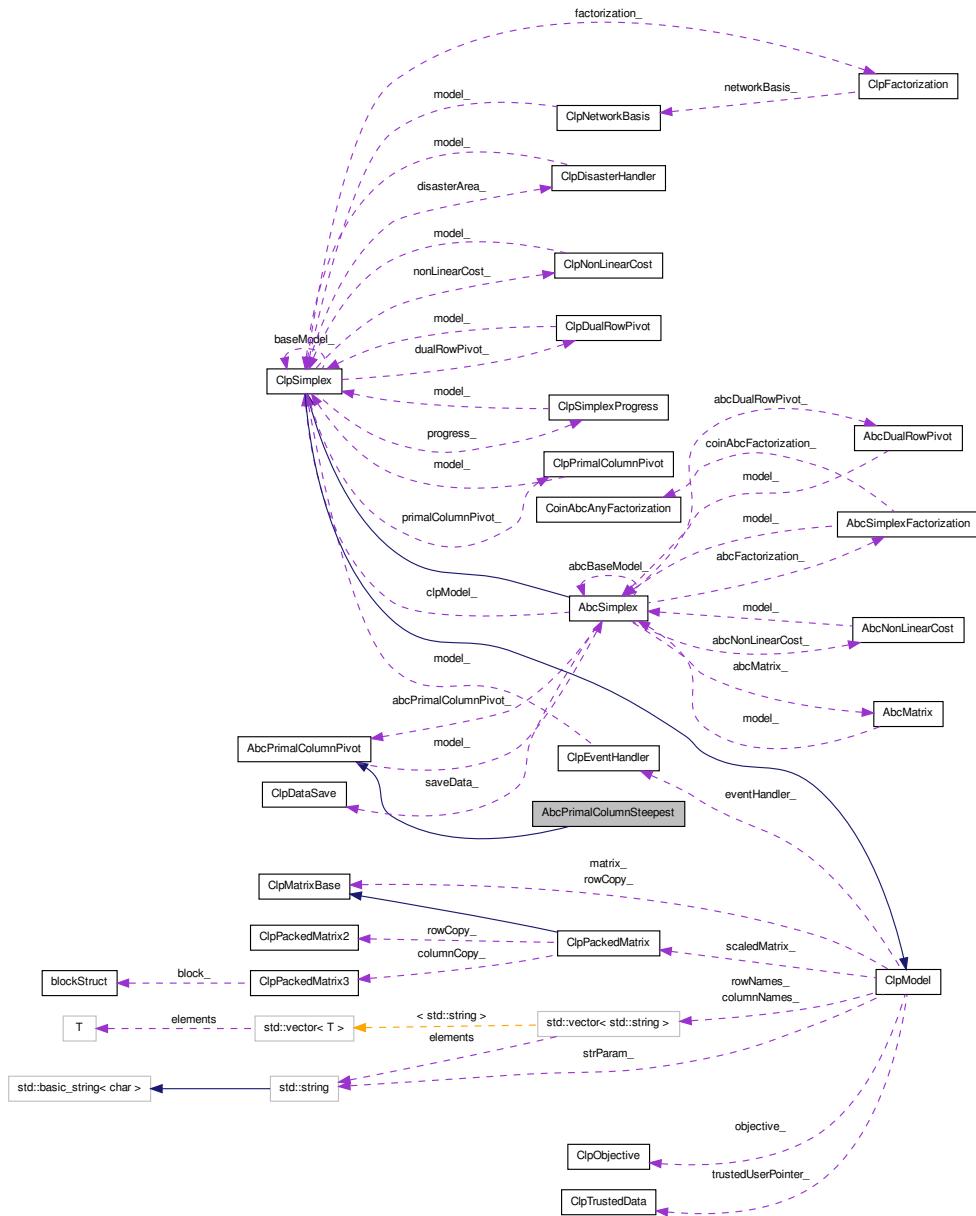
Primal Column Pivot Steepest Edge Algorithm Class.

```
#include <AbcPrimalColumnSteepest.hpp>
```

Inheritance diagram for AbcPrimalColumnSteepest:



Collaboration diagram for AbcPrimalColumnSteepest:



Public Types

- enum [Persistence](#)
enums for persistence

Public Member Functions

Algorithmic methods

- virtual int [pivotColumn](#) (CoinPartitionedVector *updates, CoinPartitionedVector *spareRow2, CoinPartitionedVector *spareColumn1)
Returns pivot column, -1 if none.
- void [justDjs](#) (CoinIndexedVector *updates, CoinIndexedVector *spareColumn1)
Just update djs.
- int [partialPricing](#) (CoinIndexedVector *updates, int numberWanted, int numberLook)
Update djs doing partial pricing (dantzig).
- void [djsAndDevex](#) (CoinIndexedVector *updates, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1)
Update djs, weights for Devex using djs.
- void [djsAndDevex2](#) (CoinIndexedVector *updates, CoinIndexedVector *spareColumn1)
Update djs, weights for Devex using pivot row.
- void [justDevex](#) (CoinIndexedVector *updates, CoinIndexedVector *spareColumn1)
Update weights for Devex.
- int [doSteepestWork](#) (CoinPartitionedVector *updates, CoinPartitionedVector *spareRow2, CoinPartitionedVector *spareColumn1, int type)
Does steepest work type - 0 - just djs 1 - just steepest 2 - both using scaleFactor 3 - both using extra array.
- virtual void [updateWeights](#) (CoinIndexedVector *input)
Updates weights - part 1 - also checks accuracy.
- void [checkAccuracy](#) (int sequence, double relativeTolerance, CoinIndexedVector *rowArray1)
Checks accuracy - just for debug.

- void [initializeWeights \(\)](#)
Initialize weights.
- virtual void [saveWeights \(AbcSimplex *model, int mode\)](#)
*Save weights - this may initialize weights as well mode is - 1) before factorization
 2) after factorization 3) just redo infeasibilities 4) restore weights 5) at end of
 values pass (so need initialization).*
- virtual void [unrollWeights \(\)](#)
Gets rid of last update.
- virtual void [clearArrays \(\)](#)
Gets rid of all arrays.
- virtual bool [looksOptimal \(\) const](#)
Returns true if would not find any column.
- virtual void [maximumPivotsChanged \(\)](#)
Called when maximum pivots changes.

gets and sets

- int [mode \(\) const](#)
Mode.

Constructors and destructors

- [AbcPrimalColumnSteepest \(int mode=3\)](#)
*Default Constructor 0 is exact devex, 1 full steepest, 2 is partial exact devex 3
 switches between 0 and 2 depending on factorization 4 starts as partial dantzig/de-
 vex but then may switch between 0 and 2.*
- [AbcPrimalColumnSteepest \(const AbcPrimalColumnSteepest &rhs\)](#)
Copy constructor.
- [AbcPrimalColumnSteepest & operator= \(const AbcPrimalColumnSteepest &rhs\)](#)
Assignment operator.
- virtual [~AbcPrimalColumnSteepest \(\)](#)
Destructor.
- virtual [AbcPrimalColumnPivot * clone \(bool copyData=true\) const](#)

Clone.

Private functions to deal with devex

- bool **reference** (int i) const
reference would be faster using AbcSimplex's status_, but I prefer to keep modularity.
- void **setReference** (int i, bool trueFalse)
- void **setPersistence** (**Persistence** life)
Set/get persistence.
- **Persistence persistence** () const

3.10.1 Detailed Description

Primal Column Pivot Steepest Edge Algorithm Class. See Forrest-Goldfarb paper for algorithm

Definition at line 23 of file AbcPrimalColumnSteepest.hpp.

3.10.2 Constructor & Destructor Documentation

3.10.2.1 AbcPrimalColumnSteepest::AbcPrimalColumnSteepest (int mode = 3)

Default Constructor 0 is exact devex, 1 full steepest, 2 is partial exact devex 3 switches between 0 and 2 depending on factorization 4 starts as partial dantzig/devex but then may switch between 0 and 2.

By partial exact devex is meant that the weights are updated as normal but only part of the nonbasic variables are scanned. This can be faster on very easy problems.

3.10.3 Member Function Documentation

3.10.3.1 virtual int AbcPrimalColumnSteepest::pivotColumn (CoinPartitionedVector * updates, CoinPartitionedVector * spareRow2, CoinPartitionedVector * spareColumn1) [virtual]

Returns pivot column, -1 if none.

The Packed CoinIndexedVector updates has cost updates - for normal LP that is just +-weight where a feasibility changed. It also has reduced cost from last iteration in pivot row Parts of operation split out into separate functions for profiling and speed

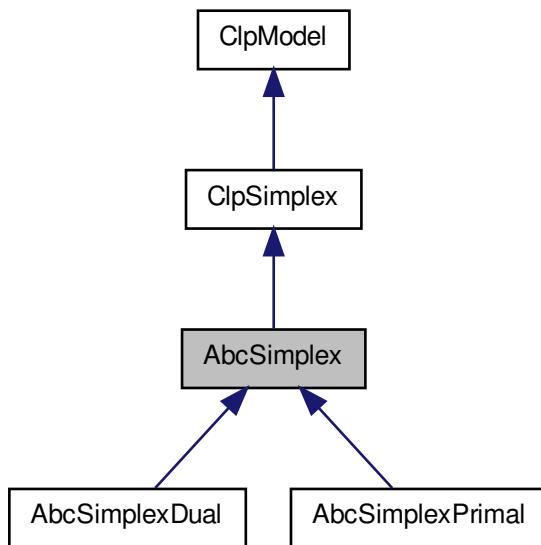
Implements [AbcPrimalColumnPivot](#).

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

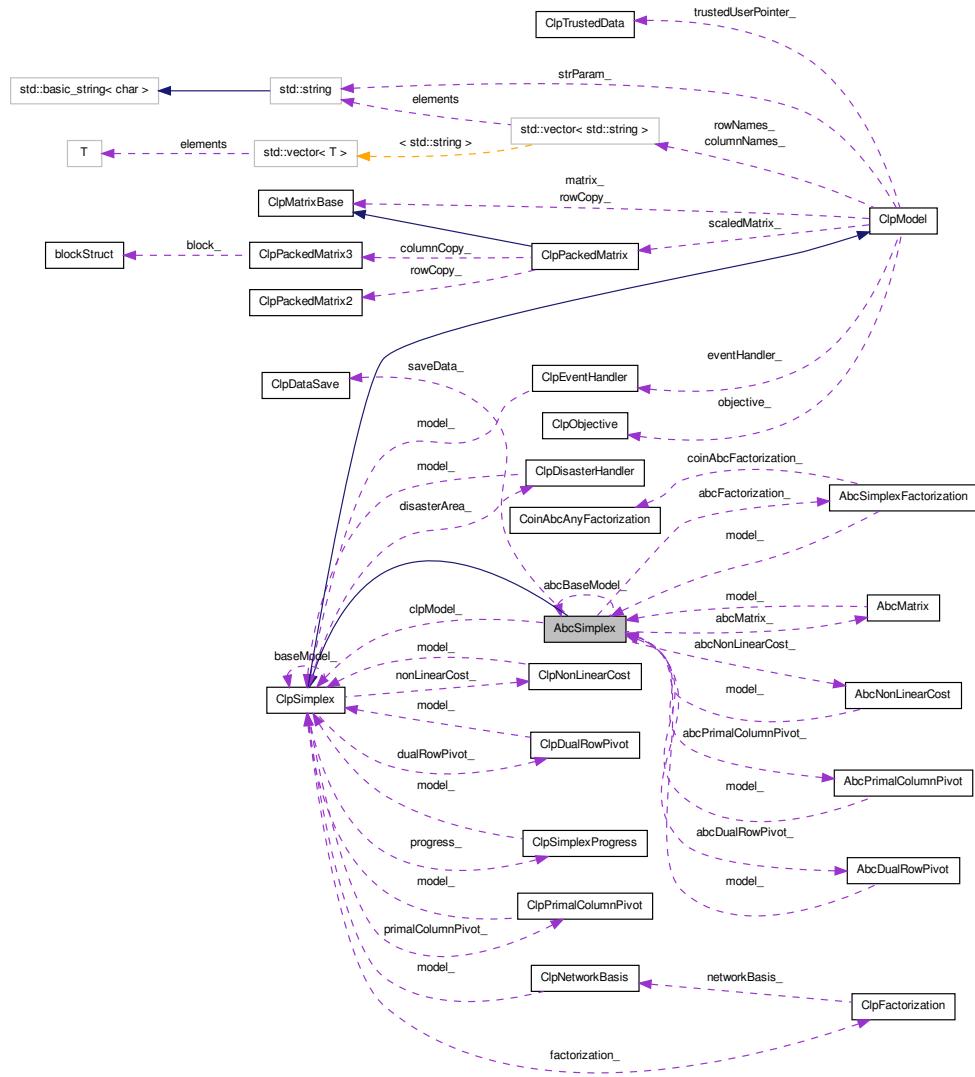
- AbcPrimalColumnSteepest.hpp

3.11 AbcSimplex Class Reference

Inheritance diagram for AbcSimplex:



Collaboration diagram for AbcSimplex:



Public Types

- enum [Status](#)

enums for status of various sorts.

Public Member Functions

- void [defaultFactorizationFrequency \(\)](#)
If user left factorization frequency then compute.

Constructors and destructor and copy

- [AbcSimplex \(bool emptyMessages=false\)](#)
Default constructor.
- [AbcSimplex \(const AbcSimplex &rhs\)](#)
Copy constructor.
- [AbcSimplex \(const ClpSimplex &rhs\)](#)
Copy constructor from model.
- [AbcSimplex \(const ClpSimplex *wholeModel, int numberOfRows, const int *whichRows, int numberColumns, const int *whichColumns, bool dropNames=true, bool dropIntegers=true, bool fixOthers=false\)](#)
Subproblem constructor.
- [AbcSimplex \(const AbcSimplex *wholeModel, int numberOfRows, const int *whichRows, int numberColumns, const int *whichColumns, bool dropNames=true, bool dropIntegers=true, bool fixOthers=false\)](#)
Subproblem constructor.
- [AbcSimplex \(AbcSimplex *wholeModel, int numberColumns, const int *whichColumns\)](#)
This constructor modifies original [AbcSimplex](#) and stores original stuff in created [AbcSimplex](#).
- void [originalModel \(AbcSimplex *miniModel\)](#)
This copies back stuff from miniModel and then deletes miniModel.
- [AbcSimplex \(const ClpSimplex *clpSimplex\)](#)
This constructor copies from [ClpSimplex](#).
- void [putBackSolution \(ClpSimplex *simplex\)](#)
Put back solution into [ClpSimplex](#).
- void [make BaseModel \(\)](#)
Array persistence flag If 0 then as now (delete/new) 1 then only do arrays if bigger needed 2 as 1 but give a bit extra if bigger needed.
- void [delete BaseModel \(\)](#)

Switch off base model.

- **AbcSimplex * baseModel () const**
See if we have base model.
- **void setToBaseModel (AbcSimplex *model=NULL)**
Reset to base model (just size and arrays needed) If model NULL use internal copy.
- **AbcSimplex & operator= (const AbcSimplex &rhs)**
Assignment operator. This copies the data.
- **~AbcSimplex ()**
Destructor.

Functions most useful to user

- **int dual ()**
Dual algorithm - see [AbcSimplexDual.hpp](#) for method.
- **int doAbcDual ()**
- **int primal (int ifValuesPass)**
Primal algorithm - see [AbcSimplexPrimal.hpp](#) for method.
- **int doAbcPrimal (int ifValuesPass)**
- **CoinWarmStartBasis * getBasis () const**
Returns a basis (to be deleted by user).
- **void setFactorization (AbcSimplexFactorization &factorization)**
Passes in factorization.
- **AbcSimplexFactorization * swapFactorization (AbcSimplexFactorization *factorization)**
Swaps factorization.
- **AbcSimplexFactorization * getEmptyFactorization ()**
Gets clean and emptyish factorization.
- **int tightenPrimalBounds ()**
Tightens primal bounds to make dual faster.
- **void setDualRowPivotAlgorithm (AbcDualRowPivot &choice)**
Sets row pivot choice algorithm in dual.
- **void setPrimalColumnPivotAlgorithm (AbcPrimalColumnPivot &choice)**
Sets column pivot choice algorithm in primal.

most useful gets and sets

- `AbcSimplexFactorization * factorization () const`
factorization
- `int factorizationFrequency () const`
Factorization frequency.
- `void setFactorizationFrequency (int value)`
- `int maximumAbcNumberRows () const`
Maximum rows.
- `int maximumNumberTotal () const`
Maximum Total.
- `int maximumTotal () const`
- `bool isObjectiveLimitTestValid () const`
Return true if the objective limit test can be relied upon.
- `int numberTotal () const`
Number of variables (includes spare rows).
- `int numberTotalWithoutFixed () const`
Number of variables without fixed to zero (includes spare rows).
- `CoinPartitionedVector * usefulArray (int index)`
Useful arrays (0,1,2,3,4,5,6,7).
- `CoinPartitionedVector * usefulArray (int index) const`
- `double clpObjectiveValue () const`
Objective value.
- `int * pivotVariable () const`
Basic variables pivoting on which rows may be same as toExternal but may be as at invert.
- `int stateOfProblem () const`
State of problem.
- `void setStateOfProblem (int value)`
State of problem.
- `double * scaleFromExternal () const`
Points from external to internal.

- `double * scaleToExternal () const`
Scale from primal internal to external (in external order) Or other way for dual.
- `double * rowScale2 () const`
corresponds to rowScale etc
- `double * inverseRowScale2 () const`
- `double * inverseColumnScale2 () const`
- `double * columnScale2 () const`
- `int arrayForDualColumn () const`
- `double upperTheta () const`
upper theta from dual column
- `int arrayForReplaceColumn () const`
- `int arrayForFlipBounds () const`
- `int arrayForFlipRhs () const`
- `int arrayForBtran () const`
- `int arrayForFtran () const`
- `int arrayForTableauRow () const`
- `double valueIncomingDual () const`
value of incoming variable (in Dual)
- `const double * getColSolution () const`
Get pointer to array[getNumCols()] of primal solution vector.
- `const double * getRowPrice () const`
Get pointer to array[getNumRows()] of dual prices.
- `const double * getReducedCost () const`
Get a pointer to array[getNumCols()] of reduced costs.
- `const double * getRowActivity () const`
Get pointer to array[getNumRows()] of row activity levels (constraint matrix times the solution vector).

Functions less likely to be useful to casual user

- `int getSolution ()`
Given an existing factorization computes and checks primal and dual solutions.
- `void setClpSimplexObjectiveValue ()`
Sets objectiveValue_ from rawObjectiveValue_.
- `void setupDualValuesPass (const double *fakeDuals, const double *fakePrimals, int type)`

Sets dual values pass *djs* using unscaled duals type 1 - values pass type 2 - just use as infeasibility weights type 3 - as 2 but crash.

- double **minimizationObjectiveValue** () const
Gets objective value with all offsets but as for minimization.
- double **currentDualTolerance** () const
*Current dualTolerance (will end up as *dualTolerance_*).*
- void **setCurrentDualTolerance** (double value)
- **AbcNonLinearCost * abcNonLinearCost** () const
Return pointer to details of costs.
- double * **perturbationSaved** () const
Perturbation (fixed) - is just scaled random numbers.
- double **acceptablePivot** () const
Acceptable pivot for this iteration.
- int **ordinaryVariables** () const
Set to 1 if no free or super basic.
- int **numberOrdinary** () const
Number of ordinary (lo/up) in tableau row.
- void **setNumberOrdinary** (int number)
Set number of ordinary (lo/up) in tableau row.
- double **currentDualBound** () const
*Current dualBound (will end up as *dualBound_*).*
- **AbcDualRowPivot * dualRowPivot** () const
dual row pivot choice
- **AbcPrimalColumnPivot * primalColumnPivot** () const
primal column pivot choice
- **AbcMatrix * abcMatrix** () const
Abc Matrix.
- int **internalFactorize** (int solveType)
Factorizes using current basis.
- void **permuteIn** ()
*Permutates in from *ClpModel* data - assumes scale factors done and *AbcMatrix* exists but is in original order (including slacks) For now just add basicArray at end == But could partition into normal (i.e.*

- void **permuteBasis** ()
deals with new basis and puts in abcPivotVariable_
- void **permuteOut** (int whatsWanted)
Permutates out - bit settings same as stateOfProblem.
- **ClpDataSave saveData** ()
Save data.
- void **restoreData** (ClpDataSave saved)
Restore data.
- void **cleanStatus** ()
Clean up status.
- int **computeDuals** (double *givenDjs, CoinIndexedVector *array1, CoinIndexedVector *array2)
Computes duals from scratch.
- int **computePrimals** (CoinIndexedVector *array1, CoinIndexedVector *array2)
Computes primals from scratch. Returns number of refinements.
- void **computeObjective** ()
Computes nonbasic cost and total cost.
- void **setMultipleSequenceIn** (int sequenceIn[4])
set multiple sequence in
- void **unpack** (CoinIndexedVector &rowArray) const
Unpacks one column of the matrix into indexed array Uses sequenceIn_
- void **unpack** (CoinIndexedVector &rowArray, int sequence) const
Unpacks one column of the matrix into indexed array.
- int **housekeeping** ()
This does basis housekeeping and does values for in/out variables.
- void **checkPrimalSolution** (bool justBasic)
This sets largest infeasibility and most infeasible and sum and number of infeasibilities (Primal).
- void **checkDualSolution** ()
This sets largest infeasibility and most infeasible and sum and number of infeasibilities (Dual).

- void **checkDualSolutionPlusFake** ()
This sets largest infeasibility and most infeasible and sum and number of infeasibilities AND sumFakeInfeasibilities_(Dual).
- void **checkBothSolutions** ()
This sets sum and number of infeasibilities (Dual and Primal).
- int **gutsOfSolution** (int type)
Computes solutions - 1 do duals, 2 do primal, 3 both (returns number of refinements).
- int **gutsOfPrimalSolution** (int type)
Computes solutions - 1 do duals, 2 do primal, 3 both (returns number of refinements).
- void **saveGoodStatus** ()
Saves good status etc.
- void **restoreGoodStatus** (int type)
Restores previous good status and says trouble.
- void **refreshCosts** ()
After modifying first copy refreshes second copy and marks as updated.
- void **refreshLower** (unsigned int type=ROW_LOWER_SAME|COLUMN_UPPER_SAME))
- void **refreshUpper** (unsigned int type=ROW_LOWER_SAME|COLUMN_LOWER_SAME))
- void **setupPointers** (int maxRows, int maxColumns)
Sets up all extra pointers.
- void **copyFromSaved** (int type=31)
Copies all saved versions to working versions and may do something for perturbation.
- void **fillPerturbation** (int start, int number)
fills in perturbationSaved_from start with 0.5+random
- void **checkArrays** (int ignoreEmpty=0) const
For debug - prints summary of arrays which are out of kilter.
- void **checkDjs** (int type=1) const
For debug - summarizes dj situation (1 recomputes duals first, 2 checks duals as well).

- void `checkSolutionBasic` () const
For debug - checks solutionBasic.
- void `checkMoveBack` (bool checkDuals)
For debug - moves solution back to external and computes stuff (always checks djs).
- void `setValuesPassAction` (double incomingInfeasibility, double allowedInfeasibility)
For advanced use.
- int `cleanFactorization` (int ifValuesPass)
Get a clean factorization - i.e.
- void `moveStatusToClp` (`ClpSimplex` *clpModel)
Move status and solution to `ClpSimplex`.
- void `moveStatusFromClp` (`ClpSimplex` *clpModel)
Move status and solution from `ClpSimplex`.

protected methods

- int `gutsOfSolution` (double *givenDuals, const double *givenPrimals, bool valuesPass=false)
May change basis and then returns number changed.
- void `gutsOfDelete` (int type)
Does most of deletion for arrays etc(0 just null arrays, 1 delete first).
- void `gutsOfCopy` (const `AbcSimplex` &rhs)
Does most of copying.
- void `gutsOfInitialize` (int numberOfRows, int numberOfColumns, bool doMore)
Initializes arrays.
- void `gutsOfResize` (int numberOfRows, int numberOfColumns)
resizes arrays
- void `translate` (int type)
Translates `ClpModel` to `AbcSimplex` See DO_ bits in stateOfProblem_ for type e.g.
- void `moveToBasic` (int which=15)
Moves basic stuff to basic area.

public methods

- double * [solutionRegion](#) () const

Return region.

- double * [djRegion](#) () const
- double * [lowerRegion](#) () const
- double * [upperRegion](#) () const
- double * [costRegion](#) () const
- double * [solutionRegion](#) (int which) const

Return region.

- double * [djRegion](#) (int which) const
- double * [lowerRegion](#) (int which) const
- double * [upperRegion](#) (int which) const
- double * [costRegion](#) (int which) const
- double * [solutionBasic](#) () const

Return region.

- double * [djBasic](#) () const
- double * [lowerBasic](#) () const
- double * [upperBasic](#) () const
- double * [costBasic](#) () const
- double * [abcPerturbation](#) () const

Perturbation.

- double * [fakeDjs](#) () const

Fake djs.

- unsigned char * [internalStatus](#) () const
- [AbcSimplex::Status](#) [getInternalStatus](#) (int sequence) const
- [AbcSimplex::Status](#) [getInternalColumnStatus](#) (int sequence) const
- void [setInternalStatus](#) (int sequence, [AbcSimplex::Status](#) newstatus)
- void [setInternalColumnStatus](#) (int sequence, [AbcSimplex::Status](#) newstatus)
- void [setInitialDenseFactorization](#) (bool onOff)

Normally the first factorization does sparse coding because the factorization could be singular.

- bool [initialDenseFactorization](#) () const
- int [sequenceIn](#) () const

Return sequence In or Out.

- int [sequenceOut](#) () const
- void [setSequenceIn](#) (int sequence)

Set sequenceIn or Out.

- void [setSequenceOut](#) (int sequence)

- int **isColumn** (int sequence) const
Returns 1 if sequence indicates column.
- int **sequenceWithin** (int sequence) const
Returns sequence number within section.
- int **lastPivotRow** () const
Current/last pivot row (set after END of choosing pivot row in dual).
- int **firstFree** () const
First Free_.
- int **lastFirstFree** () const
Last firstFree_.
- int **freeSequenceIn** () const
Free chosen vector.
- double **currentAcceptablePivot** () const
Acceptable pivot for this iteration.
- int **fakeSuperBasic** (int iSequence)
Returns 1 if fake superbasic 0 if free or true superbasic -1 if was fake but has cleaned itself up (sets status) -2 if wasn't fake.
- double **solution** (int sequence)
Return row or column values.
- double & **solutionAddress** (int sequence)
Return address of row or column values.
- double **reducedCost** (int sequence)
- double & **reducedCostAddress** (int sequence)
- double **lower** (int sequence)
- double & **lowerAddress** (int sequence)
Return address of row or column lower bound.
- double **upper** (int sequence)
- double & **upperAddress** (int sequence)
Return address of row or column upper bound.
- double **cost** (int sequence)
- double & **costAddress** (int sequence)
Return address of row or column cost.
- double **originalLower** (int iSequence) const

Return original lower bound.

- double [originalUpper](#) (int iSequence) const
Return original lower bound.
- AbcSimplexProgress * [abcProgress](#) ()
For dealing with all issues of cycling etc.
- void [clearArraysPublic](#) (int which)
Clears an array and says available (-1 does all) when no possibility of going parallel.
- int [getAvailableArrayPublic](#) () const
Returns first available empty array (and sets flag) when no possibility of going parallel.
- void [clearArrays](#) (int which)
Clears an array and says available (-1 does all).
- void [clearArrays](#) (CoinPartitionedVector *which)
Clears an array and says available.
- int [getAvailableArray](#) () const
Returns first available empty array (and sets flag).
- void [setUsedArray](#) (int which) const
Say array going to be used.
- void [setAvailableArray](#) (int which) const
Say array going available.
- void [swapPrimalStuff](#) ()
Swaps primal stuff.
- void [swapDualStuff](#) (int lastSequenceOut, int lastDirectionOut)
Swaps dual stuff.

Changing bounds on variables and constraints

- void [setObjectiveCoefficient](#) (int elementIndex, double elementValue)
Set an objective function coefficient.
- void [setObjCoeff](#) (int elementIndex, double elementValue)
Set an objective function coefficient.

- void `setColumnLower` (int elementIndex, double elementValue)
Set a single column lower bound
Use -DBL_MAX for -infinity.
- void `setColumnUpper` (int elementIndex, double elementValue)
Set a single column upper bound
Use DBL_MAX for infinity.
- void `setColumnBounds` (int elementIndex, double lower, double upper)
Set a single column lower and upper bound.
- void `setColumnSetBounds` (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of columns simultaneously
The default implementation just invokes `setColLower()` and `setColUpper()` over and over again.
- void `setColLower` (int elementIndex, double elementValue)
Set a single column lower bound
Use -DBL_MAX for -infinity.
- void `setColUpper` (int elementIndex, double elementValue)
Set a single column upper bound
Use DBL_MAX for infinity.
- void `setColBounds` (int elementIndex, double newlower, double newupper)
Set a single column lower and upper bound.
- void `setColSetBounds` (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of columns simultaneously
- void `setRowLower` (int elementIndex, double elementValue)
Set a single row lower bound
Use -DBL_MAX for -infinity.
- void `setRowUpper` (int elementIndex, double elementValue)
Set a single row upper bound
Use DBL_MAX for infinity.
- void `setRowBounds` (int elementIndex, double lower, double upper)
Set a single row lower and upper bound.
- void `setRowSetBounds` (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of rows simultaneously

- void `resize` (int newNumberRows, int newNumberColumns)
Resizes rim part of model.

Friends

- void `AbcSimplexUnitTest` (const std::string &mpsDir)
A function that tests the methods in the `AbcSimplex` class.

data. Many arrays have a row part and a column part.

There is a single array with both - columns then rows and then normally two arrays pointing to rows and columns.

The single array is the owner of memory

- double `sumNonBasicCosts_`
Sum of nonbasic costs.
- double `rawObjectiveValue_`
Sum of costs (raw objective value).
- double `objectiveOffset_`
Objective offset (from offset_).
- double `perturbationFactor_`
Perturbation factor If <0.0 then virtual if 0.0 none if >0.0 use this as factor.
- double `currentDualTolerance_`
Current dualTolerance (will end up as dualTolerance_).
- double `currentDualBound_`
Current dualBound (will end up as dualBound_).
- double `largestGap_`
Largest gap.
- double `lastDualBound_`
Last dual bound.
- double `sumFakeInfeasibilities_`

Sum of infeasibilities when using fake perturbation tolerance.

- double `lastPrimalError_`
Last primal error.
- double `lastDualError_`
Last dual error.
- double `currentAcceptablePivot_`
Acceptable pivot for this iteration.
- double `movement_`
Movement of variable.
- double `objectiveChange_`
Objective change.
- double `btranAlpha_`
Btran alpha.
- double `ftAlpha_`
FT alpha.
- double `minimumThetaMovement_`
Minimum theta movement.
- double `initialSumInfeasibilities_`
Initial sum of infeasibilities.
- int `lastFirstFree_`
Last firstFree_.
- int `freeSequenceIn_`
Free chosen vector.
- int `maximumAbcNumberRows_`
Maximum number rows.
- int `maximumAbcNumberColumns_`
Maximum number columns.
- int `maximumNumberTotal_`

Maximum numberTotal.

- int **numberFlagged_**

Current number of variables flagged.

- int **normalDualColumnIteration_**

Iteration at which to do relaxed dualColumn.

- int **stateDualColumn_**

State of dual waffle -2 - in initial large tolerance phase -1 - in medium tolerance phase n - in correct tolerance phase and thought optimal n times.

- int **numberTotal_**

Number of variables (includes spare rows).

- int **numberTotalWithoutFixed_**

Number of variables without fixed to zero (includes spare rows).

- int **startAtLowerOther_**

Start of variables at lower bound with upper.

- int **startAtUpperNoOther_**

Start of variables at upper bound with no lower.

- int **startAtUpperOther_**

Start of variables at upper bound with lower.

- int **startOther_**

Start of superBasic, free or awkward bounds variables.

- int **startFixed_**

Start of fixed variables.

- int **stateOfProblem_**

- int **numberOrdinary_**

Number of ordinary (lo/up) in tableau row.

- int **ordinaryVariables_**

Set to 1 if no free or super basic.

- int **numberFreeNonBasic_**

Number of free nonbasic variables.

- int **lastCleaned_**
Last time cleaned up.
- int **lastPivotRow_**
Current/last pivot row (set after END of choosing pivot row in dual).
- int **swappedAlgorithm_**
Nonzero (probably 10) if swapped algorithms.
- int **initialNumberInfeasibilities_**
Initial number of infeasibilities.
- double * **scaleFromExternal_**
Points from external to internal.
- double * **scaleToExternal_**
Scale from primal internal to external (in external order) Or other way for dual.
- double * **columnUseScale_**
use this instead of columnScale
- double * **inverseColumnUseScale_**
use this instead of inverseColumnScale
- double * **offset_**
*Primal offset (in external order) So internal value is (external-offset)*scaleFromExternal.*
- double * **offsetRhs_**
*Offset for accumulated offsets*matrix.*
- double * **tempArray_**
Useful array of numberTotal length.
- unsigned char * **internalStatus_**
Working status ? may be signed ? link pi_ to an indexed array? may have saved from last factorization at end.
- unsigned char * **internalStatusSaved_**
Saved status.
- double * **abcPerturbation_**

Perturbation (fixed) - is just scaled random numbers If perturbationFactor_<0 then virtual perturbation.

- double * **perturbationSaved_**
saved perturbation
- double * **perturbationBasic_**
basic perturbation
- **AbcMatrix * abcMatrix_**
Working matrix.
- double * **abcLower_**
Working scaled copy of lower bounds has original scaled copy at end.
- double * **abcUpper_**
Working scaled copy of upper bounds has original scaled copy at end.
- double * **abcCost_**
Working scaled copy of objective ? where perturbed copy or can we always work with perturbed copy (in B&B) if we adjust increments/cutoffs ? should we save a fixed perturbation offset array has original scaled copy at end.
- double * **abcSolution_**
Working scaled primal solution may have saved from last factorization at end.
- double * **abcDj_**
Working scaled dual solution may have saved from last factorization at end.
- double * **lowerSaved_**
Saved scaled copy of lower bounds.
- double * **upperSaved_**
Saved scaled copy of upper bounds.
- double * **costSaved_**
Saved scaled copy of objective.
- double * **solutionSaved_**
Saved scaled primal solution.
- double * **djSaved_**
Saved scaled dual solution.

- `double * lowerBasic_`
Working scaled copy of basic lower bounds.
- `double * upperBasic_`
Working scaled copy of basic upper bounds.
- `double * costBasic_`
Working scaled copy of basic objective.
- `double * solutionBasic_`
Working scaled basic primal solution.
- `double * djBasic_`
Working scaled basic dual solution (want it to be zero).
- `AbcDualRowPivot * abcDualRowPivot_`
dual row pivot choice
- `AbcPrimalColumnPivot * abcPrimalColumnPivot_`
primal column pivot choice
- `int * abcPivotVariable_`
Basic variables pivoting on which rows followed by atLo/atUp then free/superbasic then fixed.
- `int * reversePivotVariable_`
Reverse abcPivotVariable_ for moving around.
- `AbcSimplexFactorization * abcFactorization_`
factorization
- `AbcSimplex * abcBaseModel_`
Saved version of solution.
- `ClpSimplex * clpModel_`
A copy of model as ClpSimplex with certain state.
- `AbcNonLinearCost * abcNonLinearCost_`
Very wasteful way of dealing with infeasibilities in primal.
- `CoinPartitionedVector usefulArray_ [ABC_NUMBER_USEFUL]`
- `AbcSimplexProgress abcProgress_`

For dealing with all issues of cycling etc.

- **ClpDataSave saveData_**
For saving stuff at beginning.
- double **upperTheta_**
upper theta from dual column
- int **multipleSequenceIn_** [4]
Multiple sequence in.
- int **numberFlipped_**
- int **numberDisasters_**
- int **stateOfIteration_**
Where we are in iteration.
- int **arrayForDualColumn_**
- int **arrayForReplaceColumn_**
- int **arrayForFlipBounds_**
- int **arrayForFlipRhs_**
- int **arrayForBtran_**
- int **arrayForFtran_**
- int **arrayForTableauRow_**

status methods

- void **swap** (int pivotRow, int nonBasicPosition)
Swaps two variables.
- void **setFlagged** (int sequence)
To flag a variable.
- void **clearFlagged** (int sequence)
- bool **flagged** (int sequence) const
- void **createStatus** ()
Set up status array (can be used by OsiAbc).
- void **crash** (int type)
Does sort of crash.
- void **putStuffInBasis** (int type)

Puts more stuff in basis 1 bit set - do even if basis exists 2 bit set - don't bother staying triangular.

- void **allSlackBasis** ()

Sets up all slack basis and resets solution to as it was after initial load or readMps.

- void **checkConsistentPivots** () const

For debug - check pivotVariable consistent.

- void **printStuff** () const

Print stuff.

- int **startup** (int ifValuesPass)

Common bits of coding for dual and primal.

- double **rawObjectiveValue** () const

Raw objective value (so always minimize in primal).

- void **computeObjectiveValue** (bool useWorkingSolution=false)

Compute objective value from solution and put in objectiveValue_.

- double **computeInternalObjectiveValue** ()

Compute minimization objective value from internal solution without perturbation.

- void **moveInfo** (const **AbcSimplex** &rhs, bool justStatus=false)

Move status and solution across.

- void **swap** (int pivotRow, int nonBasicPosition, **Status** newStatus)

Swaps two variables and does status.

- void **setFakeBound** (int sequence, **FakeBound** fakeBound)

- **FakeBound** **getFakeBound** (int sequence) const

- bool **atFakeBound** (int sequence) const

- void **setPivoted** (int sequence)

- void **clearPivoted** (int sequence)

- bool **pivoted** (int sequence) const

- void **setActive** (int iRow)

To say row active in primal pivot row choice.

- void **clearActive** (int iRow)

- bool **active** (int iRow) const

3.11.1 Detailed Description

Definition at line 70 of file AbcSimplex.hpp.

3.11.2 Member Enumeration Documentation

3.11.2.1 enum AbcSimplex::Status

enums for status of various sorts.

[ClpModel](#) order (and warmstart) is isFree = 0x00, basic = 0x01, atUpperBound = 0x02, atLowerBound = 0x03, isFixed means fixed at lower bound and out of basis

Reimplemented from [ClpSimplex](#).

Definition at line 82 of file AbcSimplex.hpp.

3.11.3 Constructor & Destructor Documentation

3.11.3.1 AbcSimplex::AbcSimplex (const ClpSimplex * *wholeModel*, int *numberRows*, const int * *whichRows*, int *numberColumns*, const int * *whichColumns*, bool *dropNames* = **true**, bool *dropIntegers* = **true**, bool *fixOthers* = **false**)

Subproblem constructor.

A subset of whole model is created from the row and column lists given. The new order is given by list order and duplicates are allowed. Name and integer information can be dropped Can optionally modify rhs to take into account variables NOT in list in this case duplicates are not allowed (also see getbackSolution)

3.11.3.2 AbcSimplex::AbcSimplex (const AbcSimplex * *wholeModel*, int *numberRows*, const int * *whichRows*, int *numberColumns*, const int * *whichColumns*, bool *dropNames* = **true**, bool *dropIntegers* = **true**, bool *fixOthers* = **false**)

Subproblem constructor.

A subset of whole model is created from the row and column lists given. The new order is given by list order and duplicates are allowed. Name and integer information can be dropped Can optionally modify rhs to take into account variables NOT in list in this case duplicates are not allowed (also see getbackSolution)

3.11.3.3 AbcSimplex::AbcSimplex (AbcSimplex * *wholeModel*, int *numberColumns*, const int * *whichColumns*)

This constructor modifies original [AbcSimplex](#) and stores original stuff in created [AbcSimplex](#).

It is only to be used in conjunction with originalModel

3.11.4 Member Function Documentation**3.11.4.1 void AbcSimplex::originalModel (AbcSimplex * *miniModel*)**

This copies back stuff from miniModel and then deletes miniModel.

Only to be used with mini constructor

3.11.4.2 void AbcSimplex::makeBaseModel ()

Array persistence flag If 0 then as now (delete/new) 1 then only do arrays if bigger needed 2 as 1 but give a bit extra if bigger needed.

Save a copy of model with certain state - normally without cuts

Reimplemented from [ClpSimplex](#).

3.11.4.3 int AbcSimplex::tightenPrimalBounds ()

Tightens primal bounds to make dual faster.

Unless fixed or doTight>10, bounds are slightly looser than they could be. This is to make dual go faster and is probably not needed with a presolve. Returns non-zero if problem infeasible.

Fudge for branch and bound - put bounds on columns of factor * largest value (at continuous) - should improve stability in branch and bound on infeasible branches (0.0 is off)

3.11.4.4 int AbcSimplex::getSolution ()

Given an existing factorization computes and checks primal and dual solutions.

Uses current problem arrays for bounds. Returns feasibility states

Reimplemented from [ClpSimplex](#).

3.11.4.5 int AbcSimplex::internalFactorize (int *solveType*)

Factorizes using current basis.

solveType - 1 iterating, 0 initial, -1 external If 10 added then in primal values pass
 Return codes are as from [AbcSimplexFactorization](#) unless initial factorization when
 total number of singularities is returned. Special case is *numberRows_*+1 -> all slack
 basis. if initial should be before permute in *pivotVariable* may be same as *toExternal*

Reimplemented from [ClpSimplex](#).

3.11.4.6 void AbcSimplex::permuteIn ()

Permutates in from [ClpModel](#) data - assumes scale factors done and [AbcMatrix](#) exists
 but is in original order (including slacks) For now just add basicArray at end == But
 could partition into normal (i.e.

reasonable lower/upper) abnormal - free, odd bounds fixed == sets a valid *pivotVariable*
 Slacks always shifted by offset Fixed variables always shifted by offset Recode to allow
 row objective so can use pi from idiot etc

3.11.4.7 int AbcSimplex::computeDuals (double * *givenDjs*, CoinIndexedVector * *array1*, CoinIndexedVector * *array2*)

Computes duals from scratch.

If *givenDjs* then allows for nonzero basic djs. Returns number of refinements

3.11.4.8 int AbcSimplex::housekeeping ()

This does basis housekeeping and does values for in/out variables.

Can also decide to re-factorize

**3.11.4.9 void AbcSimplex::setValuesPassAction (double *incomingInfeasibility*,
double *allowedInfeasibility*)**

For advanced use.

When doing iterative solves things can get nasty so on values pass if incoming solution has largest infeasibility < incomingInfeasibility throw out variables from basis until largest infeasibility < allowedInfeasibility or incoming largest infeasibility. If allowedInfeasibility>= incomingInfeasibility this is always possible although you may end up with an all slack basis.

Defaults are 1.0,10.0

Reimplemented from [ClpSimplex](#).

3.11.4.10 int AbcSimplex::cleanFactorization (int *ifValuesPass*)

Get a clean factorization - i.e.

throw out singularities may do more later

Reimplemented from [ClpSimplex](#).

3.11.4.11 double* AbcSimplex::scaleFromExternal () const [inline]

Points from external to internal.

Points from internal to external Scale from primal external to internal (in external order)
Or other way for dual

Definition at line 451 of file AbcSimplex.hpp.

**3.11.4.12 int AbcSimplex::gutsOfSolution (double * *givenDuals*, const double
* *givenPrimals*, bool *valuesPass* = **false**)**

May change basis and then returns number changed.

Computation of solutions may be overridden by given pi and solution

Reimplemented from [ClpSimplex](#).

3.11.4.13 void AbcSimplex::translate (int *type*)

Translates [ClpModel](#) to [AbcSimplex](#). See DO_ bits in stateOfProblem_ for type e.g.
DO_BASIS_AND_ORDER

3.11.4.14 void AbcSimplex::setInitialDenseFactorization (bool *onOff*)

Normally the first factorization does sparse coding because the factorization could be singular.

This allows initial dense factorization when it is known to be safe

Reimplemented from [ClpSimplex](#).

3.11.4.15 void AbcSimplex::createStatus ()

Set up status array (can be used by OsiAbc).

Also can be used to set up all slack basis

Reimplemented from [ClpSimplex](#).

3.11.4.16 void AbcSimplex::setColumnLower (int *elementIndex*, double *elementValue*)

Set a single column lower bound

Use -DBL_MAX for -infinity.

Reimplemented from [ClpSimplex](#).

3.11.4.17 void AbcSimplex::setColumnUpper (int *elementIndex*, double *elementValue*)

Set a single column upper bound

Use DBL_MAX for infinity.

Reimplemented from [ClpSimplex](#).

**3.11.4.18 void AbcSimplex::setColumnSetBounds (const int * *indexFirst*,
const int * *indexLast*, const double * *boundList*)**

Set the bounds on a number of columns simultaneously

The default implementation just invokes [setColLower\(\)](#) and [setColUpper\(\)](#) over and over again.

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes

boundList the new lower/upper bound pairs for the variables

Reimplemented from [ClpSimplex](#).

**3.11.4.19 void AbcSimplex::setColLower (int *elementIndex*, double
elementType) [inline]**

Set a single column lower bound

Use -DBL_MAX for -infinity.

Reimplemented from [ClpSimplex](#).

Definition at line 921 of file AbcSimplex.hpp.

**3.11.4.20 void AbcSimplex::setColUpper (int *elementIndex*, double
elementType) [inline]**

Set a single column upper bound

Use DBL_MAX for infinity.

Reimplemented from [ClpSimplex](#).

Definition at line 926 of file AbcSimplex.hpp.

**3.11.4.21 void AbcSimplex::setColSetBounds (const int * *indexFirst*, const int
* *indexLast*, const double * *boundList*) [inline]**

Set the bounds on a number of columns simultaneously

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes
boundList the new lower/upper bound pairs for the variables

Reimplemented from [ClpSimplex](#).

Definition at line 942 of file AbcSimplex.hpp.

3.11.4.22 void AbcSimplex::setRowLower (int *elementIndex*, double *elementValue*)

Set a single row lower bound

Use -DBL_MAX for -infinity.

Reimplemented from [ClpSimplex](#).

3.11.4.23 void AbcSimplex::setRowUpper (int *elementIndex*, double *elementValue*)

Set a single row upper bound

Use DBL_MAX for infinity.

Reimplemented from [ClpSimplex](#).

3.11.4.24 void AbcSimplex::setRowSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*)

Set the bounds on a number of rows simultaneously

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the constraints whose *either* bound changes
boundList the new lower/upper bound pairs for the constraints

Reimplemented from [ClpSimplex](#).

3.11.5 Friends And Related Function Documentation

3.11.5.1 void AbcSimplexUnitTest (const std::string & *mpsDir*) [friend]

A function that tests the methods in the [AbcSimplex](#) class.

The only reason for it not to be a member method is that this way it doesn't have to be compiled into the library. And that's a gain, because the library should be compiled with optimization on, but this method should be compiled with debugging.

It also does some testing of [AbcSimplexFactorization](#) class

3.11.6 Member Data Documentation

3.11.6.1 double* AbcSimplex::scaleFromExternal_ [protected]

Points from external to internal.

Points from internal to external Scale from primal external to internal (in external order)
Or other way for dual

Definition at line 1134 of file AbcSimplex.hpp.

3.11.6.2 AbcSimplex* AbcSimplex::abcBaseModel_ [protected]

Saved version of solution.

A copy of model with certain state - normally without cuts

Definition at line 1227 of file AbcSimplex.hpp.

3.11.6.3 AbcNonLinearCost* AbcSimplex::abcNonLinearCost_ [protected]

Very wasteful way of dealing with infeasibilities in primal.

However it will allow non-linearities and use of dual analysis. If it doesn't work it can easily be replaced.

Definition at line 1234 of file AbcSimplex.hpp.

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

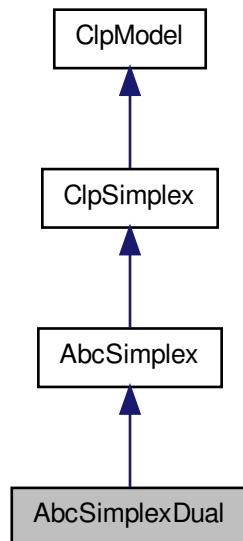
- AbcSimplex.hpp

3.12 AbcSimplexDual Class Reference

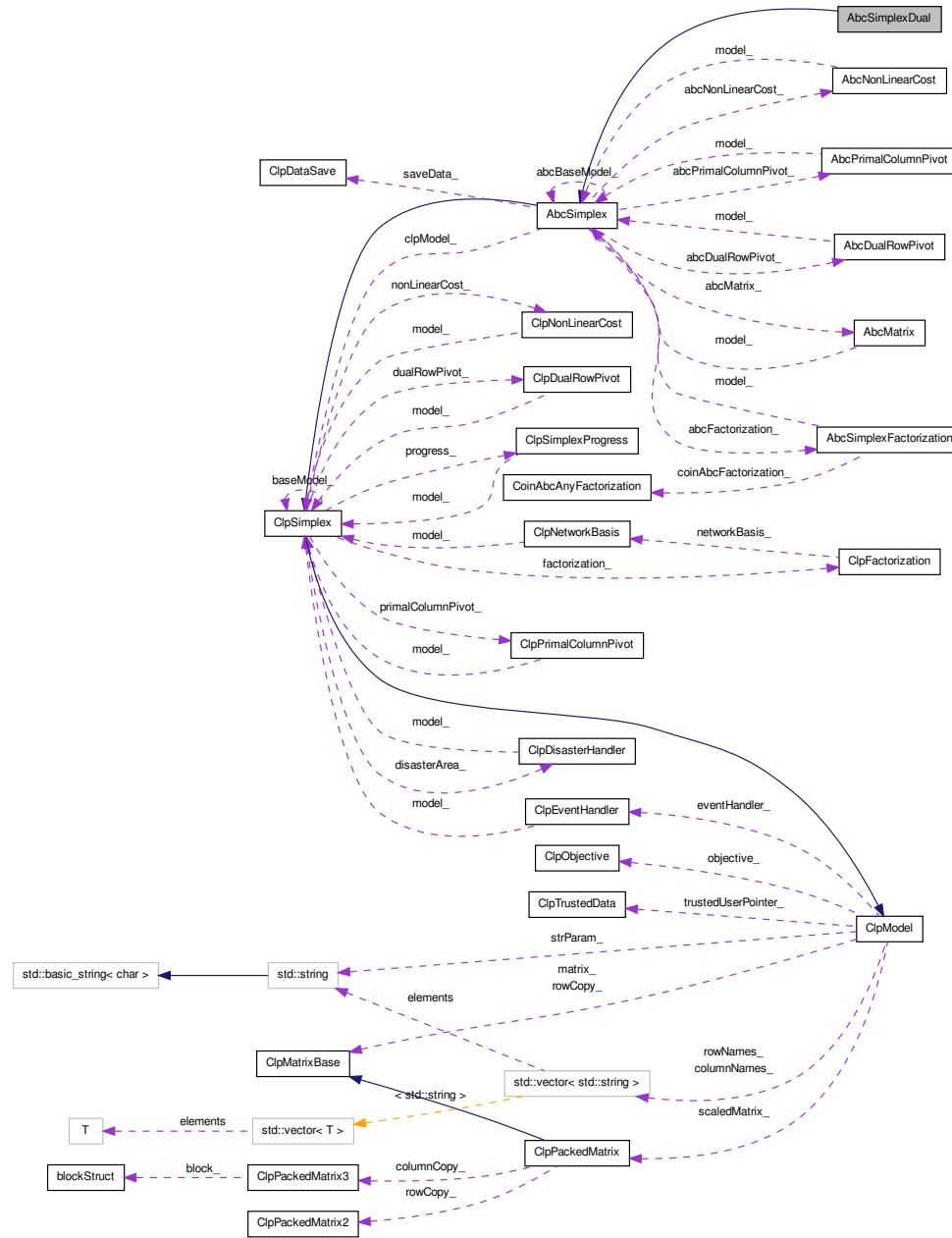
This solves LPs using the dual simplex method.

```
#include <AbcSimplexDual.hpp>
```

Inheritance diagram for AbcSimplexDual:



Collaboration diagram for AbcSimplexDual:



Public Member Functions

Description of algorithm

- int **dual** ()

Dual algorithm.

- int **strongBranching** (int numberVariables, const int *variables, double *newLower, double *newUpper, double **outputSolution, int *outputStatus, int *outputIterations, bool stopOnFirstInfeasible=true, bool alwaysFinish=false, int startFinishOptions=0)

For strong branching.

- **AbcSimplexFactorization** * **setupForStrongBranching** (char *arrays, int numberRows, int numberColumns, bool solveLp=false)

This does first part of StrongBranching.

- void **cleanupAfterStrongBranching** (**AbcSimplexFactorization** *factorization)

This cleans up after strong branching.

Functions used in dual

- int **whileIteratingSerial** ()

This has the flow between re-factorizations Broken out for clarity and will be used by strong branching.

- void **whileIterating2** ()

- int **whileIteratingParallel** (int numberIterations)

- int **whileIterating3** ()

- void **updatePrimalSolution** ()

- int **noPivotRow** ()

- int **noPivotColumn** ()

- void **dualPivotColumn** ()

- void **createDualPricingVectorSerial** ()

Create dual pricing vector.

- int **getTableauColumnFlipAndStartReplaceSerial** ()

- void **getTableauColumnPart1Serial** ()

- void **getTableauColumnPart2** ()

- int **checkReplace** ()

- void **replaceColumnPart3** ()

- void **checkReplacePart1** ()

- void **checkReplacePart1a** ()

- void **checkReplacePart1b** ()

- void **updateDialsInDual** ()

The duals are updated.

- int **flipBounds** ()
The duals are updated by the given arrays.
- void **flipBack** (int number)
Undo a flip.
- void **dualColumn1** (bool doAll=false)
Array has tableau row (row section) Puts candidates for rows in list Returns guess at upper theta (infinite if no pivot) and may set sequenceIn_ if free Can do all (if tableauRow created).
- double **dualColumn1A** ()
Array has tableau row (row section) Just does slack part Returns guess at upper theta (infinite if no pivot) and may set sequenceIn_ if free.
- double **dualColumn1B** ()
Do all given tableau row.
- void **dualColumn2** ()
Chooses incoming Puts flipped ones in list If necessary will modify costs.
- void **dualColumn2Most** (**dualColumnResult** &result)
- void **dualColumn2First** (**dualColumnResult** &result)
- void **dualColumn2** (**dualColumnResult** &result)
Chooses part of incoming Puts flipped ones in list If necessary will modify costs.
- void **checkPossibleCleanup** (CoinIndexedVector *array)
This sees what is best thing to do in branch and bound cleanup If sequenceIn_- < 0 then can't do anything.
- void **dualPivotRow** ()
Chooses dual pivot row Would be faster with separate region to scan and will have this (with square of infeasibility) when steepest For easy problems we can just choose one of the first rows we look at.
- int **changeBounds** (int initialize, double &changeCost)
Checks if any fake bounds active - if so returns number and modifies updatedDualBound_ and everything.
- bool **changeBound** (int iSequence)
As changeBounds but just changes new bounds for a single variable.
- void **originalBound** (int iSequence)
Restores bound to original bound.

- int **checkUnbounded** (CoinIndexedVector &ray, double changeCost)
Checks if tentative optimal actually means unbounded in dual Returns -3 if not, 2 if is unbounded.
- void **statusOfProblemInDual** (int type)
Refactorizes if necessary Checks if finished.
- int **whatNext** ()
Fast iterations.
- bool **checkCutoff** (bool computeObjective)
see if cutoff reached
- int **bounceTolerances** (int type)
Does something about fake tolerances.
- void **perturb** (double factor)
Perturbs problem.
- void **perturbB** (double factor, int type)
Perturbs problem B.
- int **makeNonFreeVariablesDualFeasible** (bool changeCosts=false)
Make non free variables dual feasible by moving to a bound.
- int **fastDual** (bool alwaysFinish=false)
- int **numberAtFakeBound** ()
Checks number of variables at fake bounds.
- int **pivotResultPart1** ()
Pivot in a variable and choose an outgoing one.
- int **nextSuperBasic** ()
Get next free , -1 if none.
- void **startupSolve** ()
Startup part of dual.
- void **finishSolve** ()
Ending part of dual.
- void **gutsOfDual** ()
- int **resetFakeBounds** (int type)

3.12.1 Detailed Description

This solves LPs using the dual simplex method. It inherits from [AbcSimplex](#). It has no data of its own and is never created - only cast from a [AbcSimplex](#) object at algorithm time.

Definition at line 49 of file AbcSimplexDual.hpp.

3.12.2 Member Function Documentation

3.12.2.1 int AbcSimplexDual::dual ()

Dual algorithm.

Method

It tries to be a single phase approach with a weight of 1.0 being given to getting optimal and a weight of updatedDualBound_ being given to getting dual feasible. In this version I have used the idea that this weight can be thought of as a fake bound. If the distance between the lower and upper bounds on a variable is less than the feasibility weight then we are always better off flipping to other bound to make dual feasible. If the distance is greater then we make up a fake bound updatedDualBound_ away from one bound. If we end up optimal or primal infeasible, we check to see if bounds okay. If so we have finished, if not we increase updatedDualBound_ and continue (after checking if unbounded). I am undecided about free variables - there is coding but I am not sure about it. At present I put them in basis anyway.

The code is designed to take advantage of sparsity so arrays are seldom zeroed out from scratch or gone over in their entirety. The only exception is a full scan to find outgoing variable for Dantzig row choice. For steepest edge we keep an updated list of infeasibilities (actually squares). On easy problems we don't need full scan - just pick first reasonable.

One problem is how to tackle degeneracy and accuracy. At present I am using the modification of costs which I put in OSL and some of what I think is the dual analog of Gill et al. I am still not sure of the exact details.

The flow of dual is three while loops as follows:

```
while (not finished) {  
    while (not clean solution) {
```

Factorize and/or clean up solution by flipping variables so dual feasible. If looks finished check fake dual bounds. Repeat until status is iterating (-1) or finished (0,1,2)

```
}
```

```
    while (status===-1) {
```

Iterate until no pivot in or out or time to re-factorize.

Flow is:

choose pivot row (outgoing variable). if none then we are primal feasible so looks as if done but we need to break and check bounds etc.

Get pivot row in tableau

Choose incoming column. If we don't find one then we look primal infeasible so break and check bounds etc. (Also the pivot tolerance is larger after any iterations so that may be reason)

If we do find incoming column, we may have to adjust costs to keep going forwards (anti-degeneracy). Check pivot will be stable and if unstable throw away iteration and break to re-factorize. If minor error re-factorize after iteration.

Update everything (this may involve flipping variables to stay dual feasible.

}

}

TODO's (or maybe not)

At present we never check we are going forwards. I overdid that in OSL so will try and make a last resort.

Needs partial scan pivot out option.

May need other anti-degeneracy measures, especially if we try and use loose tolerances as a way to solve in fewer iterations.

I like idea of dynamic scaling. This gives opportunity to decouple different implications of scaling for accuracy, iteration count and feasibility tolerance.

for use of exotic parameter startFinishOptions see Abcsimplex.hpp

Reimplemented from [AbcSimplex](#).

```
3.12.2.2 int AbcSimplexDual::strongBranching ( int numberVariables, const
int * variables, double * newLower, double * newUpper, double
** outputSolution, int * outputStatus, int * outputIterations, bool
stopOnFirstInfeasible = true, bool alwaysFinish = false, int
startFinishOptions = 0 )
```

For strong branching.

On input lower and upper are new bounds while on output they are change in objective function values ($>1.0e50$ infeasible). Return code is 0 if nothing interesting, -1 if infeasible both ways and +1 if infeasible one way (check values to see which one(s)) Solutions are filled in as well - even down, odd up - also status and number of iterations

Reimplemented from [ClpSimplex](#).

3.12.2.3 int AbcSimplexDual::whileIteratingSerial()

This has the flow between re-factorizations Broken out for clarity and will be used by strong branching.

Reasons to come out: -1 iterations etc -2 inaccuracy -3 slight inaccuracy (and done iterations) +0 looks optimal (might be unbounded - but we will investigate) +1 looks infeasible +3 max iterations

If givenPi not NULL then in values pass (copy from [ClpSimplexDual](#))

3.12.2.4 int AbcSimplexDual::flipBounds()

The duals are updated by the given arrays.

This is in values pass - so no changes to primal is made While dualColumn gets flips this does actual flipping. returns number flipped

3.12.2.5 int AbcSimplexDual::changeBounds(int *initialize*, double & *changeCost*)

Checks if any fake bounds active - if so returns number and modifies updatedDualBound_ and everything.

Free variables will be left as free Returns number of bounds changed if $>= 0$ Returns -1 if not initialize and no effect fills cost of change vector

3.12.2.6 bool AbcSimplexDual::changeBound(int *iSequence*)

As changeBounds but just changes new bounds for a single variable.

Returns true if change

3.12.2.7 void AbcSimplexDual::statusOfProblemInDual(int *type*)

Refactorizes if necessary Checks if finished.

Updates status. lastCleaned refers to iteration at which some objective/feasibility cleaning too place.

type - 0 initial so set up save arrays etc

- 1 normal -if good update save
- 2 restoring from saved

3.12.2.8 int AbcSimplexDual::whatNext ()

Fast iterations.

Misses out a lot of initialization. Normally stops on maximum iterations, first re-factorization or tentative optimum. If looks interesting then continues as normal. Returns 0 if finished properly, 1 otherwise. Gets tableau column - does flips and checks what to do next Knows tableau column in 1, flips in 2 and gets an array for flips (as serial here)

3.12.2.9 int AbcSimplexDual::numberAtFakeBound ()

Checks number of variables at fake bounds.

This is used by fastDual so can exit gracefully before end

3.12.2.10 int AbcSimplexDual::pivotResultPart1 ()

Pivot in a variable and choose an outgoing one.

Assumes dual feasible - will not go through a reduced cost. Returns step length in theta
Return codes as before but -1 means no acceptable pivot

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

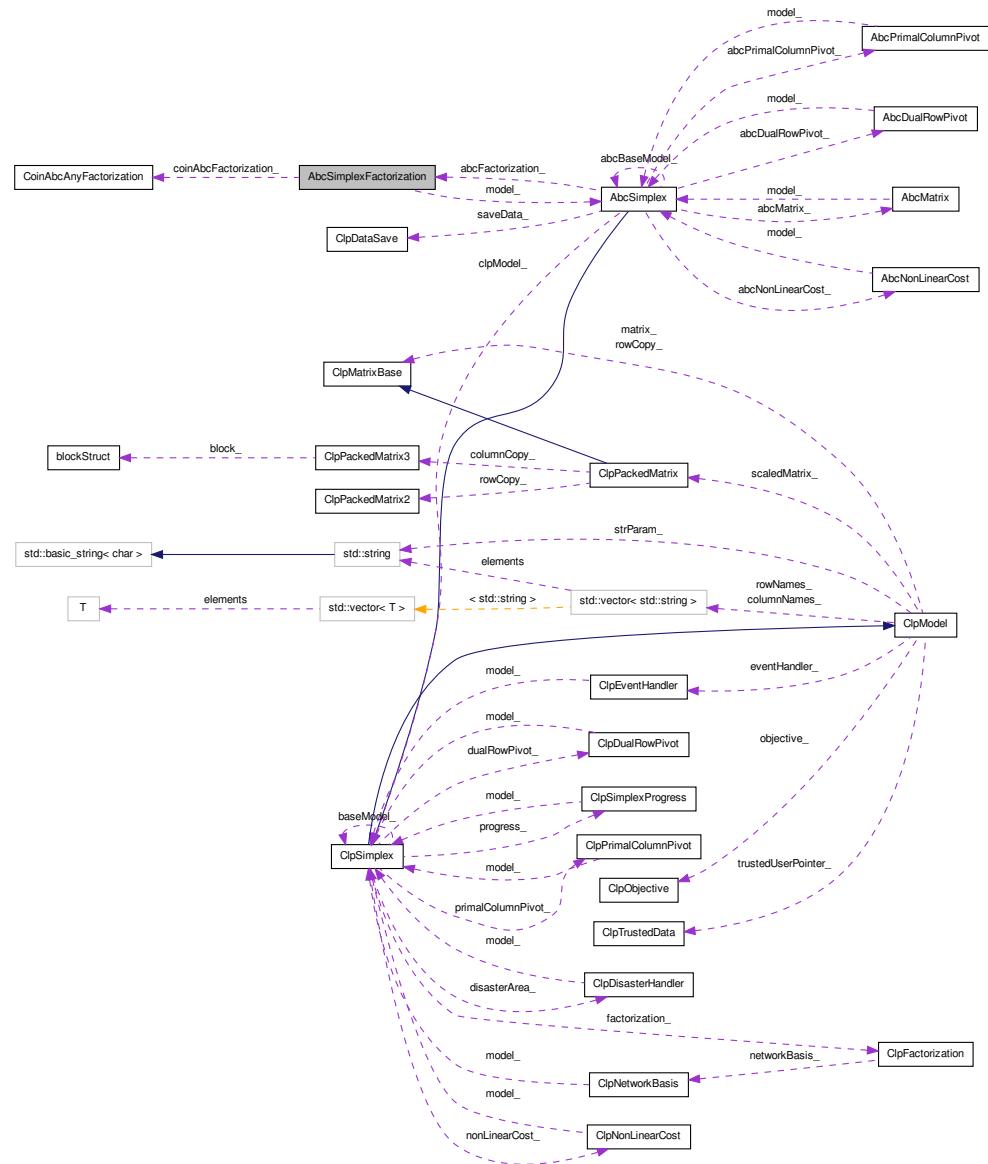
- AbcSimplexDual.hpp

3.13 AbcSimplexFactorization Class Reference

This just implements AbcFactorization when an [AbcMatrix](#) object is passed.

```
#include <AbcSimplexFactorization.hpp>
```

Collaboration diagram for AbcSimplexFactorization:



Public Member Functions

factorization

- int **factorize** ([AbcSimplex](#) *model, int solveType, bool valuesPass)
When part of LP - given by basic variables.

Constructors, destructor

- [AbcSimplexFactorization](#) (int numRows=0)
Default constructor.
- [~AbcSimplexFactorization](#) ()
Destructor.

Copy method

- [AbcSimplexFactorization](#) (const [AbcSimplexFactorization](#) &, int denseIfSmaller=0)
The copy constructor.
- [AbcSimplexFactorization](#) & **operator=** (const [AbcSimplexFactorization](#) &)
- void **setFactorization** ([AbcSimplexFactorization](#) &rhs)
Sets factorization.

rank one updates which do exist

- double **checkReplacePart1** (CoinIndexedVector *regionSparse, int pivotRow)
Checks if can replace one Column to basis, returns update alpha Fills in region for use later partial update already in U.
- double **checkReplacePart1** (CoinIndexedVector *regionSparse, CoinIndexedVector *partialUpdate, int pivotRow)
Checks if can replace one Column to basis, returns update alpha Fills in region for use later partial update in vector.
- void **checkReplacePart1a** (CoinIndexedVector *regionSparse, int pivotRow)
Checks if can replace one Column to basis, returns update alpha Fills in region for use later partial update already in U.
- double **checkReplacePart1b** (CoinIndexedVector *regionSparse, int pivotRow)

- int `checkReplacePart2` (int pivotRow, double btranAlpha, double ftranAlpha, double ftAlpha)

Checks if can replace one Column to basis, returns 0=OK, 1=Probably OK, 2=singular, 3=no room, 5 max pivots.
- void `replaceColumnPart3` (const `AbcSimplex` *model, CoinIndexedVector *regionSparse, CoinIndexedVector *tableauColumn, int pivotRow, double alpha)

Replaces one Column to basis, partial update already in U.
- void `replaceColumnPart3` (const `AbcSimplex` *model, CoinIndexedVector *regionSparse, CoinIndexedVector *tableauColumn, CoinIndexedVector *partialUpdate, int pivotRow, double alpha)

Replaces one Column to basis, partial update in vector.

various uses of factorization (return code number elements)

which user may want to know about

- int `updateColumnFT` (CoinIndexedVector ®ionSparseFT)

Updates one column (FTRAN) Tries to do FT update number returned is negative if no room.
- int `updateColumnFTPPart1` (CoinIndexedVector ®ionSparseFT)
- void `updateColumnFTPPart2` (CoinIndexedVector ®ionSparseFT)
- void `updateColumnFT` (CoinIndexedVector ®ionSparseFT, CoinIndexedVector &partialUpdate, int which)

Updates one column (FTRAN) Tries to do FT update puts partial update in vector.
- int `updateColumn` (CoinIndexedVector ®ionSparse) const

Updates one column (FTRAN).
- int `updateTwoColumnsFT` (CoinIndexedVector ®ionSparseFT, CoinIndexedVector ®ionSparseOther)

Updates one column (FTRAN) from regionFT Tries to do FT update number returned is negative if no room.
- int `updateColumnTranspose` (CoinIndexedVector ®ionSparse) const

Updates one column (BTRAN).
- void `updateColumnCpu` (CoinIndexedVector ®ionSparse, int whichCpu) const

Updates one column (FTRAN).
- void `updateColumnTransposeCpu` (CoinIndexedVector ®ionSparse, int whichCpu) const

Updates one column (FTRAN).

Updates one column (BTRAN).

- void [updateFullColumn](#) (CoinIndexedVector ®ionSparse) const
 - Updates one full column (FTRAN).*
- void [updateFullColumnTranspose](#) (CoinIndexedVector ®ionSparse) const

Updates one full column (BTRAN).

- void [updateWeights](#) (CoinIndexedVector ®ionSparse) const
 - Updates one column for dual steepest edge weights (FTRAN).*

Lifted from CoinFactorization

- int [numberElements](#) () const
 - Total number of elements in factorization.*
- int [maximumPivots](#) () const
 - Maximum number of pivots between factorizations.*
- void [maximumPivots](#) (int value)
 - Set maximum number of pivots between factorizations.*
- bool [usingFT](#) () const
 - Returns true if doing FT.*
- int [pivots](#) () const
 - Returns number of pivots since factorization.*
- void [setPivots](#) (int value) const
 - Sets number of pivots since factorization.*
- double [areaFactor](#) () const
 - Whether larger areas needed.*
- void [areaFactor](#) (double value)
 - Set whether larger areas needed.*
- double [zeroTolerance](#) () const
 - Zero tolerance.*
- void [zeroTolerance](#) (double value)
 - Set zero tolerance.*

- void **saferTolerances** (double zeroTolerance, double pivotTolerance)
Set tolerances to safer of existing and given.
- int **status** () const
Returns status.
- void **setStatus** (int value)
Sets status.
- int **numberDense** () const
Returns number of dense rows.
- bool **timeToRefactorize** () const
- void **clearArrays** ()
Get rid of all memory.
- int **numberRows** () const
Number of Rows after factorization.
- int **numberSlacks** () const
Number of slacks at last factorization.
- double **pivotTolerance** () const
Pivot tolerance.
- void **pivotTolerance** (double value)
Set pivot tolerance.
- double **minimumPivotTolerance** () const
Minimum pivot tolerance.
- void **minimumPivotTolerance** (double value)
Set minimum pivot tolerance.
- double * **pivotRegion** () const
pivot region
- void **almostDestructor** ()
Allows change of pivot accuracy check 1.0 == none >1.0 relaxed.
- void **setDenseThreshold** (int number)
So we can temporarily switch off dense.
- int **getDenseThreshold** () const
- void **forceOtherFactorization** (int which)

If nonzero force use of 1,dense 2,small 3,long.

- void [goDenseOrSmall](#) (int numberOfRows)

Go over to dense code.
- int [goDenseThreshold](#) () const

Get switch to dense if number rows <= this.
- void [setGoDenseThreshold](#) (int value)

Set switch to dense if number rows <= this.
- int [goSmallThreshold](#) () const

Get switch to small if number rows <= this.
- void [setGoSmallThreshold](#) (int value)

Set switch to small if number rows <= this.
- int [goLongThreshold](#) () const

Get switch to long/ordered if number rows >= this.
- void [setGoLongThreshold](#) (int value)

Set switch to long/ordered if number rows >= this.
- int [typeOfFactorization](#) () const

Returns type.
- void [synchronize](#) (const [ClpFactorization](#) *otherFactorization, const [AbcSimplexFactorization](#) *model)

Synchronize stuff.

other stuff

- void [goSparse](#) ()

makes a row copy of L for speed and to allow very sparse problems
- void [checkMarkArrays](#) () const
- bool [needToReorder](#) () const

Says whether to redo pivot order.
- [CoinAbcAnyFactorization](#) * [factorization](#) () const

Pointer to factorization.

3.13.1 Detailed Description

This just implements AbcFactorization when an [AbcMatrix](#) object is passed.
 Definition at line 22 of file AbcSimplexFactorization.hpp.

3.13.2 Constructor & Destructor Documentation

3.13.2.1 `AbcSimplexFactorization::AbcSimplexFactorization (int numberRows = 0)`

Default constructor.

3.13.2.2 `AbcSimplexFactorization::AbcSimplexFactorization (const AbcSimplexFactorization &, int denseIfSmaller = 0)`

The copy constructor.

3.13.3 Member Function Documentation

3.13.3.1 `int AbcSimplexFactorization::factorize (AbcSimplex * model, int solveType, bool valuesPass)`

When part of LP - given by basic variables.

Actually does factorization. Arrays passed in have non negative value to say basic. If status is okay, basic variables have pivot row - this is only needed if increasingRows_ >1. Allows scaling If status is singular, then basic variables have pivot row and ones thrown out have -1 returns 0 -okay, -1 singular, -2 too many in basis, -99 memory

3.13.3.2 `int AbcSimplexFactorization::updateTwoColumnsFT (CoinIndexedVector & regionSparseFT, CoinIndexedVector & regionSparseOther) [inline]`

Updates one column (FTRAN) from regionFT Tries to do FT update number returned is negative if no room.

Also updates regionOther

Definition at line 195 of file AbcSimplexFactorization.hpp.

3.13.3.3 `void AbcSimplexFactorization::almostDestructor () [inline]`

Allows change of pivot accuracy check 1.0 == none >1.0 relaxed.

Delete all stuff (leaves as after CoinFactorization())

Definition at line 315 of file AbcSimplexFactorization.hpp.

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

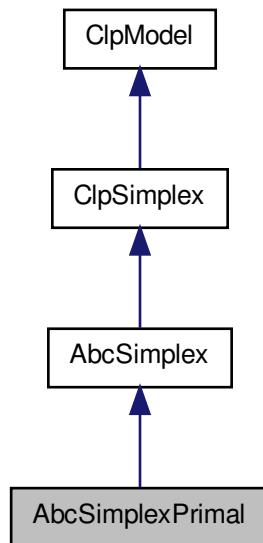
- AbcSimplexFactorization.hpp

3.14 AbcSimplexPrimal Class Reference

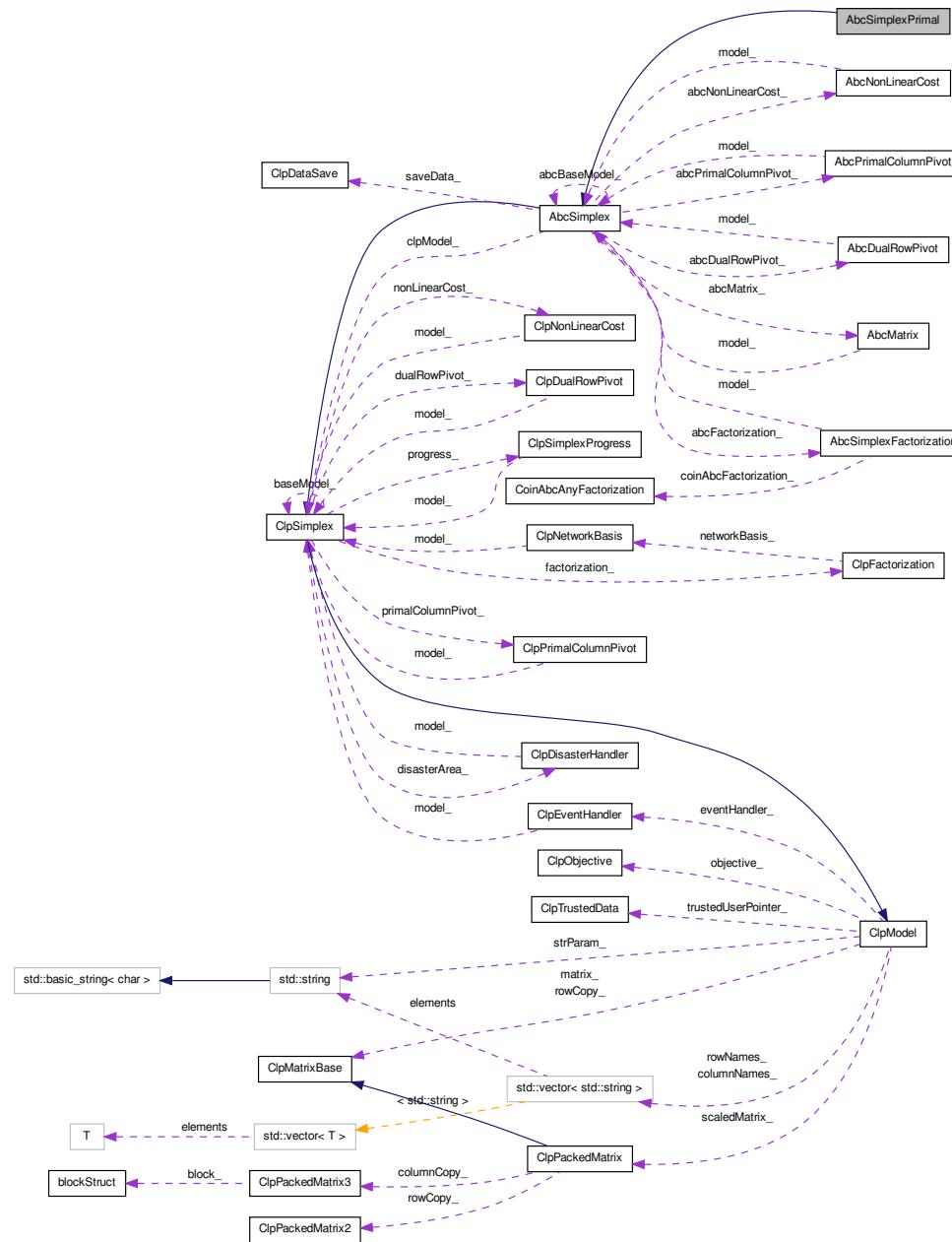
This solves LPs using the primal simplex method.

```
#include <AbcSimplexPrimal.hpp>
```

Inheritance diagram for AbcSimplexPrimal:



Collaboration diagram for AbcSimplexPrimal:



Classes

- struct [pivotStruct](#)

Public Member Functions

Description of algorithm

- int [primal](#) (int ifValuesPass=0, int startFinishOptions=0)
Primal algorithm.

For advanced users

- void [alwaysOptimal](#) (bool onOff)
Do not change infeasibility cost and always say optimal.
- bool [alwaysOptimal](#) () const
- void [exactOutgoing](#) (bool onOff)
Normally outgoing variables can go out to slightly negative values (but within tolerance) - this is to help stability and and degeneracy.
- bool [exactOutgoing](#) () const

Functions used in primal

- int [whileIterating](#) (int valuesOption)
This has the flow between re-factorizations.
- int [pivotResult](#) (int ifValuesPass=0)
Do last half of an iteration.
- int [pivotResult4](#) (int ifValuesPass=0)
- int [updatePrimalsInPrimal](#) (CoinIndexedVector *rowArray, double theta, double &objectiveChange, int valuesPass)
The primals are updated by the given array.
- void [updatePrimalsInPrimal](#) (CoinIndexedVector &rowArray, double theta, bool valuesPass)
The primals are updated by the given array.
- void [createUpdateDuals](#) (CoinIndexedVector &rowArray, const double *originalCost, const double extraCost[4], double &objectiveChange, int valuesPass)
After rowArray will have cost changes for use next iteration.

- double **updateMinorCandidate** (const CoinIndexedVector &updateBy, CoinIndexedVector &candidate, int sequenceIn)

Update minor candidate vector - new reduced cost returned later try and get change in reduced cost (then may not need sequence in).
- void **updatePartialUpdate** (CoinIndexedVector &partialUpdate)

Update partial Ftran by R update.
- int **doFTUpdate** (CoinIndexedVector *vector[4])

Do FT update as separate function for minor iterations (nonzero return code on problems).
- void **primalRow** (CoinIndexedVector *rowArray, CoinIndexedVector *rhsArray, CoinIndexedVector *spareArray, int valuesPass)

Row array has pivot column This chooses pivot row.
- void **primalRow** (CoinIndexedVector *rowArray, CoinIndexedVector *rhsArray, CoinIndexedVector *spareArray, **pivotStruct** &stuff)
- void **primalColumn** (CoinPartitionedVector *updateArray, CoinPartitionedVector *spareRow2, CoinPartitionedVector *spareColumn1)

Chooses primal pivot column updateArray has cost updates (also use pivotRow_ from last iteration) Would be faster with separate region to scan and will have this (with square of infeasibility) when steepest For easy problems we can just choose one of the first columns we look at.
- int **checkUnbounded** (CoinIndexedVector *ray, CoinIndexedVector *spare, double changeCost)

Checks if tentative optimal actually means unbounded in primal Returns -3 if not, 2 if is unbounded.
- void **statusOfProblemInPrimal** (int type)

Refactorizes if necessary Checks if finished.
- void **perturb** (int type)

Perturbs problem (method depends on [perturbation\(\)](#)).
- bool **unPerturb** ()

Take off effect of perturbation and say whether to try dual.
- int **unflag** ()

Unflag all variables and return number unflagged.
- int **nextSuperBasic** (int superBasicType, CoinIndexedVector *columnArray)

Get next superbasic -1 if none, Normal type is 1 If type is 3 then initializes sorted list if 2 uses list.

- void [primalRay](#) (CoinIndexedVector *rowArray)
Create primal ray.
- void [clearAll](#) ()
Clears all bits and clears rowArray[1] etc.
- int [lexSolve](#) ()
Sort of lexicographic resolve.

3.14.1 Detailed Description

This solves LPs using the primal simplex method. It inherits from [AbcSimplex](#). It has no data of its own and is never created - only cast from a [AbcSimplex](#) object at algorithm time.

Definition at line 23 of file AbcSimplexPrimal.hpp.

3.14.2 Member Function Documentation

3.14.2.1 int AbcSimplexPrimal::primal (int *ifValuesPass* = 0, int *startFinishOptions* = 0)

Primal algorithm.

Method

It tries to be a single phase approach with a weight of 1.0 being given to getting optimal and a weight of infeasibilityCost_ being given to getting primal feasible. In this version I have tried to be clever in a stupid way. The idea of fake bounds in dual seems to work so the primal analogue would be that of getting bounds on reduced costs (by a presolve approach) and using these for being above or below feasible region. I decided to waste memory and keep these explicitly. This allows for non-linear costs! I have not tested non-linear costs but will be glad to do something if a reasonable example is provided.

The code is designed to take advantage of sparsity so arrays are seldom zeroed out from scratch or gone over in their entirety. The only exception is a full scan to find incoming variable for Dantzig row choice. For steepest edge we keep an updated list of dual infeasibilities (actually squares). On easy problems we don't need full scan - just pick first reasonable. This method has not been coded.

One problem is how to tackle degeneracy and accuracy. At present I am using the modification of costs which I put in OSL and which was extended by Gill et al. I am still not sure whether we will also need explicit perturbation.

The flow of primal is three while loops as follows:

```
while (not finished) {
    while (not clean solution) {
```

Factorize and/or clean up solution by changing bounds so primal feasible. If looks finished check fake primal bounds. Repeat until status is iterating (-1) or finished (0,1,2)

```
}
```

```
while (status===-1) {
```

Iterate until no pivot in or out or time to re-factorize.

Flow is:

choose pivot column (incoming variable). if none then we are primal feasible so looks as if done but we need to break and check bounds etc.

Get pivot column in tableau

Choose outgoing row. If we don't find one then we look primal unbounded so break and check bounds etc. (Also the pivot tolerance is larger after any iterations so that may be reason)

If we do find outgoing row, we may have to adjust costs to keep going forwards (anti-degeneracy). Check pivot will be stable and if unstable throw away iteration and break to re-factorize. If minor error re-factorize after iteration.

Update everything (this may involve changing bounds on variables to stay primal feasible.

```
}
```

```
}
```

TODO's (or maybe not)

At present we never check we are going forwards. I overdid that in OSL so will try and make a last resort.

Needs partial scan pivot in option.

May need other anti-degeneracy measures, especially if we try and use loose tolerances as a way to solve in fewer iterations.

I like idea of dynamic scaling. This gives opportunity to decouple different implications of scaling for accuracy, iteration count and feasibility tolerance.

for use of exotic parameter startFinishoptions see Clpsimplex.hpp

Reimplemented from [ClpSimplex](#).

3.14.2.2 void AbcSimplexPrimal::exactOutgoing (bool *onOff*)

Normally outgoing variables can go out to slightly negative values (but within tolerance) - this is to help stability and and degeneracy.

This can be switched off

3.14.2.3 int AbcSimplexPrimal::whileIterating (int *valuesOption*)

This has the flow between re-factorizations.

Returns a code to say where decision to exit was made Problem status set to:

-2 re-factorize -4 Looks optimal/infeasible -5 Looks unbounded +3 max iterations
valuesOption has original value of valuesPass

3.14.2.4 int AbcSimplexPrimal::pivotResult (int *ifValuesPass = 0*)

Do last half of an iteration.

This is split out so people can force incoming variable. If solveType_ is 2 then this may re-factorize while normally it would exit to re-factorize. Return codes Reasons to come out (normal mode/user mode): -1 normal -2 factorize now - good iteration/ NA -3 slight inaccuracy - refactorize - iteration done/ same but factor done -4 inaccuracy - refactorize - no iteration/ NA -5 something flagged - go round again/ pivot not possible +2 looks unbounded +3 max iterations (iteration done)

With solveType_ ==2 this should Pivot in a variable and choose an outgoing one. Assumes primal feasible - will not go through a bound. Returns step length in theta
Returns ray in ray_

3.14.2.5 int AbcSimplexPrimal::updatePrimalsInPrimal (CoinIndexedVector * *rowArray*, double *theta*, double & *objectiveChange*, int *valuesPass*)

The primals are updated by the given array.

Returns number of infeasibilities. After rowArray will have cost changes for use next iteration

3.14.2.6 void AbcSimplexPrimal::updatePrimalsInPrimal (CoinIndexedVector & *rowArray*, double *theta*, bool *valuesPass*)

The primals are updated by the given array.

costs are changed

3.14.2.7 void AbcSimplexPrimal::primalRow (CoinIndexedVector * *rowArray*, CoinIndexedVector * *rhsArray*, CoinIndexedVector * *spareArray*, int *valuesPass*)

Row array has pivot column This chooses pivot row.

Rhs array is used for distance to next bound (for speed) For speed, we may need to go to a bucket approach when many variables go through bounds If valuesPass non-zero then compute dj for direction

3.14.2.8 void AbcSimplexPrimal::statusOfProblemInPrimal (int *type*)

Refactorizes if necessary Checks if finished.

Updates status. lastCleaned refers to iteration at which some objective/feasibility cleaning too place.

type - 0 initial so set up save arrays etc

- 1 normal -if good update save

2 restoring from saved

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

- AbcSimplexPrimal.hpp

3.15 AbcTolerancesEtc Class Reference

Public Member Functions

Constructors and destructors

- [AbcTolerancesEtc \(\)](#)
Default Constructor.

- `AbcTolerancesEtc (const ClpSimplex *model)`
Useful Constructors.
- `AbcTolerancesEtc (const AbcSimplex *model)`
- `AbcTolerancesEtc (const AbcTolerancesEtc &)`
Copy constructor.
- `AbcTolerancesEtc & operator= (const AbcTolerancesEtc &rhs)`
Assignment operator.
- `~AbcTolerancesEtc ()`
Destructor.

Public Attributes

Public member data

- double `zeroTolerance_`
Zero tolerance.
- double `primalToleranceToGetOptimal_`
Primal tolerance needed to make dual feasible (<largeTolerance).
- double `largeValue_`
Large bound value (for complementarity etc).
- double `alphaAccuracy_`
For computing whether to re-factorize.
- double `dualBound_`
Dual bound.
- double `dualTolerance_`
Current dual tolerance for algorithm.
- double `primalTolerance_`
Current primal tolerance for algorithm.
- double `infeasibilityCost_`
Weight assigned to being infeasible in primal.
- double `incomingInfeasibility_`
For advanced use.

- double **allowedInfeasibility_**
- int **baseIteration_**
Iteration when we entered dual or primal.
- int **numberRefinements_**
How many iterative refinements to do.
- int **forceFactorization_**
Now for some reliability aids This forces re-factorization early.
- int **perturbation_**
Perturbation: -50 to +50 - perturb by this power of ten (-6 sounds good) 100 - auto perturb if takes too long (1.0e-6 largest nonzero) 101 - we are perturbed 102 - don't try perturbing again default is 100.
- int **dontFactorizePivots_**
If may skip final factorize then allow up to this pivots (default 20).
- int **maximumPivots_**
For factorization Maximum number of pivots before factorization.

3.15.1 Detailed Description

Definition at line 251 of file CoinAbcCommon.hpp.

3.15.2 Member Data Documentation

3.15.2.1 double AbcTolerancesEtc::incomingInfeasibility_

For advanced use.

When doing iterative solves things can get nasty so on values pass if incoming solution has largest infeasibility < incomingInfeasibility throw out variables from basis until largest infeasibility < allowedInfeasibility. if allowedInfeasibility>= incomingInfeasibility this is always possible althoug you may end up with an all slack basis.

Defaults are 1.0,10.0

Definition at line 307 of file CoinAbcCommon.hpp.

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

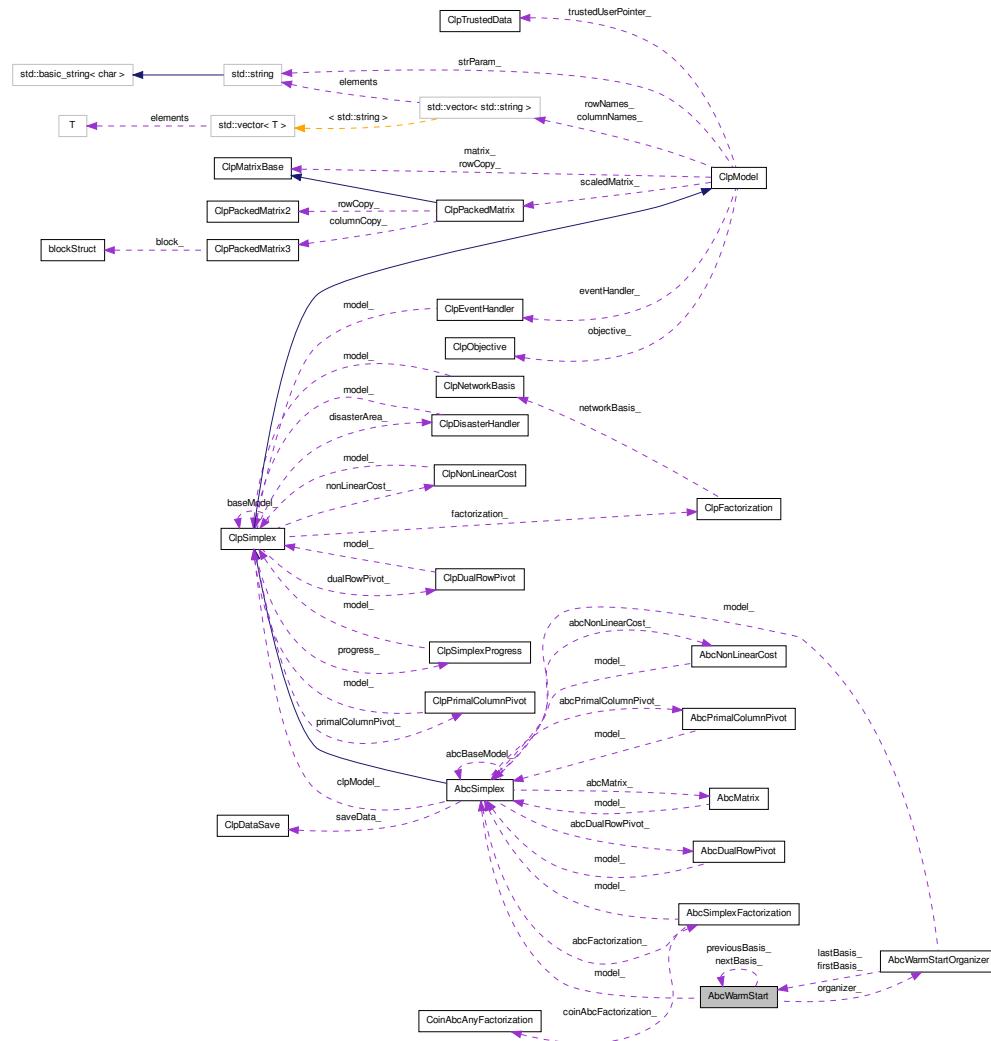
- CoinAbcCommon.hpp

3.16 AbcWarmStart Class Reference

As CoinWarmStartBasis but with alternatives (Also uses Clp status meaning for slacks).

```
#include <AbcWarmStart.hpp>
```

Collaboration diagram for AbcWarmStart:



Public Member Functions

Methods to modify the warm start object

- virtual void [setSize](#) (int ns, int na)
Set basis capacity; existing basis is discarded.
- virtual void [resize](#) (int newNumberRows, int newNumberColumns)
Set basis capacity; existing basis is maintained.
- virtual void [compressRows](#) (int tgtCnt, const int *tgts)
Delete a set of rows from the basis.
- virtual void [deleteRows](#) (int rawTgtCnt, const int *rawTgts)
Delete a set of rows from the basis.
- virtual void [deleteColumns](#) (int number, const int *which)
Delete a set of columns from the basis.
- void [setModel](#) ([AbcSimplex](#) *model)
Set model.
- [AbcSimplex](#) * [model](#) () const
Get model.
- void [createBasis0](#) (const [AbcSimplex](#) *model)
Create Basis type 0.
- void [createBasis12](#) (const [AbcSimplex](#) *model)
Create Basis type 12.
- void [createBasis34](#) (const [AbcSimplex](#) *model)
Create Basis type 34.

Constructors, destructors, and related functions

- [AbcWarmStart](#) ()
Default constructor.
- [AbcWarmStart](#) ([AbcSimplex](#) *model, int type)
Constructs a warm start object with the specified status vectors.
- [AbcWarmStart](#) (const [AbcWarmStart](#) &ws)
Copy constructor.

- virtual CoinWarmStart * [clone](#) () const
'Virtual constructor'
- virtual [~AbcWarmStart](#) ()
Destructor.
- virtual [AbcWarmStart & operator=](#) (const AbcWarmStart &rhs)
Assignment.
- virtual void [assignBasisStatus](#) (int ns, int na, char *&sStat, char *&aStat)
Assign the status vectors to be the warm start information.

Protected Attributes

Protected data members

- int [typeExtraInformation_](#)
Type of basis (always status arrays) 0 - as CoinWarmStartBasis 1,2 - plus factor order as shorts or ints (top bit set means column) 3,4 - plus compact saved factorization add 8 to say steepest edge weights stored (as floats) may want to change next,previous to tree info so can use a different basis for weights.
- int [lengthExtraInformation_](#)
Length of extra information in bytes.
- char * [extraInformation_](#)
The extra information.
- [AbcSimplex * model_](#)
Pointer back to [AbcSimplex](#) (can only be applied to that).
- [AbcWarmStartOrganizer * organizer_](#)
Pointer back to [AbcWarmStartOrganizer](#) for organization.
- [AbcWarmStart * previousBasis_](#)
Pointer to previous basis.
- [AbcWarmStart * nextBasis_](#)
Pointer to next basis.
- int [stamp_](#)
Sequence stamp for deletion.
- int [numberValidRows_](#)
Number of valid rows (rest should have slacks) Check to see if weights are OK for these rows and then just btran new ones for weights.

3.16.1 Detailed Description

As CoinWarmStartBasis but with alternatives (Also uses Clp status meaning for slacks).

Definition at line 75 of file AbcWarmStart.hpp.

3.16.2 Constructor & Destructor Documentation

3.16.2.1 AbcWarmStart::AbcWarmStart()

Default constructor.

Creates a warm start object representing an empty basis (0 rows, 0 columns).

3.16.2.2 AbcWarmStart::AbcWarmStart(AbcSimplex * *model*, int *type*)

Constructs a warm start object with the specified status vectors.

The parameters are copied. Consider [assignBasisStatus\(int,int,char*&,char*&\)](#) if the object should assume ownership.

See also

AbcWarmStart::Status for a description of the packing used in the status arrays.

3.16.3 Member Function Documentation

3.16.3.1 virtual void AbcWarmStart::setSize(int *ns*, int *na*) [virtual]

Set basis capacity; existing basis is discarded.

After execution of this routine, the warm start object does not describe a valid basis: all structural and artificial variables have status isFree.

3.16.3.2 virtual void AbcWarmStart::resize(int *newNumberRows*, int *newNumberColumns*) [virtual]

Set basis capacity; existing basis is maintained.

After execution of this routine, the warm start object describes a valid basis: the status of new structural variables (added columns) is set to nonbasic at lower bound, and the status of new artificial variables (added rows) is set to basic. (The basis can be invalid if new structural variables do not have a finite lower bound.)

3.16.3.3 **virtual void AbcWarmStart::compressRows (int *tgtCnt*, const int * *tgts*) [virtual]**

Delete a set of rows from the basis.

Warning

This routine assumes that the set of indices to be deleted is sorted in ascending order and contains no duplicates. Use [deleteRows\(\)](#) if this is not the case.

The resulting basis is guaranteed valid only if all deleted constraints are slack (hence the associated logicals are basic).

Removal of a tight constraint with a nonbasic logical implies that some basic variable must be made nonbasic. This correction is left to the client.

3.16.3.4 **virtual void AbcWarmStart::deleteRows (int *rawTgtCnt*, const int * *rawTgts*) [virtual]**

Delete a set of rows from the basis.

Warning

The resulting basis is guaranteed valid only if all deleted constraints are slack (hence the associated logicals are basic).

Removal of a tight constraint with a nonbasic logical implies that some basic variable must be made nonbasic. This correction is left to the client.

3.16.3.5 **virtual void AbcWarmStart::deleteColumns (int *number*, const int * *which*) [virtual]**

Delete a set of columns from the basis.

Warning

The resulting basis is guaranteed valid only if all deleted variables are nonbasic.

Removal of a basic variable implies that some nonbasic variable must be made basic. This correction is left to the client.

3.16.3.6 virtual void AbcWarmStart::assignBasisStatus (int *ns*, int *na*, char *& *sStat*, char *& *aStat*) [virtual]

Assign the status vectors to be the warm start information.

In this method the [AbcWarmStart](#) object assumes ownership of the pointers and upon return the argument pointers will be NULL. If copying is desirable, use the [array constructor](#) or the [assignment operator](#).

Note

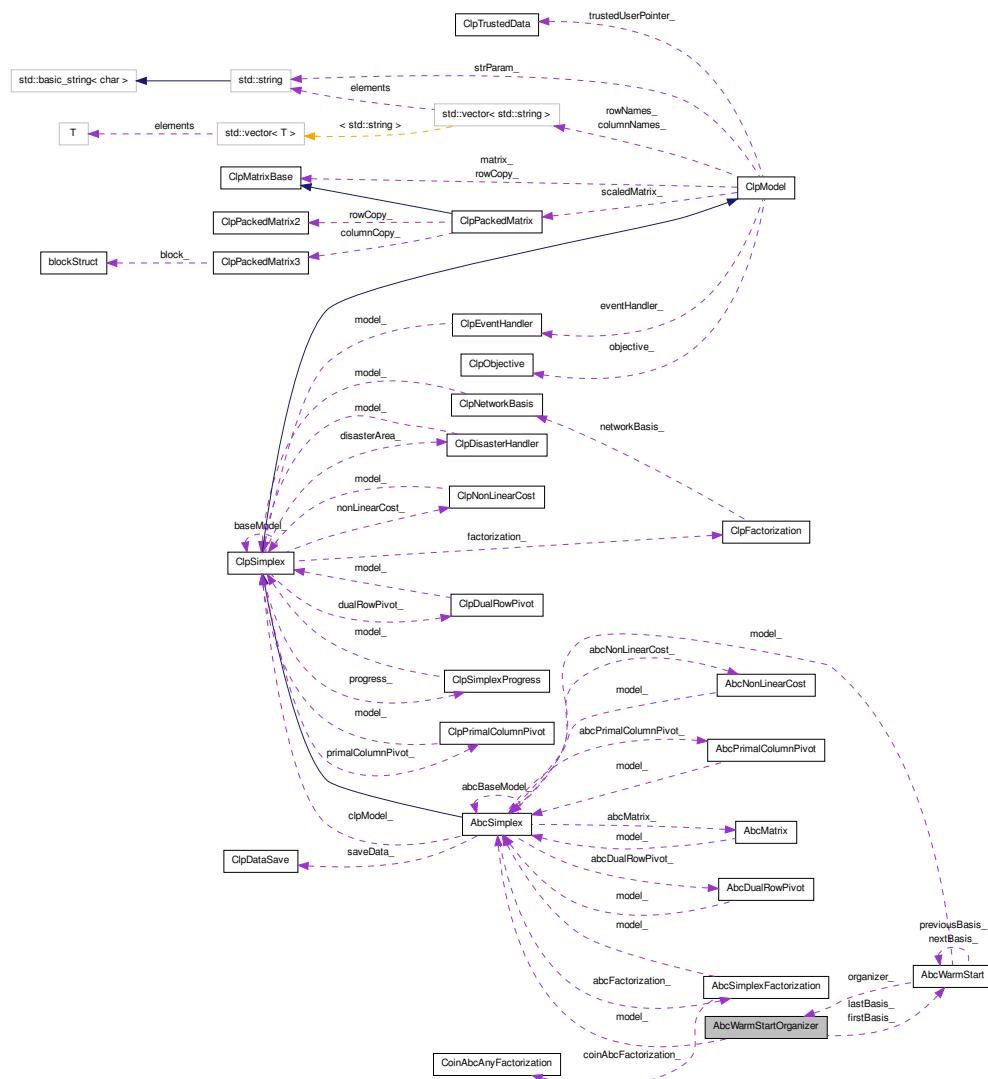
The pointers passed to this method will be freed using `delete[]`, so they must be created using `new[]`.

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

- `AbcWarmStart.hpp`

3.17 AbcWarmStartOrganizer Class Reference

Collaboration diagram for AbcWarmStartOrganizer:



Public Member Functions

- void `createBasis0()`

Create Basis type 0.

- void [createBasis12 \(\)](#)
Create Basis type 1,2.
- void [createBasis34 \(\)](#)
Create Basis type 3,4.
- void [deleteBasis \(AbcWarmStart *basis\)](#)
delete basis

Constructors, destructors, and related functions

- [AbcWarmStartOrganizer \(AbcSimplex *model=NULL\)](#)
Default constructor.
- [AbcWarmStartOrganizer \(const AbcWarmStartOrganizer &ws\)](#)
Copy constructor.
- virtual [~AbcWarmStartOrganizer \(\)](#)
Destructor.
- virtual [AbcWarmStartOrganizer & operator= \(const AbcWarmStartOrganizer &rhs\)](#)
Assignment.

Protected Attributes

Protected data members

- [AbcSimplex * model_](#)
Pointer to [AbcSimplex](#) (can only be applied to that).
- [AbcWarmStart * firstBasis_](#)
Pointer to first basis.
- [AbcWarmStart * lastBasis_](#)
Pointer to last basis.
- int [numberBases_](#)
Number of bases.
- int [sizeBases_](#)
Size of bases (extra).

3.17.1 Detailed Description

Definition at line 23 of file AbcWarmStart.hpp.

3.17.2 Constructor & Destructor Documentation

3.17.2.1 AbcWarmStartOrganizer::AbcWarmStartOrganizer (*AbcSimplex * model = NULL*)

Default constructor.

Creates a warm start object organizer

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

- AbcWarmStart.hpp

3.18 blockStruct Struct Reference

3.18.1 Detailed Description

Definition at line 571 of file ClpPackedMatrix.hpp.

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

- ClpPackedMatrix.hpp

3.19 blockStruct3 Struct Reference

3.19.1 Detailed Description

Definition at line 557 of file AbcMatrix.hpp.

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

- AbcMatrix.hpp

3.20 ClpNode::branchState Struct Reference

3.20.1 Detailed Description

Definition at line 121 of file ClpNode.hpp.

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

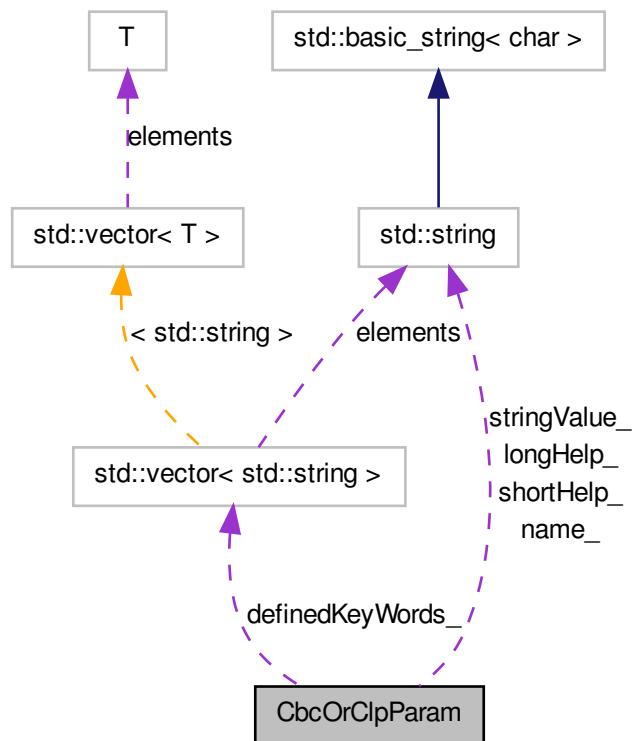
- ClpNode.hpp

3.21 CbcOrClpParam Class Reference

Very simple class for setting parameters.

```
#include <CbcOrClpParam.hpp>
```

Collaboration diagram for CbcOrClpParam:



Public Member Functions

Constructor and destructor

- [CbcOrClpParam \(\)](#)

Constructors.

- [CbcOrClpParam \(std::string name, std::string help, double lower, double upper, CbcOrClpParameterType type, int display=2\)](#)
- [CbcOrClpParam \(std::string name, std::string help, int lower, int upper, CbcOrClpParameterType type, int display=2\)](#)
- [CbcOrClpParam \(std::string name, std::string help, std::string firstValue, CbcOrClpParameterType type, int whereUsed=7, int display=2\)](#)
- [CbcOrClpParam \(std::string name, std::string help, CbcOrClpParameterType type, int whereUsed=7, int display=2\)](#)
- [CbcOrClpParam \(const CbcOrClpParam &\)](#)

Copy constructor.

- [CbcOrClpParam & operator= \(const CbcOrClpParam &rhs\)](#)

Assignment operator. This copies the data.

- [~CbcOrClpParam \(\)](#)

Destructor.

stuff

- [void append \(std::string keyWord\)](#)

Insert string (only valid for keywords).

- [void addHelp \(std::string keyWord\)](#)

Adds one help line.

- [std::string name \(\) const](#)

Returns name.

- [std::string shortHelp \(\) const](#)

Returns short help.

- [int setDoubleParameter \(CbcModel &model, double value\)](#)

Sets a double parameter (nonzero code if error).

- [const char * setDoubleParameterWithMessage \(CbcModel &model, double value, int &returnCode\)](#)

Sets double parameter and returns printable string and error code.

- [double doubleParameter \(CbcModel &model\) const](#)

Gets a double parameter.

- int [setIntParameter](#) (CbcModel &model, int value)
Sets a int parameter (nonzero code if error).
- const char * [setIntParameterWithMessage](#) (CbcModel &model, int value, int &returnCode)
Sets int parameter and returns printable string and error code.
- int [intParameter](#) (CbcModel &model) const
Gets a int parameter.
- int [setDoubleParameter](#) ([ClpSimplex](#) *model, double value)
Sets a double parameter (nonzero code if error).
- double [doubleParameter](#) ([ClpSimplex](#) *model) const
Gets a double parameter.
- const char * [setDoubleParameterWithMessage](#) ([ClpSimplex](#) *model, double value, int &returnCode)
Sets double parameter and returns printable string and error code.
- int [setIntParameter](#) ([ClpSimplex](#) *model, int value)
Sets a int parameter (nonzero code if error).
- const char * [setIntParameterWithMessage](#) ([ClpSimplex](#) *model, int value, int &returnCode)
Sets int parameter and returns printable string and error code.
- int [intParameter](#) ([ClpSimplex](#) *model) const
Gets a int parameter.
- int [setDoubleParameter](#) ([OsiSolverInterface](#) *model, double value)
Sets a double parameter (nonzero code if error).
- const char * [setDoubleParameterWithMessage](#) ([OsiSolverInterface](#) *model, double value, int &returnCode)
Sets double parameter and returns printable string and error code.
- double [doubleParameter](#) ([OsiSolverInterface](#) *model) const
Gets a double parameter.
- int [setIntParameter](#) ([OsiSolverInterface](#) *model, int value)
Sets a int parameter (nonzero code if error).

- const char * [setIntParameterWithMessage](#) (OsiSolverInterface *model, int value, int &returnCode)
Sets int parameter and returns printable string and error code.
- int [intParameter](#) (OsiSolverInterface *model) const
Gets a int parameter.
- int [checkDoubleParameter](#) (double value) const
Checks a double parameter (nonzero code if error).
- std::string [matchName](#) () const
Returns name which could match.
- int [lengthMatchName](#) () const
Returns length of name for printing.
- int [parameterOption](#) (std::string check) const
Returns parameter option which matches (-1 if none).
- void [printOptions](#) () const
Prints parameter options.
- std::string [currentOption](#) () const
Returns current parameter option.
- void [setCurrentOption](#) (int value, bool printIt=false)
Sets current parameter option.
- const char * [setCurrentOptionWithMessage](#) (int value)
Sets current parameter option and returns printable string.
- void [setCurrentOption](#) (const std::string value)
Sets current parameter option using string.
- int [currentOptionAsInteger](#) () const
Returns current parameter option position.
- void [setIntValue](#) (int value)
Sets int value.
- int [intValue](#) () const

- void **setDoubleValue** (double value)
Sets double value.
- double **doubleValue** () const
- void **setStringValue** (std::string value)
Sets string value.
- std::string **stringValue** () const
- int **matches** (std::string input) const
Returns 1 if matches minimum, 2 if matches less, 0 if not matched.
- CbcOrClpParameterType **type** () const
type
- int **displayThis** () const
whether to display
- void **setLonghelp** (const std::string help)
Set Long help.
- void **printLongHelp** () const
Print Long help.
- void **printString** () const
Print action and string.
- int **whereUsed** () const
7 if used everywhere, 1 - used by clp 2 - used by cbc 4 - used by ampl

3.21.1 Detailed Description

Very simple class for setting parameters.

Definition at line 288 of file CbcOrClpParam.hpp.

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

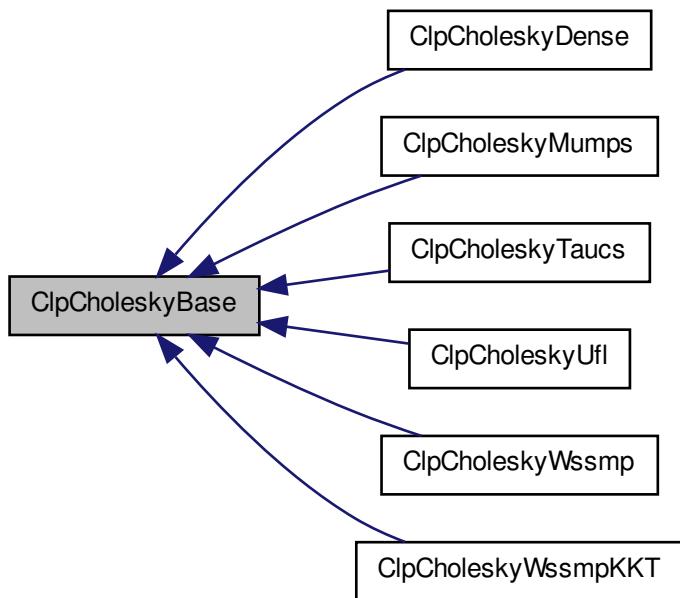
- CbcOrClpParam.hpp

3.22 ClpCholeskyBase Class Reference

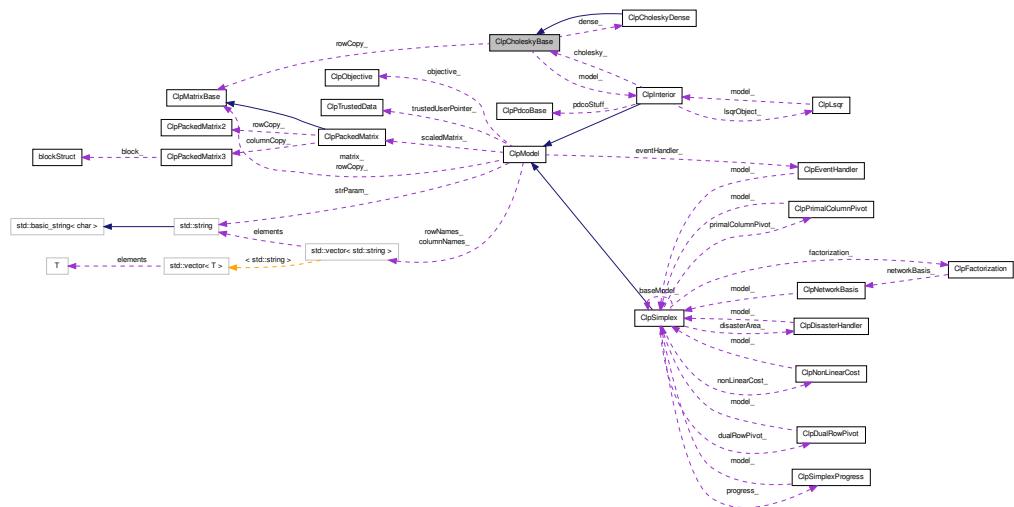
Base class for Clp Cholesky factorization Will do better factorization.

```
#include <ClpCholeskyBase.hpp>
```

Inheritance diagram for ClpCholeskyBase:



Collaboration diagram for ClpCholeskyBase:



Public Member Functions

Gets

- int **status** () const
status. Returns status
 - int **numberRowsDropped** () const
numberRowsDropped. Number of rows gone
 - void **resetRowsDropped** ()
reset numberRowsDropped and rowsDropped.
 - char * **rowsDropped** () const
rowsDropped - which rows are gone
 - double **choleskyCondition** () const
choleskyCondition.
 - double **goDense** () const
goDense i.e. use dense factoriaztion if > this (default 0.7).
 - void **setGoDense** (double value)

goDense i.e. use dense factoriaztion if > this (default 0.7).

- int **rank** () const
rank. Returns rank
- int **numberRows** () const
Return number of rows.
- CoinBigIndex **size** () const
Return size.
- longDouble * **sparseFactor** () const
Return sparseFactor.
- longDouble * **diagonal** () const
Return diagonal.
- longDouble * **workDouble** () const
Return workDouble.
- bool **kkt** () const
If KKT on.
- void **setKKT** (bool yesNo)
Set KKT.
- void **setIntegerParameter** (int i, int value)
Set integer parameter.
- int **getIntegerParameter** (int i)
get integer parameter
- void **setDoubleParameter** (int i, double value)
Set double parameter.
- double **getDoubleParameter** (int i)
get double parameter

Constructors, destructor

- **ClpCholeskyBase** (int denseThreshold=-1)
Constructor which has dense columns activated.
- virtual **~ClpCholeskyBase** ()

Destructor (has to be public).

- [ClpCholeskyBase](#) (const [ClpCholeskyBase](#) &)
Copy.
- [ClpCholeskyBase](#) & [operator=](#) (const [ClpCholeskyBase](#) &)
Assignment.

Protected Member Functions

Symbolic, factor and solve

- int [symbolic1](#) (const CoinBigIndex *Astart, const int *Arow)
Symbolic1 - works out size without clever stuff.
- void [symbolic2](#) (const CoinBigIndex *Astart, const int *Arow)
Symbolic2 - Fills in indices Uses lower triangular so can do cliques etc.
- void [factorizePart2](#) (int *rowsDropped)
Factorize - filling in rowsDropped and returning number dropped in integerParam.
- void [solve](#) (CoinWorkDouble *region, int type)
solve - 1 just first half, 2 just second half - 3 both.
- int [preOrder](#) (bool lowerTriangular, bool includeDiagonal, bool doKKT)
Forms ADAT - returns nonzero if not enough memory.
- void [updateDense](#) (longDouble *d, int *first)
Updates dense part (broken out for profiling).

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- int [type_](#)
type (may be useful) if > 20 do KKT
- bool [doKKT_](#)
Doing full KKT (only used if default symbolic and factorization).
- double [goDense_](#)
Go dense at this fraction.

- double **choleskyCondition_**
choleskyCondition.
- **ClpInterior * model_**
model.
- int **numberTrials_**
numberTrials. Number of trials before rejection
- int **numberRows_**
numberRows. Number of Rows in factorization
- int **status_**
status. Status of factorization
- char * **rowsDropped_**
rowsDropped
- int * **permuteInverse_**
permute inverse.
- int * **permute_**
main permute.
- int **numberRowsDropped_**
numberRowsDropped. Number of rows gone
- longDouble * **sparseFactor_**
sparseFactor.
- CoinBigIndex * **choleskyStart_**
choleskyStart - element starts
- int * **choleskyRow_**
choleskyRow (can be shorter than sparsefactor)
- CoinBigIndex * **indexStart_**
Index starts.
- longDouble * **diagonal_**
Diagonal.
- longDouble * **workDouble_**
double work array

- `int * link_`
link array
- `CoinBigIndex * workInteger_`
- `int * clique_`
- `CoinBigIndex sizeFactor_`
sizeFactor.
- `CoinBigIndex sizeIndex_`
Size of index array.
- `int firstDense_`
First dense row.
- `int integerParameters_ [64]`
integerParameters
- `double doubleParameters_ [64]`
doubleParameters;
- `ClpMatrixBase * rowCopy_`
Row copy of matrix.
- `char * whichDense_`
Dense indicators.
- `longDouble * denseColumn_`
Dense columns (updated).
- `ClpCholeskyDense * dense_`
Dense cholesky.
- `int denseThreshold_`
Dense threshold (for taking out of Cholesky).

Virtual methods that the derived classes may provide

- `virtual int order (ClpInterior *model)`
Orders rows and saves pointer to matrix.and model.
- `virtual int symbolic ()`
Does Symbolic factorization given permutation.

- virtual int **factorize** (const CoinWorkDouble *diagonal, int *rowsDropped)
Factorize - filling in rowsDropped and returning number dropped.
- virtual void **solve** (CoinWorkDouble *region)
Uses factorization to solve.
- virtual void **solveKKT** (CoinWorkDouble *region1, CoinWorkDouble *region2, const CoinWorkDouble *diagonal, CoinWorkDouble diagonalScaleFactor)
Uses factorization to solve.

Other

Clone

- virtual ClpCholeskyBase * **clone** () const
- int **type** () const
Returns type.
- void **setType** (int type)
Sets type.
- void **setModel** (ClpInterior *model)
model.

3.22.1 Detailed Description

Base class for Clp Cholesky factorization Will do better factorization. very crude ordering

Derived classes may be using more sophisticated methods

Definition at line 53 of file ClpCholeskyBase.hpp.

3.22.2 Constructor & Destructor Documentation

3.22.2.1 ClpCholeskyBase::ClpCholeskyBase (int *denseThreshold* = -1)

Constructor which has dense columns activated.

Default is off.

3.22.3 Member Function Documentation

3.22.3.1 virtual int ClpCholeskyBase::order (ClpInterior * *model*) [virtual]

Orders rows and saves pointer to matrix and model.

returns non-zero if not enough memory. You can use preOrder to set up ADAT If using default symbolic etc then must set sizeFactor_ to size of input matrix to order (and to symbolic). Also just permute_ and permuteInverse_ should be created

Reimplemented in [ClpCholeskyDense](#), [ClpCholeskyMumps](#), [ClpCholeskyTaucs](#), [ClpCholeskyUfl](#), [ClpCholeskyWssmp](#), and [ClpCholeskyWssmpKKT](#).

3.22.3.2 virtual int ClpCholeskyBase::symbolic () [virtual]

Does Symbolic factorization given permutation.

This is called immediately after order. If user provides this then user must provide factorize and solve. Otherwise the default factorization is used returns non-zero if not enough memory

Reimplemented in [ClpCholeskyDense](#), [ClpCholeskyMumps](#), [ClpCholeskyTaucs](#), [ClpCholeskyUfl](#), [ClpCholeskyWssmp](#), and [ClpCholeskyWssmpKKT](#).

3.22.3.3 virtual int ClpCholeskyBase::factorize (const CoinWorkDouble * *diagonal*, int * *rowsDropped*) [virtual]

Factorize - filling in rowsDropped and returning number dropped.

If return code negative then out of memory

Reimplemented in [ClpCholeskyDense](#).

3.22.3.4 virtual void ClpCholeskyBase::solve (CoinWorkDouble * *region*) [virtual]

Uses factorization to solve.

Reimplemented in [ClpCholeskyDense](#).

```
3.22.3.5 virtual void ClpCholeskyBase::solveKKT ( CoinWorkDouble *
region1, CoinWorkDouble * region2, const CoinWorkDouble *
diagonal, CoinWorkDouble diagonalScaleFactor ) [virtual]
```

Uses factorization to solve.

- given as if KKT. region1 is rows+columns, region2 is rows

```
3.22.3.6 int ClpCholeskyBase::symbolic1 ( const CoinBigIndex * Astart, const
int * Arow ) [protected]
```

Symbolic1 - works out size without clever stuff.

Uses upper triangular as much easier. Returns size

```
3.22.3.7 void ClpCholeskyBase::solve ( CoinWorkDouble * region, int type )
[protected]
```

solve - 1 just first half, 2 just second half - 3 both.

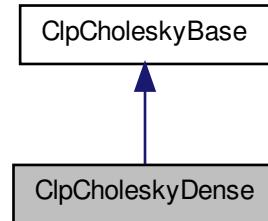
If 1 and 2 then diagonal has sqrt of inverse otherwise inverse

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

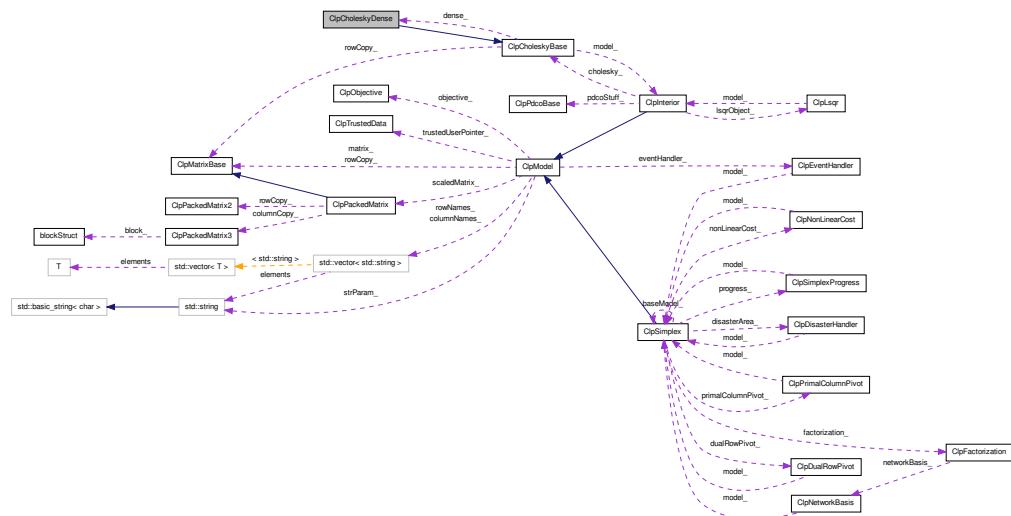
- ClpCholeskyBase.hpp

3.23 ClpCholeskyDense Class Reference

Inheritance diagram for ClpCholeskyDense:



Collaboration diagram for ClpCholeskyDense:



Public Member Functions

Virtual methods that the derived classes provides

- virtual int **order** (ClpInterior *model)
Orders rows and saves pointer to matrix and model.
- virtual int **symbolic** ()
Does Symbolic factorization given permutation.
- virtual int **factorize** (const CoinWorkDouble *diagonal, int *rowsDropped)
Factorize - filling in rowsDropped and returning number dropped.
- virtual void **solve** (CoinWorkDouble *region)
Uses factorization to solve.

Non virtual methods for ClpCholeskyDense

- int **reserveSpace** (const ClpCholeskyBase *factor, int numberOfRows)
Reserves space.
- CoinBigIndex **space** (int numberOfRows) const
Returns space needed.
- void **factorizePart2** (int *rowsDropped)
part 2 of Factorize - filling in rowsDropped
- void **factorizePart3** (int *rowsDropped)
part 2 of Factorize - filling in rowsDropped - blocked
- void **solveF1** (longDouble *a, int n, CoinWorkDouble *region)
Forward part of solve.
- void **solveF2** (longDouble *a, int n, CoinWorkDouble *region, CoinWorkDouble *region2)
- void **solveB1** (longDouble *a, int n, CoinWorkDouble *region)
Backward part of solve.
- void **solveB2** (longDouble *a, int n, CoinWorkDouble *region, CoinWorkDouble *region2)
- int **bNumber** (const longDouble *array, int &, int &)
- longDouble * **aMatrix** () const
A.
- longDouble * **diagonal** () const
Diagonal.

Constructors, destructor

- [ClpCholeskyDense \(\)](#)
Default constructor.
- virtual [~ClpCholeskyDense \(\)](#)
Destructor.
- [ClpCholeskyDense \(const ClpCholeskyDense &\)](#)
Copy.
- [ClpCholeskyDense & operator= \(const ClpCholeskyDense &\)](#)
Assignment.
- virtual [ClpCholeskyBase * clone \(\) const](#)
Clone.

3.23.1 Detailed Description

Definition at line 14 of file ClpCholeskyDense.hpp.

3.23.2 Constructor & Destructor Documentation

3.23.2.1 ClpCholeskyDense::ClpCholeskyDense ()

Default constructor.

3.23.3 Member Function Documentation

3.23.3.1 virtual int ClpCholeskyDense::order (ClpInterior * *model*) [virtual]

Orders rows and saves pointer to matrix.and model.

Returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.23.3.2 virtual int ClpCholeskyDense::symbolic () [virtual]

Does Symbolic factorization given permutation.

This is called immediately after order. If user provides this then user must provide factorize and solve. Otherwise the default factorization is used returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.23.3.3 virtual int ClpCholeskyDense::factorize (const CoinWorkDouble * *diagonal*, int * *rowsDropped*) [virtual]

Factorize - filling in rowsDropped and returning number dropped.

If return code negative then out of memory

Reimplemented from [ClpCholeskyBase](#).

3.23.3.4 virtual void ClpCholeskyDense::solve (CoinWorkDouble * *region*) [virtual]

Uses factorization to solve.

Reimplemented from [ClpCholeskyBase](#).

3.23.3.5 int ClpCholeskyDense::reserveSpace (const ClpCholeskyBase * *factor*, int *numberRows*)

Reserves space.

If factor not NULL then just uses passed space Returns non-zero if not enough memory

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

- ClpCholeskyDense.hpp

3.24 ClpCholeskyDenseC Struct Reference

3.24.1 Detailed Description

Definition at line 88 of file ClpCholeskyDense.hpp.

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

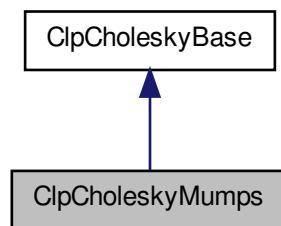
- ClpCholeskyDense.hpp

3.25 ClpCholeskyMumps Class Reference

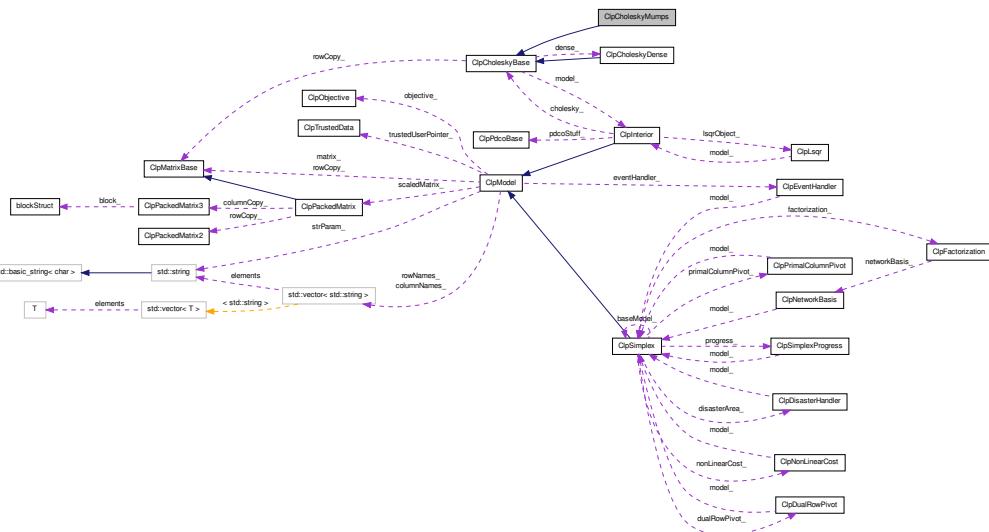
Mumps class for Clp Cholesky factorization.

```
#include <ClpCholeskyMumps.hpp>
```

Inheritance diagram for ClpCholeskyMumps:



Collaboration diagram for ClpCholeskyMumps:



Public Member Functions

Virtual methods that the derived classes provides

- virtual int **order** ([ClpInterior](#) *model)
Orders rows and saves pointer to matrix and model.
- virtual int **symbolic** ()
Does Symbolic factorization given permutation.
- virtual int **factorize** (const double *diagonal, int *rowsDropped)
Factorize - filling in rowsDropped and returning number dropped.
- virtual void **solve** (double *region)
Uses factorization to solve.

Constructors, destructor

- [**ClpCholeskyMumps** \(int denseThreshold=-1\)](#)
Constructor which has dense columns activated.
- virtual [**~ClpCholeskyMumps** \(\)](#)
Destructor.
- virtual [**ClpCholeskyBase** * **clone** \(\) const](#)
Clone.

3.25.1 Detailed Description

Mumps class for Clp Cholesky factorization.

Definition at line 21 of file ClpCholeskyMumps.hpp.

3.25.2 Constructor & Destructor Documentation

3.25.2.1 [**ClpCholeskyMumps::ClpCholeskyMumps \(int *denseThreshold* = -1 \)**](#)

Constructor which has dense columns activated.

Default is off.

3.25.3 Member Function Documentation

3.25.3.1 virtual int ClpCholeskyMumps::order (ClpInterior * *model*) [virtual]

Orders rows and saves pointer to matrix and model.

Returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.25.3.2 virtual int ClpCholeskyMumps::symbolic () [virtual]

Does Symbolic factorization given permutation.

This is called immediately after order. If user provides this then user must provide factorize and solve. Otherwise the default factorization is used returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.25.3.3 virtual int ClpCholeskyMumps::factorize (const double * *diagonal*, int * *rowsDropped*) [virtual]

Factorize - filling in rowsDropped and returning number dropped.

If return code negative then out of memory

3.25.3.4 virtual void ClpCholeskyMumps::solve (double * *region*) [virtual]

Uses factorization to solve.

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

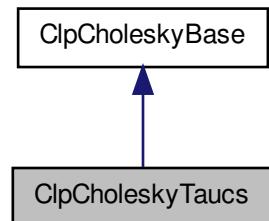
- ClpCholeskyMumps.hpp

3.26 ClpCholeskyTaucs Class Reference

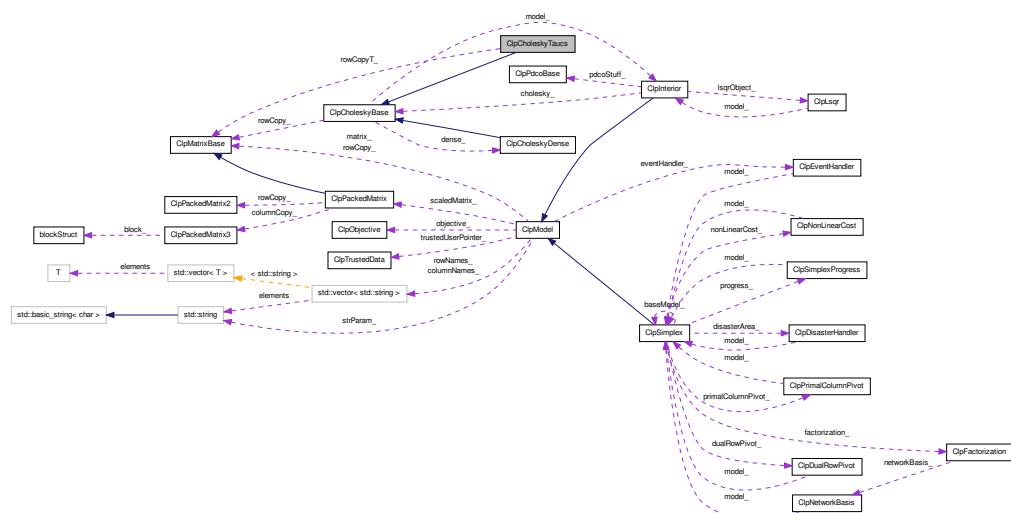
Taucs class for Clp Cholesky factorization.

```
#include <ClpCholeskyTaucs.hpp>
```

Inheritance diagram for ClpCholeskyTaucs:



Collaboration diagram for ClpCholeskyTausc:



Public Member Functions

Virtual methods that the derived classes provides

- virtual int **order** ([ClpInterior](#) *model)
Orders rows and saves pointer to matrix and model.
- virtual int **symbolic** ()
Dummy.
- virtual int **factorize** (const double *diagonal, int *rowsDropped)
Factorize - filling in rowsDropped and returning number dropped.
- virtual void **solve** (double *region)
Uses factorization to solve.

Constructors, destructor

- [ClpCholeskyTaucs](#) ()
Default constructor.
- virtual [~ClpCholeskyTaucs](#) ()
Destructor.
- [ClpCholeskyTaucs](#) (const [ClpCholeskyTaucs](#) &)
- [ClpCholeskyTaucs](#) & **operator=** (const [ClpCholeskyTaucs](#) &)
- virtual [ClpCholeskyBase](#) * **clone** () const
Clone.

3.26.1 Detailed Description

Taucs class for Clp Cholesky factorization. If you wish to use Sivan Toledo's TAUCS code see

<http://www.tau.ac.il/~stoledo/taucs/>

for terms of use

The taucs.h file was modified to put

```
ifdef __cplusplus extern "C" { endif after line 440 (endif) and ifdef __cplusplus } endif
at end
```

I also modified LAPACK dpotf2.f (two places) to change the GO TO 30 on AJJ.Lt.0.0 to

```
IF( AJJ.LE.1.0e-20 ) THEN AJJ = 1.0e100; ELSE AJJ = SQRT( AJJ ) END IF
```

Definition at line 43 of file ClpCholeskyTaucs.hpp.

3.26.2 Constructor & Destructor Documentation

3.26.2.1 ClpCholeskyTaucs::ClpCholeskyTaucs ()

Default constructor.

3.26.3 Member Function Documentation

3.26.3.1 virtual int ClpCholeskyTaucs::order (ClpInterior * *model*) [virtual]

Orders rows and saves pointer to matrix.and model.

Returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.26.3.2 virtual int ClpCholeskyTaucs::factorize (const double * *diagonal*, int * *rowsDropped*) [virtual]

Factorize - filling in rowsDropped and returning number dropped.

If return code negative then out of memory

3.26.3.3 virtual void ClpCholeskyTaucs::solve (double * *region*) [virtual]

Uses factorization to solve.

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

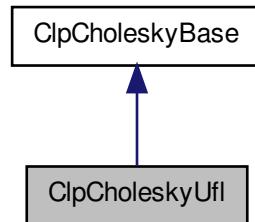
- ClpCholeskyTaucs.hpp

3.27 ClpCholeskyUfl Class Reference

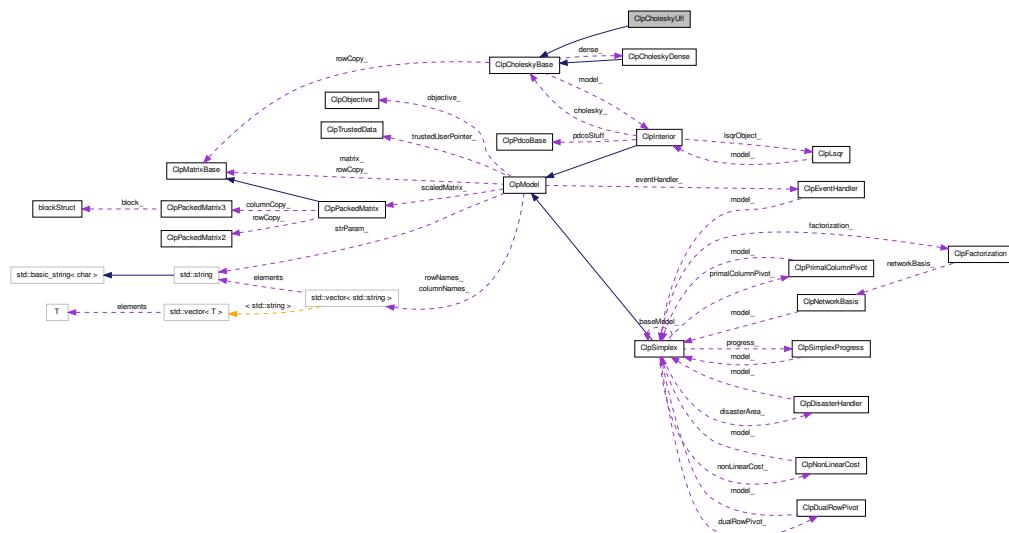
Ufl class for Clp Cholesky factorization.

```
#include <ClpCholeskyUfl.hpp>
```

Inheritance diagram for ClpCholeskyUfl:



Collaboration diagram for ClpCholeskyUfl:



Public Member Functions

Virtual methods that the derived classes provides

- virtual int [order \(ClpInterior *model\)](#)

Orders rows and saves pointer to matrix.and model.

- virtual int **symbolic** ()
Does Symbolic factorization given permutation using CHOLMOD (if available).
- virtual int **factorize** (const double *diagonal, int *rowsDropped)
Factorize - filling in rowsDropped and returning number dropped using CHOLMOD (if available).
- virtual void **solve** (double *region)
Uses factorization to solve.

Constructors, destructor

- **ClpCholeskyUfl** (int denseThreshold=-1)
Constructor which has dense columns activated.
- virtual **~ClpCholeskyUfl** ()
Destructor.
- virtual **ClpCholeskyBase** * **clone** () const
Clone.

3.27.1 Detailed Description

Ufl class for Clp Cholesky factorization. If you wish to use AMD code from University of Florida see

<http://www.cise.ufl.edu/research/sparse/amd>

for terms of use

If you wish to use CHOLMOD code from University of Florida see

<http://www.cise.ufl.edu/research/sparse/cholmod>

for terms of use

Definition at line 32 of file ClpCholeskyUfl.hpp.

3.27.2 Constructor & Destructor Documentation

3.27.2.1 ClpCholeskyUfl::ClpCholeskyUfl (int *denseThreshold* = -1)

Constructor which has dense columns activated.

Default is off.

3.27.3 Member Function Documentation

3.27.3.1 virtual int ClpCholeskyUfl::order (ClpInterior * *model*) [virtual]

Orders rows and saves pointer to matrix and model.

Returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.27.3.2 virtual int ClpCholeskyUfl::symbolic () [virtual]

Does Symbolic factorization given permutation using CHOLMOD (if available).

This is called immediately after order. If user provides this then user must provide factorize and solve. Otherwise the default factorization is used returns non-zero if not enough memory.

Reimplemented from [ClpCholeskyBase](#).

3.27.3.3 virtual int ClpCholeskyUfl::factorize (const double * *diagonal*, int * *rowsDropped*) [virtual]

Factorize - filling in rowsDropped and returning number dropped using CHOLMOD (if available).

If return code negative then out of memory

3.27.3.4 virtual void ClpCholeskyUfl::solve (double * *region*) [virtual]

Uses factorization to solve.

Uses CHOLMOD (if available).

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

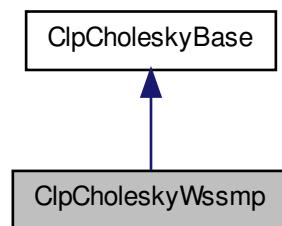
- ClpCholeskyUfl.hpp

3.28 ClpCholeskyWssmp Class Reference

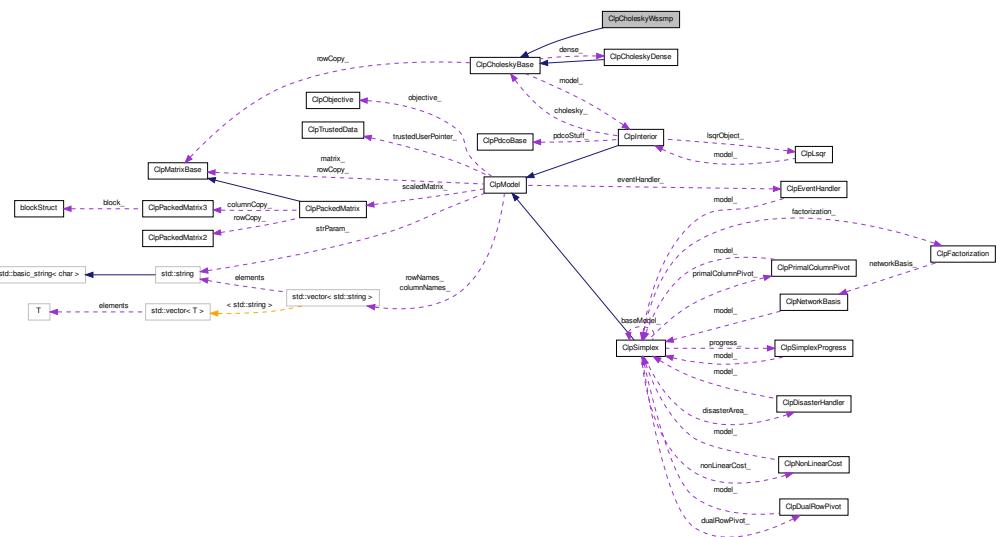
Wssmp class for Clp Cholesky factorization.

```
#include <ClpCholeskyWssmp.hpp>
```

Inheritance diagram for ClpCholeskyWssmp:



Collaboration diagram for ClpCholeskyWssmp:



Public Member Functions

Virtual methods that the derived classes provides

- virtual int `order` (`ClpInterior` *model)
Orders rows and saves pointer to matrix and model.
- virtual int `symbolic` ()
Does Symbolic factorization given permutation.
- virtual int `factorize` (const double *diagonal, int *rowsDropped)
Factorize - filling in rowsDropped and returning number dropped.
- virtual void `solve` (double *region)
Uses factorization to solve.

Constructors, destructor

- `ClpCholeskyWssmp` (int `denseThreshold`=-1)
Constructor which has dense columns activated.
- virtual `~ClpCholeskyWssmp` ()
Destructor.
- `ClpCholeskyWssmp` (const `ClpCholeskyWssmp` &)
- `ClpCholeskyWssmp` & `operator=` (const `ClpCholeskyWssmp` &)
- virtual `ClpCholeskyBase` * `clone` () const
Clone.

3.28.1 Detailed Description

Wssmp class for Clp Cholesky factorization.

Definition at line 17 of file ClpCholeskyWssmp.hpp.

3.28.2 Constructor & Destructor Documentation

3.28.2.1 `ClpCholeskyWssmp::ClpCholeskyWssmp (int denseThreshold = -1)`

Constructor which has dense columns activated.

Default is off.

3.28.3 Member Function Documentation

3.28.3.1 virtual int ClpCholeskyWssmp::order (ClpInterior * *model*) [virtual]

Orders rows and saves pointer to matrix and model.

Returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.28.3.2 virtual int ClpCholeskyWssmp::symbolic () [virtual]

Does Symbolic factorization given permutation.

This is called immediately after order. If user provides this then user must provide factorize and solve. Otherwise the default factorization is used returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.28.3.3 virtual int ClpCholeskyWssmp::factorize (const double * *diagonal*, int * *rowsDropped*) [virtual]

Factorize - filling in rowsDropped and returning number dropped.

If return code negative then out of memory

3.28.3.4 virtual void ClpCholeskyWssmp::solve (double * *region*) [virtual]

Uses factorization to solve.

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

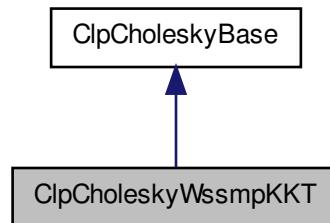
- ClpCholeskyWssmp.hpp

3.29 ClpCholeskyWssmpKKT Class Reference

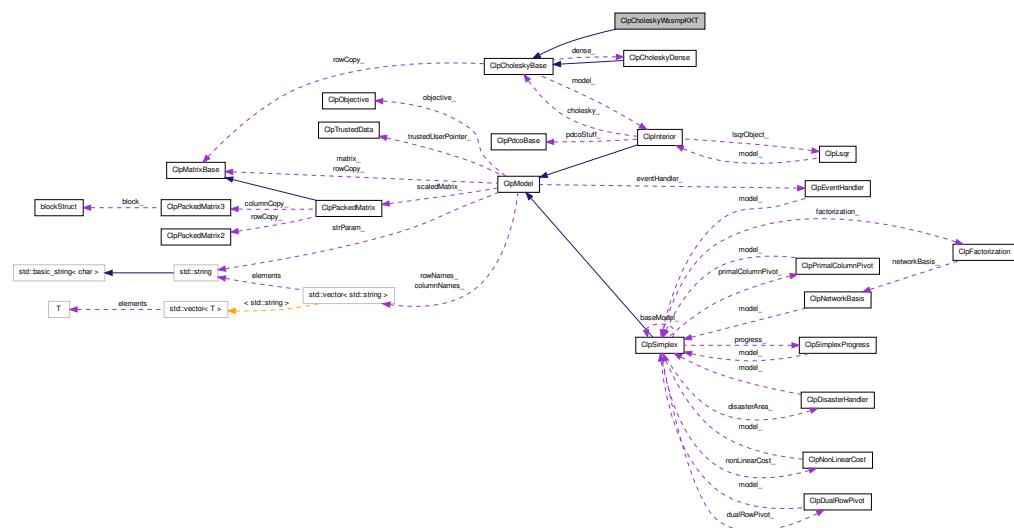
WssmpKKT class for Clp Cholesky factorization.

```
#include <ClpCholeskyWssmpKKT.hpp>
```

Inheritance diagram for ClpCholeskyWssmpKKT:



Collaboration diagram for ClpCholeskyWssmpKKT:



Public Member Functions

Virtual methods that the derived classes provides

- virtual int **order** ([ClpInterior](#) *model)
Orders rows and saves pointer to matrix and model.
- virtual int **symbolic** ()
Does Symbolic factorization given permutation.
- virtual int **factorize** (const double *diagonal, int *rowsDropped)
Factorize - filling in rowsDropped and returning number dropped.
- virtual void **solve** (double *region)
Uses factorization to solve.
- virtual void **solveKKT** (double *region1, double *region2, const double *diagonal, double diagonalScaleFactor)
Uses factorization to solve.

Constructors, destructor

- [**ClpCholeskyWssmpKKT**](#) (int denseThreshold=-1)
Constructor which has dense columns activated.
- virtual [**~ClpCholeskyWssmpKKT**](#) ()
Destructor.
- [**ClpCholeskyWssmpKKT**](#) (const [ClpCholeskyWssmpKKT](#) &)
- [**ClpCholeskyWssmpKKT**](#) & **operator=** (const [ClpCholeskyWssmpKKT](#) &)
- virtual [**ClpCholeskyBase**](#) * **clone** () const
Clone.

3.29.1 Detailed Description

WssmpKKT class for Clp Cholesky factorization.

Definition at line 17 of file ClpCholeskyWssmpKKT.hpp.

3.29.2 Constructor & Destructor Documentation

3.29.2.1 [**ClpCholeskyWssmpKKT::ClpCholeskyWssmpKKT**](#) (int **denseThreshold** = -1)

Constructor which has dense columns activated.

Default is off.

3.29.3 Member Function Documentation

3.29.3.1 virtual int ClpCholeskyWssmpKKT::order (ClpInterior * *model*) [virtual]

Orders rows and saves pointer to matrix and model.

Returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.29.3.2 virtual int ClpCholeskyWssmpKKT::symbolic () [virtual]

Does Symbolic factorization given permutation.

This is called immediately after order. If user provides this then user must provide factorize and solve. Otherwise the default factorization is used returns non-zero if not enough memory

Reimplemented from [ClpCholeskyBase](#).

3.29.3.3 virtual int ClpCholeskyWssmpKKT::factorize (const double * *diagonal*, int * *rowsDropped*) [virtual]

Factorize - filling in rowsDropped and returning number dropped.

If return code negative then out of memory

3.29.3.4 virtual void ClpCholeskyWssmpKKT::solve (double * *region*) [virtual]

Uses factorization to solve.

3.29.3.5 virtual void ClpCholeskyWssmpKKT::solveKKT (double * *region1*, double * *region2*, const double * *diagonal*, double *diagonalScaleFactor*) [virtual]

Uses factorization to solve.

- given as if KKT. region1 is rows+columns, region2 is rows

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

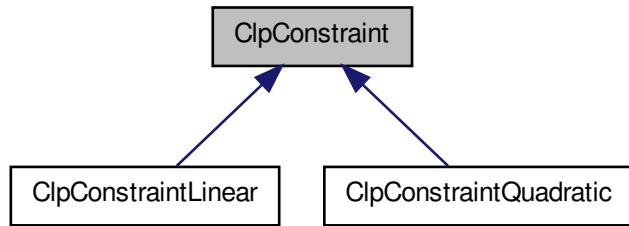
- ClpCholeskyWssmpKKT.hpp

3.30 ClpConstraint Class Reference

Constraint Abstract Base Class.

```
#include <ClpConstraint.hpp>
```

Inheritance diagram for ClpConstraint:



Public Member Functions

Stuff

- virtual int **gradient** (const [ClpSimplex](#) *model, const double *solution, double *gradient, double &functionValue, double &offset, bool useScaling=false, bool refresh=true) const =0
Fills gradient.
- virtual double **functionValue** (const [ClpSimplex](#) *model, const double *solution, bool useScaling=false, bool refresh=true) const
Constraint function value.
- virtual void **resize** (int newNumberColumns)=0
Resize constraint.

- virtual void [deleteSome](#) (int numberToDelete, const int *which)=0
Delete columns in constraint.
- virtual void [reallyScale](#) (const double *columnScale)=0
Scale constraint.
- virtual int [markNonlinear](#) (char *which) const =0
Given a zeroed array sets nonlinear columns to 1.
- virtual int [markNonzero](#) (char *which) const =0
Given a zeroed array sets possible nonzero coefficients to 1.

Constructors and destructors

- [ClpConstraint \(\)](#)
Default Constructor.
- [ClpConstraint \(const ClpConstraint &\)](#)
Copy constructor.
- [ClpConstraint & operator= \(const ClpConstraint &rhs\)](#)
Assignment operator.
- virtual [~ClpConstraint \(\)](#)
Destructor.
- virtual [ClpConstraint * clone \(\) const](#) =0
Clone.

Other

- int [type \(\)](#)
Returns type, 0 linear, 1 nonlinear.
- int [rowNumber \(\) const](#)
Row number (-1 is objective).
- virtual int [numberCoefficients \(\) const](#) =0
Number of possible coefficients in gradient.
- double [functionValue \(\) const](#)
Stored constraint function value.

- double `offset () const`
Constraint offset.
- virtual void `newXValues ()`
Say we have new primal solution - so may need to recompute.

Protected Attributes

Protected member data

- double * `lastGradient_`
Gradient at last evaluation.
- double `functionValue_`
Value of non-linear part of constraint.
- double `offset_`
Value of offset for constraint.
- int `type_`
Type of constraint - linear is 1.
- int `rowNumber_`
Row number (-1 is objective).

3.30.1 Detailed Description

Constraint Abstract Base Class. Abstract Base Class for describing a constraint or objective function

Definition at line 19 of file ClpConstraint.hpp.

3.30.2 Member Function Documentation

3.30.2.1 virtual int ClpConstraint::gradient (const ClpSimplex * *model*, const double * *solution*, double * *gradient*, double & *functionValue*, double & *offset*, bool *useScaling* = `false`, bool *refresh* = `true`) const [pure virtual]

Fills gradient.

If Linear then solution may be NULL, also returns true value of function and offset so we can use x not deltaX in constraint If refresh is false then uses last solution Uses model for scaling Returns non-zero if gradient undefined at current solution

Implemented in [ClpConstraintLinear](#), and [ClpConstraintQuadratic](#).

3.30.2.2 virtual int ClpConstraint::markNonlinear (char * *which*) const [pure virtual]

Given a zeroed array sets nonlinear columns to 1.

Returns number of nonlinear columns

Implemented in [ClpConstraintLinear](#), and [ClpConstraintQuadratic](#).

3.30.2.3 virtual int ClpConstraint::markNonzero (char * *which*) const [pure virtual]

Given a zeroed array sets possible nonzero coefficients to 1.

Returns number of nonzeros

Implemented in [ClpConstraintLinear](#), and [ClpConstraintQuadratic](#).

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

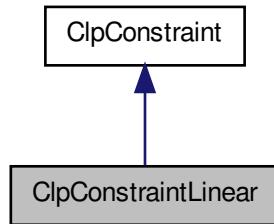
- ClpConstraint.hpp

3.31 ClpConstraintLinear Class Reference

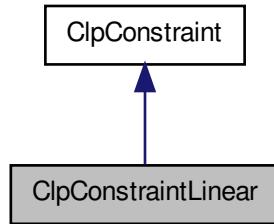
Linear Constraint Class.

```
#include <ClpConstraintLinear.hpp>
```

Inheritance diagram for ClpConstraintLinear:



Collaboration diagram for ClpConstraintLinear:



Public Member Functions

Stuff

- virtual int `gradient` (const `ClpSimplex` *model, const double *solution, double *gradient, double &functionValue, double &offset, bool useScaling=false, bool refresh=true) const
Fills gradient.
- virtual void `resize` (int newNumberColumns)

Resize constraint.

- virtual void [deleteSome](#) (int numberToDelete, const int *which)
Delete columns in constraint.
- virtual void [reallyScale](#) (const double *columnScale)
Scale constraint.
- virtual int [markNonlinear](#) (char *which) const
Given a zeroed array sets nonlinear columns to 1.
- virtual int [markNonzero](#) (char *which) const
Given a zeroed array sets possible nonzero coefficients to 1.

Constructors and destructors

- [ClpConstraintLinear \(\)](#)
Default Constructor.
- [ClpConstraintLinear](#) (int row, int numberCoefficients, int numberColumns, const int *column, const double *element)
Constructor from constraint.
- [ClpConstraintLinear](#) (const [ClpConstraintLinear](#) &rhs)
Copy constructor.
- [ClpConstraintLinear](#) & [operator=](#) (const [ClpConstraintLinear](#) &rhs)
Assignment operator.
- virtual [~ClpConstraintLinear \(\)](#)
Destructor.
- virtual [ClpConstraint](#) * [clone](#) () const
Clone.

Gets and sets

- virtual int [numberCoefficients](#) () const
Number of coefficients.
- int [numberColumns](#) () const
Number of columns in linear constraint.

- const int * **column** () const
Columns.
- const double * **coefficient** () const
Coefficients.

3.31.1 Detailed Description

Linear Constraint Class.

Definition at line 17 of file ClpConstraintLinear.hpp.

3.31.2 Member Function Documentation

**3.31.2.1 virtual int ClpConstraintLinear::gradient (const ClpSimplex *
model, const double * solution, double * gradient, double &
functionValue, double & offset, bool useScaling = false, bool
refresh = true) const [virtual]**

Fills gradient.

If Linear then solution may be NULL, also returns true value of function and offset so we can use x not deltaX in constraint If refresh is false then uses last solution Uses model for scaling Returns non-zero if gradient undefined at current solution

Implements [ClpConstraint](#).

**3.31.2.2 virtual int ClpConstraintLinear::markNonlinear (char * which)
const [virtual]**

Given a zeroed array sets nonlinear columns to 1.

Returns number of nonlinear columns

Implements [ClpConstraint](#).

**3.31.2.3 virtual int ClpConstraintLinear::markNonzero (char * which) const
[virtual]**

Given a zeroed array sets possible nonzero coefficients to 1.

Returns number of nonzeros

Implements [ClpConstraint](#).

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

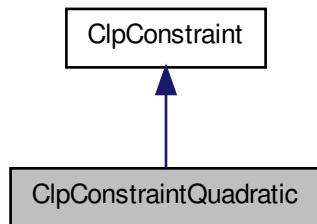
- ClpConstraintLinear.hpp

3.32 ClpConstraintQuadratic Class Reference

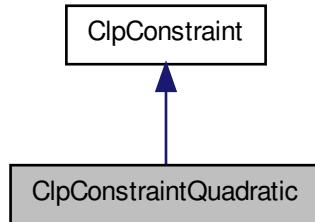
Quadratic Constraint Class.

```
#include <ClpConstraintQuadratic.hpp>
```

Inheritance diagram for ClpConstraintQuadratic:



Collaboration diagram for ClpConstraintQuadratic:



Public Member Functions

Stuff

- virtual int `gradient` (const `ClpSimplex` *model, const double *solution, double *gradient, double &functionValue, double &offset, bool useScaling=false, bool refresh=true) const
Fills gradient.
- virtual void `resize` (int newNumberColumns)
Resize constraint.
- virtual void `deleteSome` (int numberToDelete, const int *which)
Delete columns in constraint.
- virtual void `reallyScale` (const double *columnScale)
Scale constraint.
- virtual int `markNonlinear` (char *which) const
Given a zeroed array sets nonquadratic columns to 1.
- virtual int `markNonzero` (char *which) const
Given a zeroed array sets possible nonzero coefficients to 1.

Constructors and destructors

- `ClpConstraintQuadratic ()`

Default Constructor.

- `ClpConstraintQuadratic` (int row, int numberQuadraticColumns, int numberColumns, const CoinBigIndex *start, const int *column, const double *element)

Constructor from quadratic.

- `ClpConstraintQuadratic` (const `ClpConstraintQuadratic` &rhs)

Copy constructor.

- `ClpConstraintQuadratic` & `operator=` (const `ClpConstraintQuadratic` &rhs)

Assignment operator.

- virtual `~ClpConstraintQuadratic` ()

Destructor.

- virtual `ClpConstraint` * `clone` () const

Clone.

Gets and sets

- virtual int `numberCoefficients` () const

Number of coefficients.

- int `numberColumns` () const

Number of columns in constraint.

- CoinBigIndex * `start` () const

Column starts.

- const int * `column` () const

Columns.

- const double * `coefficient` () const

Coefficients.

3.32.1 Detailed Description

Quadratic Constraint Class.

Definition at line 17 of file ClpConstraintQuadratic.hpp.

3.32.2 Member Function Documentation

**3.32.2.1 virtual int ClpConstraintQuadratic::gradient (const ClpSimplex *
model, const double * solution, double * gradient, double &
functionValue, double & offset, bool useScaling = false, bool
refresh = true) const [virtual]**

Fills gradient.

If Quadratic then solution may be NULL, also returns true value of function and offset so we can use x not deltaX in constraint If refresh is false then uses last solution Uses model for scaling Returns non-zero if gradient undefined at current solution

Implements [ClpConstraint](#).

**3.32.2.2 virtual int ClpConstraintQuadratic::markNonlinear (char * which)
const [virtual]**

Given a zeroed array sets nonquadratic columns to 1.

Returns number of nonquadratic columns

Implements [ClpConstraint](#).

**3.32.2.3 virtual int ClpConstraintQuadratic::markNonzero (char * which)
const [virtual]**

Given a zeroed array sets possible nonzero coefficients to 1.

Returns number of nonzeros

Implements [ClpConstraint](#).

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

- ClpConstraintQuadratic.hpp

3.33 ClpDataSave Class Reference

This is a tiny class where data can be saved round calls.

```
#include <ClpModel.hpp>
```

Public Member Functions

Constructors and destructor

- [ClpDataSave \(\)](#)
Default constructor.
- [ClpDataSave \(const ClpDataSave &\)](#)
Copy constructor.
- [ClpDataSave & operator=\(const ClpDataSave &rhs\)](#)
Assignment operator. This copies the data.
- [~ClpDataSave \(\)](#)
Destructor.

Public Attributes

data - with same names as in other classes

- double **dualBound_**
- double **infeasibilityCost_**
- double **pivotTolerance_**
- double **zeroFactorizationTolerance_**
- double **zeroSimplexTolerance_**
- double **acceptablePivot_**
- double **objectiveScale_**
- int **sparseThreshold_**
- int **perturbation_**
- int **forceFactorization_**
- int **scalingFlag_**
- unsigned int **specialOptions_**

3.33.1 Detailed Description

This is a tiny class where data can be saved round calls.

Definition at line 1265 of file ClpModel.hpp.

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

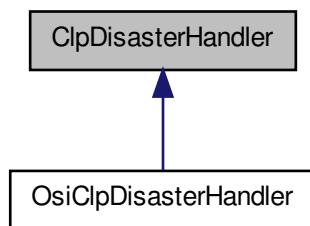
- ClpModel.hpp

3.34 ClpDisasterHandler Class Reference

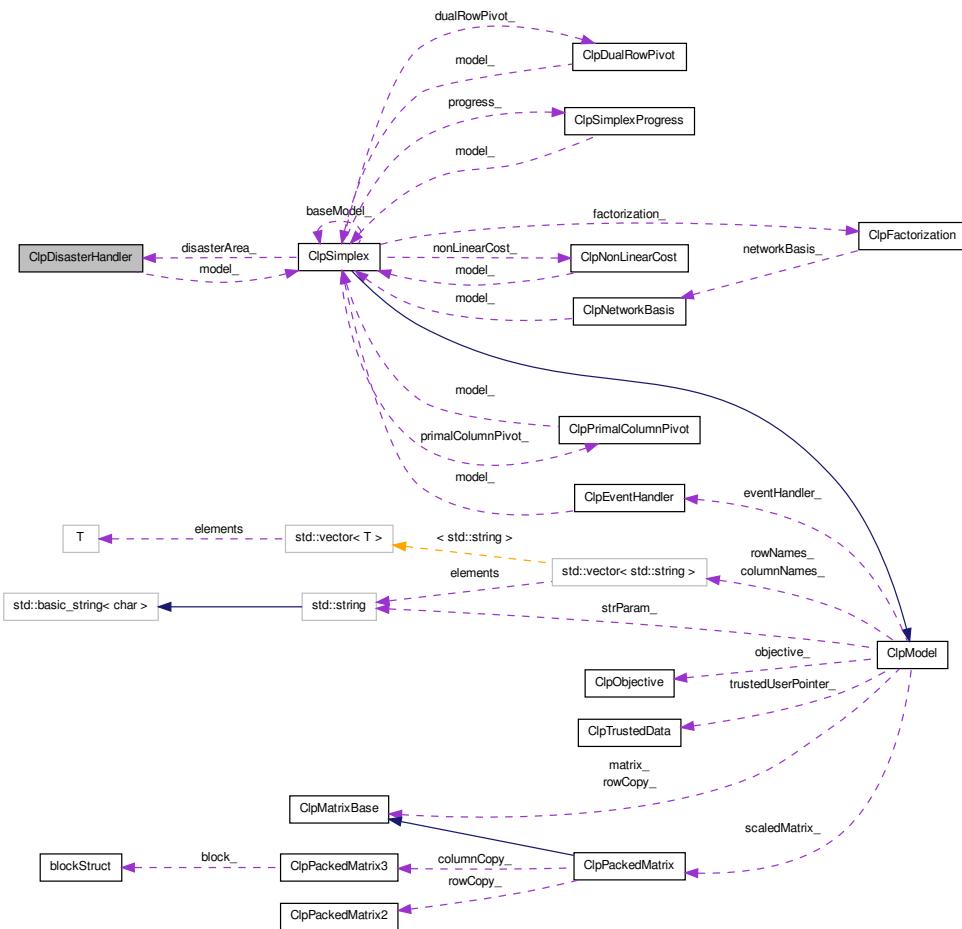
Base class for Clp disaster handling.

```
#include <ClpEventHandler.hpp>
```

Inheritance diagram for ClpDisasterHandler:



Collaboration diagram for ClpDisasterHandler:



Public Member Functions

Virtual methods that the derived classe should provide.

- virtual void `intoSimplex ()=0`

Into simplex.

- virtual bool `check () const =0`

Checks if disaster.

- virtual void `saveInfo ()=0`
saves information for next attempt
- virtual int `typeOfDisaster ()`
Type of disaster 0 can fix, 1 abort.

Constructors, destructor

- `ClpDisasterHandler (ClpSimplex *model=NULL)`
Default constructor.
- virtual `~ClpDisasterHandler ()`
Destructor.
- `ClpDisasterHandler (const ClpDisasterHandler &)`
- `ClpDisasterHandler & operator= (const ClpDisasterHandler &)`
- virtual `ClpDisasterHandler * clone () const =0`
Clone.

Sets/gets

- void `setSimplex (ClpSimplex *model)`
set model.
- `ClpSimplex * simplex () const`
Get model.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `ClpSimplex * model_`
Pointer to simplex.

3.34.1 Detailed Description

Base class for Clp disaster handling. This is here to allow for disaster handling. By disaster I mean that Clp would otherwise give up

Definition at line 133 of file ClpEventHandler.hpp.

3.34.2 Constructor & Destructor Documentation

3.34.2.1 **ClpDisasterHandler::ClpDisasterHandler (ClpSimplex * *model* = *NULL*)**

Default constructor.

3.34.3 Member Function Documentation

3.34.3.1 **void ClpDisasterHandler::setSimplex (ClpSimplex * *model*)**

set model.

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

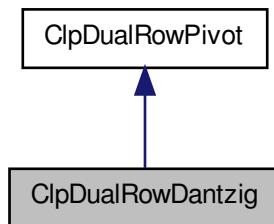
- ClpEventHandler.hpp

3.35 ClpDualRowDantzig Class Reference

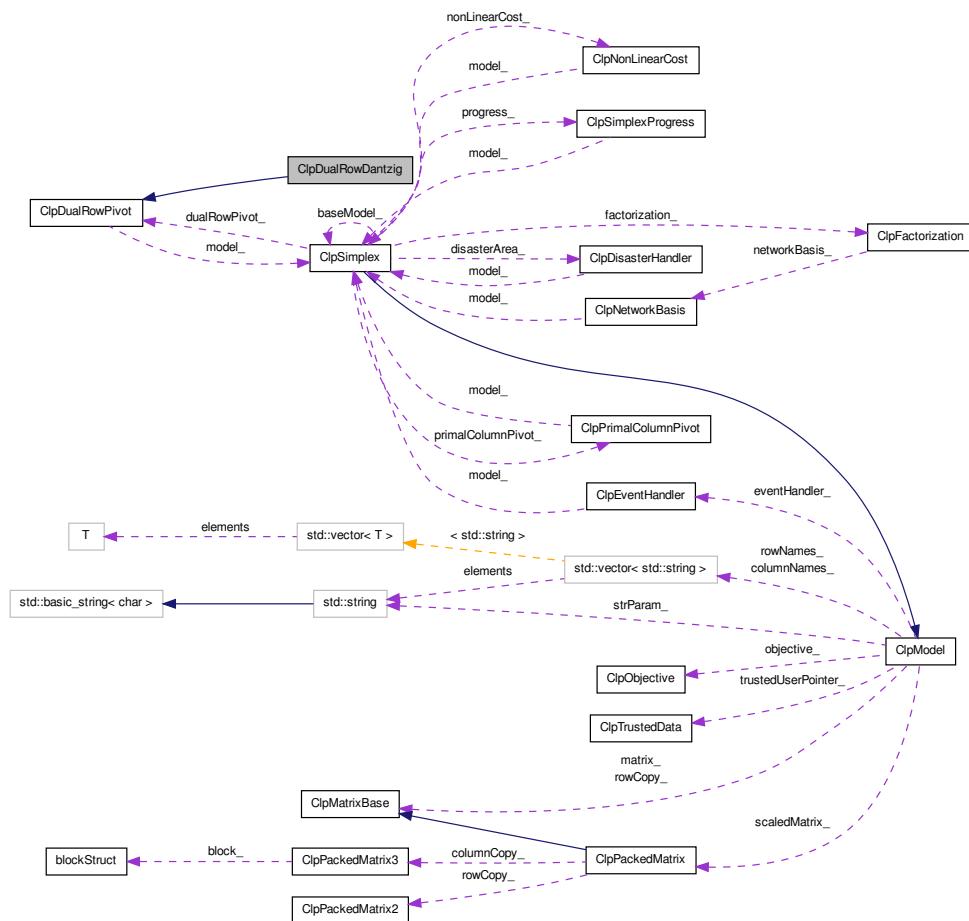
Dual Row Pivot Dantzig Algorithm Class.

```
#include <ClpDualRowDantzig.hpp>
```

Inheritance diagram for ClpDualRowDantzig:



Collaboration diagram for ClpDualRowDantzig:



Public Member Functions

Algorithmic methods

- virtual int [pivotRow](#) ()
Returns pivot row, -1 if none.
 - virtual double [updateWeights](#) (CoinIndexedVector *input, CoinIndexedVector *spare, CoinIndexedVector *spare2, CoinIndexedVector *updatedColumn)

Updates weights and returns pivot alpha.

- virtual void [updatePrimalSolution](#) (CoinIndexedVector **input*, double *theta*, double &*changeInObjective*)

Updates primal solution (and maybe list of candidates) Uses input vector which it deletes Computes change in objective function.

Constructors and destructors

- [ClpDualRowDantzig \(\)](#)
Default Constructor.
- [ClpDualRowDantzig \(const ClpDualRowDantzig &\)](#)
Copy constructor.
- [ClpDualRowDantzig & operator= \(const ClpDualRowDantzig &rhs\)](#)
Assignment operator.
- virtual [~ClpDualRowDantzig \(\)](#)
Destructor.
- virtual [ClpDualRowPivot * clone \(bool copyData=true\) const](#)
Clone.

3.35.1 Detailed Description

Dual Row Pivot Dantzig Algorithm Class. This is simplest choice - choose largest infeasibility

Definition at line 19 of file ClpDualRowDantzig.hpp.

3.35.2 Member Function Documentation

3.35.2.1 virtual double ClpDualRowDantzig::updateWeights (

CoinIndexedVector * *input*, CoinIndexedVector * *spare*,
CoinIndexedVector * *spare2*, CoinIndexedVector * *updatedColumn*)
[virtual]

Updates weights and returns pivot alpha.

Also does FT update

Implements [ClpDualRowPivot](#).

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

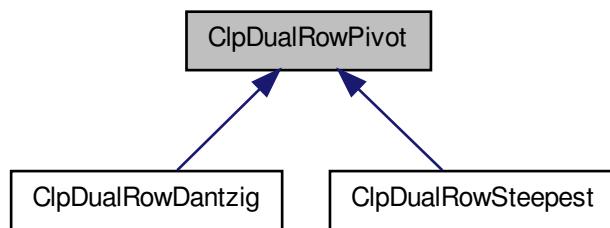
- ClpDualRowDantzig.hpp

3.36 ClpDualRowPivot Class Reference

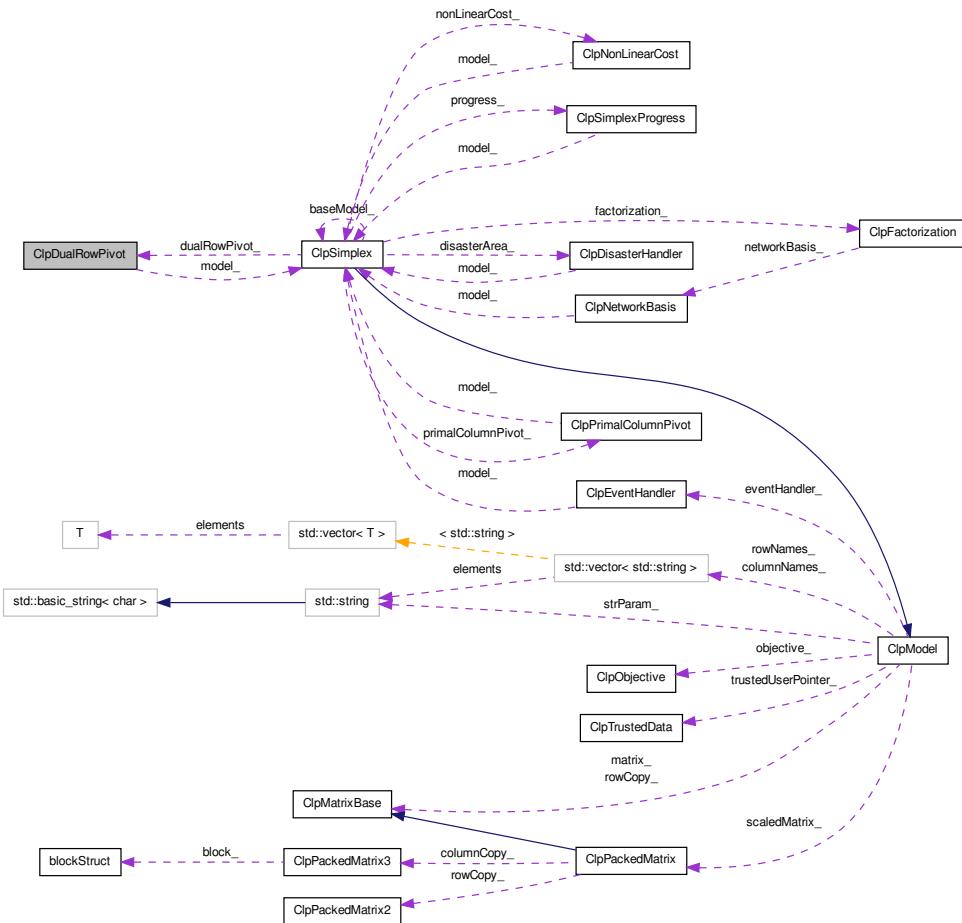
Dual Row Pivot Abstract Base Class.

```
#include <ClpDualRowPivot.hpp>
```

Inheritance diagram for ClpDualRowPivot:



Collaboration diagram for ClpDualRowPivot:



Public Member Functions

Algorithmic methods

- virtual int **pivotRow ()=0**
Returns pivot row, -1 if none.
- virtual double **updateWeights (CoinIndexedVector *input, CoinIndexedVector *spare, CoinIndexedVector *spare2, CoinIndexedVector *updatedColumn)=0**

Updates weights and returns pivot alpha.

- virtual void `updatePrimalSolution` (CoinIndexedVector *input, double theta, double &changeInObjective)=0

Updates primal solution (and maybe list of candidates) Uses input vector which it deletes Computes change in objective function Would be faster if we kept basic regions, but on other hand it means everything is always in sync.

- virtual void `saveWeights` (ClpSimplex *model, int mode)

Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.

- virtual void `checkAccuracy` ()

checks accuracy and may re-initialize (may be empty)

- virtual void `unrollWeights` ()

Gets rid of last update (may be empty).

- virtual void `clearArrays` ()

Gets rid of all arrays (may be empty).

- virtual bool `looksOptimal` () const

Returns true if would not find any row.

- virtual void `maximumPivotsChanged` ()

Called when maximum pivots changes.

Constructors and destructors

- `ClpDualRowPivot` ()

Default Constructor.

- `ClpDualRowPivot` (const `ClpDualRowPivot` &)

Copy constructor.

- `ClpDualRowPivot` & `operator=` (const `ClpDualRowPivot` &rhs)

Assignment operator.

- virtual `~ClpDualRowPivot` ()

Destructor.

- virtual `ClpDualRowPivot` * `clone` (bool copyData=true) const =0

Clone.

Other

- `ClpSimplex * model ()`
Returns model.
- `void setModel (ClpSimplex *newmodel)`
Sets model (normally to NULL).
- `int type ()`
Returns type (above 63 is extra information).

Protected Attributes

Protected member data

- `ClpSimplex * model_`
Pointer to model.
- `int type_`
Type of row pivot algorithm.

3.36.1 Detailed Description

Dual Row Pivot Abstract Base Class. Abstract Base Class for describing an interface to an algorithm to choose row pivot in dual simplex algorithm. For some algorithms e.g. Dantzig choice then some functions may be null.

Definition at line 22 of file ClpDualRowPivot.hpp.

3.36.2 Member Function Documentation

3.36.2.1 `virtual double ClpDualRowPivot::updateWeights (` `CoinIndexedVector * input, CoinIndexedVector * spare,` `CoinIndexedVector * spare2, CoinIndexedVector * updatedColumn)` `[pure virtual]`

Updates weights and returns pivot alpha.

Also does FT update

Implemented in [ClpDualRowDantzig](#), and [ClpDualRowSteepest](#).

3.36.2.2 virtual void ClpDualRowPivot::saveWeights (ClpSimplex * *model*, int *mode*) [virtual]

Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.

check for infeasible) 4) as 2 but restore weights from previous snapshot 5) for strong branching - initialize , infeasibilities

Reimplemented in [ClpDualRowSteepest](#).

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

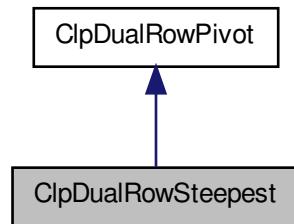
- ClpDualRowPivot.hpp

3.37 ClpDualRowSteepest Class Reference

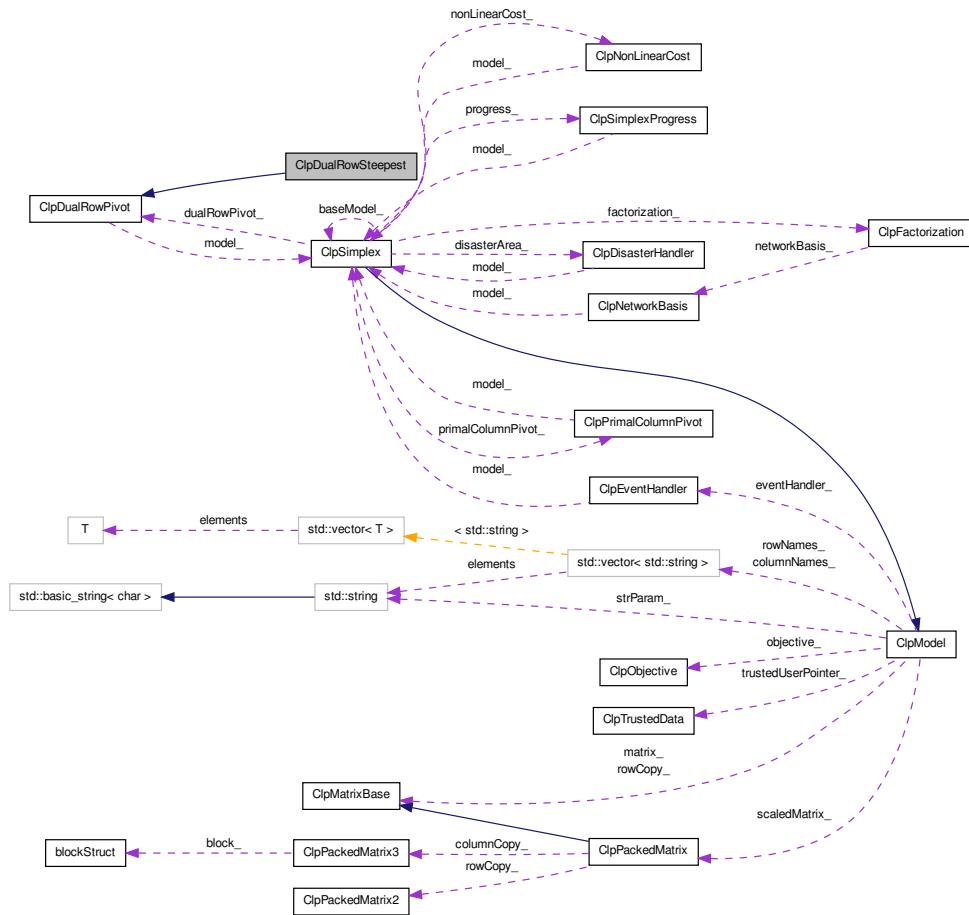
Dual Row Pivot Steepest Edge Algorithm Class.

```
#include <ClpDualRowSteepest.hpp>
```

Inheritance diagram for ClpDualRowSteepest:



Collaboration diagram for ClpDualRowSteepest:



Public Types

- enum `Persistence`
enums for persistence

Public Member Functions

Algorithmic methods

- **virtual int pivotRow ()**
Returns pivot row, -1 if none.
- **virtual double updateWeights (CoinIndexedVector *input, CoinIndexedVector *spare, CoinIndexedVector *spare2, CoinIndexedVector *updatedColumn)**
Updates weights and returns pivot alpha.
- **virtual void updatePrimalSolution (CoinIndexedVector *input, double theta, double &changeInObjective)**
Updates primal solution (and maybe list of candidates) Uses input vector which it deletes Computes change in objective function.
- **virtual void saveWeights (ClpSimplex *model, int mode)**
Saves any weights round factorization as pivot rows may change Save model May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.
- **virtual void unrollWeights ()**
Gets rid of last update.
- **virtual void clearArrays ()**
Gets rid of all arrays.
- **virtual bool looksOptimal () const**
Returns true if would not find any row.
- **virtual void maximumPivotsChanged ()**
Called when maximum pivots changes.

Constructors and destructors

- **ClpDualRowSteepest (int mode=3)**
Default Constructor 0 is uninitialized, 1 full, 2 is partial uninitialized, 3 starts as 2 but may switch to 1.
- **ClpDualRowSteepest (const ClpDualRowSteepest &)**
Copy constructor.
- **ClpDualRowSteepest & operator= (const ClpDualRowSteepest &rhs)**
Assignment operator.
- **void fill (const ClpDualRowSteepest &rhs)**
Fill most values.

- virtual `~ClpDualRowSteepest ()`
Destructor.
- virtual `ClpDualRowPivot * clone (bool copyData=true) const`
Clone.

gets and sets

- int `mode () const`
Mode.
- void `setPersistence (Persistence life)`
Set/ get persistence.
- Persistence `persistence () const`

3.37.1 Detailed Description

Dual Row Pivot Steepest Edge Algorithm Class. See Forrest-Goldfarb paper for algorithm

Definition at line 21 of file ClpDualRowSteepest.hpp.

3.37.2 Constructor & Destructor Documentation**3.37.2.1 ClpDualRowSteepest::ClpDualRowSteepest (int mode = 3)**

Default Constructor 0 is uninitialized, 1 full, 2 is partial uninitialized, 3 starts as 2 but may switch to 1.

By partial is meant that the weights are updated as normal but only part of the infeasible basic variables are scanned. This can be faster on very easy problems.

3.37.3 Member Function Documentation**3.37.3.1 virtual double ClpDualRowSteepest::updateWeights (**
`CoinIndexedVector * input, CoinIndexedVector * spare,`
`CoinIndexedVector * spare2, CoinIndexedVector * updatedColumn)`
[virtual]

Updates weights and returns pivot alpha.

Also does FT update

Implements [ClpDualRowPivot](#).

3.37.3.2 virtual void ClpDualRowSteepest::saveWeights (ClpSimplex * *model*, int *mode*) [virtual]

Saves any weights round factorization as pivot rows may change Save model May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g. check for infeasible) 4) as 2 but restore weights from previous snapshot 5) for strong branching - initialize (uninitialized), infeasibilities

Reimplemented from [ClpDualRowPivot](#).

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

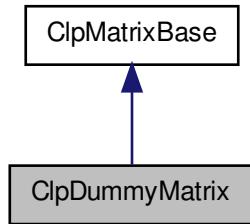
- ClpDualRowSteepest.hpp

3.38 ClpDummyMatrix Class Reference

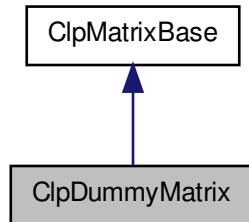
This implements a dummy matrix as derived from [ClpMatrixBase](#).

```
#include <ClpDummyMatrix.hpp>
```

Inheritance diagram for ClpDummyMatrix:



Collaboration diagram for ClpDummyMatrix:



Public Member Functions

Useful methods

- virtual CoinPackedMatrix * [getPackedMatrix](#) () const
Return a complete CoinPackedMatrix.
- virtual bool [isColOrdered](#) () const
Whether the packed matrix is column major ordered or not.
- virtual CoinBigIndex [getNumElements](#) () const
Number of entries in the packed matrix.
- virtual int [getNumCols](#) () const
Number of columns.
- virtual int [getNumRows](#) () const
Number of rows.
- virtual const double * [getElements](#) () const
A vector containing the elements in the packed matrix.
- virtual const int * [getIndices](#) () const
A vector containing the minor indices of the elements in the packed matrix.
- virtual const CoinBigIndex * [getVectorStarts](#) () const
- virtual const int * [getVectorLengths](#) () const
The lengths of the major-dimension vectors.

- virtual void `deleteCols` (const int numDel, const int *indDel)
Delete the columns whose indices are listed in indDel.
- virtual void `deleteRows` (const int numDel, const int *indDel)
Delete the rows whose indices are listed in indDel.
- virtual `ClpMatrixBase *` `reverseOrderedCopy` () const
Returns a new matrix in reverse order without gaps.
- virtual CoinBigIndex `countBasis` (const int *whichColumn, int &numberColumnBasic)
Returns number of elements in column part of basis.
- virtual void `fillBasis` (`ClpSimplex` *model, const int *whichColumn, int &numberColumnBasic, int *row, int *start, int *rowCount, int *columnCount, CoinFactorizationDouble *element)
Fills in column part of basis.
- virtual void `unpack` (const `ClpSimplex` *model, CoinIndexedVector *rowArray, int column) const
Unpacks a column into an CoinIndexedvector.
- virtual void `unpackPacked` (`ClpSimplex` *model, CoinIndexedVector *rowArray, int column) const
Unpacks a column into an CoinIndexedvector in packed format Note that model is NOT const.
- virtual void `add` (const `ClpSimplex` *model, CoinIndexedVector *rowArray, int column, double multiplier) const
Adds multiple of a column into an CoinIndexedvector You can use quickAdd to add to vector.
- virtual void `add` (const `ClpSimplex` *model, double *array, int column, double multiplier) const
Adds multiple of a column into an array.
- virtual void `releasePackedMatrix` () const
Allow any parts of a created CoinMatrix to be deleted Allow any parts of a created CoinPackedMatrix to be deleted.

Matrix times vector methods

- virtual void `times` (double scalar, const double *x, double *y) const
*Return y + A * scalar *x in y.*

- virtual void `times` (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale) const
And for scaling.
- virtual void `transposeTimes` (double scalar, const double *x, double *y) const
*Return $y + x * scalar * A$ in y .*
- virtual void `transposeTimes` (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale) const
And for scaling.
- virtual void `transposeTimes` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
*Return $x * scalar * A + y$ in z .*
- virtual void `subsetTransposeTimes` (const `ClpSimplex` *model, const `CoinIndexedVector` *x, const `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
*Return $x * A$ in z but just for indices in y .*

Constructors, destructor

- `ClpDummyMatrix` ()
Default constructor.
- `ClpDummyMatrix` (int numberColumns, int numberOfRows, int numberElements)
Constructor with data.
- virtual `~ClpDummyMatrix` ()
Destructor.

Copy method

- `ClpDummyMatrix` (const `ClpDummyMatrix` &)
The copy constructor.
- `ClpDummyMatrix` (const `CoinPackedMatrix` &)
The copy constructor from an `CoinDummyMatrix`.
- `ClpDummyMatrix` & `operator=` (const `ClpDummyMatrix` &)
- virtual `ClpMatrixBase` * `clone` () const
Clone.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- int `numberRows_`
Number of rows.
- int `numberColumns_`
Number of columns.
- int `numberElements_`
Number of elements.

3.38.1 Detailed Description

This implements a dummy matrix as derived from `ClpMatrixBase`. This is so you can do `ClpPdco` but may come in useful elsewhere. It just has dimensions but no data

Definition at line 20 of file `ClpDummyMatrix.hpp`.

3.38.2 Constructor & Destructor Documentation

3.38.2.1 ClpDummyMatrix::ClpDummyMatrix()

Default constructor.

3.38.2.2 ClpDummyMatrix::ClpDummyMatrix(const ClpDummyMatrix &)

The copy constructor.

3.38.2.3 ClpDummyMatrix::ClpDummyMatrix(const CoinPackedMatrix &)

The copy constructor from an `CoinDummyMatrix`.

3.38.3 Member Function Documentation

3.38.3.1 virtual bool ClpDummyMatrix::isColOrdered () const [inline, virtual]

Whether the packed matrix is column major ordered or not.

Implements [ClpMatrixBase](#).

Definition at line 28 of file ClpDummyMatrix.hpp.

3.38.3.2 virtual CoinBigIndex ClpDummyMatrix::getNumElements () const [inline, virtual]

Number of entries in the packed matrix.

Implements [ClpMatrixBase](#).

Definition at line 32 of file ClpDummyMatrix.hpp.

3.38.3.3 virtual int ClpDummyMatrix::getNumCols () const [inline, virtual]

Number of columns.

Implements [ClpMatrixBase](#).

Definition at line 36 of file ClpDummyMatrix.hpp.

3.38.3.4 virtual int ClpDummyMatrix::getNumRows () const [inline, virtual]

Number of rows.

Implements [ClpMatrixBase](#).

Definition at line 40 of file ClpDummyMatrix.hpp.

**3.38.3.5 virtual const double* ClpDummyMatrix::getElements () const
[virtual]**

A vector containing the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implements [ClpMatrixBase](#).

**3.38.3.6 virtual const int* ClpDummyMatrix::getIndices () const
[virtual]**

A vector containing the minor indices of the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implements [ClpMatrixBase](#).

**3.38.3.7 virtual const int* ClpDummyMatrix::getVectorLengths () const
[virtual]**

The lengths of the major-dimension vectors.

Implements [ClpMatrixBase](#).

**3.38.3.8 virtual void ClpDummyMatrix::deleteCols (const int numDel, const
int * indDel) [virtual]**

Delete the columns whose indices are listed in `indDel`.

Implements [ClpMatrixBase](#).

**3.38.3.9 virtual void ClpDummyMatrix::deleteRows (const int numDel, const
int * indDel) [virtual]**

Delete the rows whose indices are listed in `indDel`.

Implements [ClpMatrixBase](#).

3.38.3.10 virtual void ClpDummyMatrix::unpackPacked (ClpSimplex * model, CoinIndexedVector * rowArray, int column) const [virtual]

Unpacks a column into an CoinIndexedvector in packed format. Note that `model` is NOT const.

Bounds and objective could be modified if doing column generation (just for this variable)

Implements [ClpMatrixBase](#).

3.38.3.11 virtual void ClpDummyMatrix::times (double scalar, const double * x, double * y) const [virtual]

Return $y + A * scalar * x$ in y .

Precondition

x must be of size `numColumns()`
 y must be of size `numRows()`

Implements [ClpMatrixBase](#).

3.38.3.12 virtual void ClpDummyMatrix::transposeTimes (double scalar, const double * x, double * y) const [virtual]

Return $y + x * scalar * A$ in y .

Precondition

x must be of size `numRows()`
 y must be of size `numColumns()`

Implements [ClpMatrixBase](#).

```
3.38.3.13 virtual void ClpDummyMatrix::transposeTimes ( const  
ClpSimplex * model, double scalar, const CoinIndexedVector  
* x, CoinIndexedVector * y, CoinIndexedVector * z ) const  
[virtual]
```

Return $x * \text{scalar} * A + y$ in z .

Can use y as temporary array (will be empty at end) Note - If x packed mode - then z packed mode

Implements [ClpMatrixBase](#).

```
3.38.3.14 virtual void ClpDummyMatrix::subsetTransposeTimes ( const  
ClpSimplex * model, const CoinIndexedVector * x, const  
CoinIndexedVector * y, CoinIndexedVector * z ) const  
[virtual]
```

Return $x * A$ in z but just for indices in y .

Note - If x packed mode - then z packed mode Squashes small elements and knows about [ClpSimplex](#)

Implements [ClpMatrixBase](#).

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

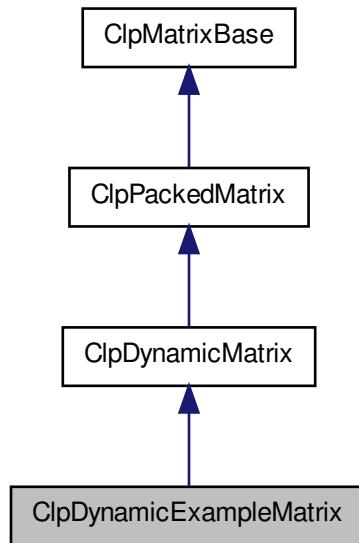
- ClpDummyMatrix.hpp

3.39 ClpDynamicExampleMatrix Class Reference

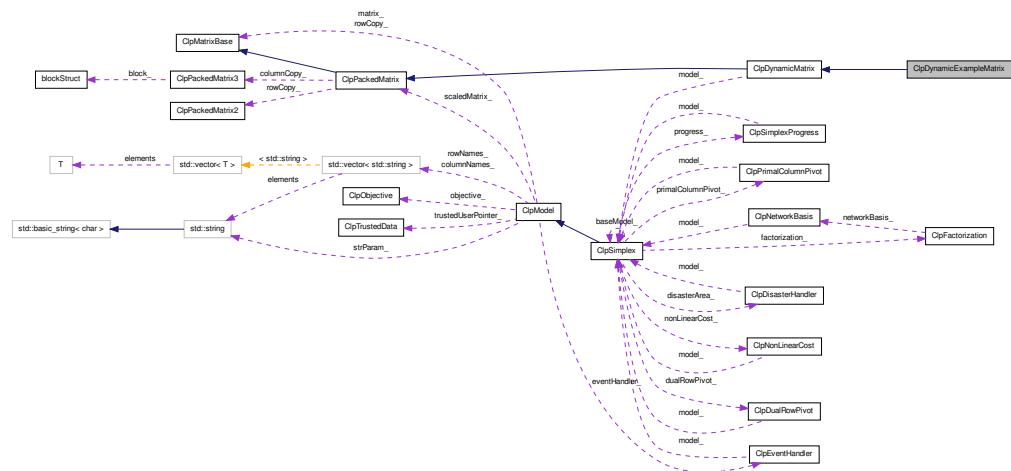
This implements a dynamic matrix when we have a limit on the number of "interesting rows".

```
#include <ClpDynamicExampleMatrix.hpp>
```

Inheritance diagram for ClpDynamicExampleMatrix:



Collaboration diagram for ClpDynamicExampleMatrix:



Public Member Functions

Main functions provided

- virtual void **partialPricing** (ClpSimplex *model, double start, double end, int &bestSequence, int &numberWanted)
Partial pricing.
 - virtual void **createVariable** (ClpSimplex *model, int &bestSequence)
Creates a variable.
 - virtual void **packDown** (const int *in, int numberToPack)
If addColumn forces compression then this allows descendant to know what to do.

Constructors, destructor

- **ClpDynamicExampleMatrix ()**
Default constructor.
 - **ClpDynamicExampleMatrix (ClpSimplex *model, int numberSets, int numberColumns, const int *starts, const double *lower, const double *upper, const int *startColumn, const int *row, const double *element, const double *cost, const double *columnLower=NULL, const double *columnUpper=NULL, const unsigned char *status=NULL, const unsigned char *dynamicStatus=NULL, int numberIds=0, const int *ids=NULL)**

This is the real constructor.

- virtual [`~ClpDynamicExampleMatrix \(\)`](#)
Destructor.

Copy method

- [`ClpDynamicExampleMatrix \(const ClpDynamicExampleMatrix &\)`](#)
The copy constructor.
- [`ClpDynamicExampleMatrix & operator= \(const ClpDynamicExampleMatrix &\)`](#)
- virtual [`ClpMatrixBase * clone \(\) const`](#)
Clone.

gets and sets

- [`CoinBigIndex * startColumnGen \(\) const`](#)
Starts of each column.
- [`int * rowGen \(\) const`](#)
rows
- [`double * elementGen \(\) const`](#)
elements
- [`double * costGen \(\) const`](#)
costs
- [`int * fullStartGen \(\) const`](#)
full starts
- [`int * idGen \(\) const`](#)
ids in next level matrix
- [`double * columnLowerGen \(\) const`](#)
Optional lower bounds on columns.
- [`double * columnUpperGen \(\) const`](#)
Optional upper bounds on columns.
- [`int numberColumns \(\) const`](#)
size

- void **setDynamicStatusGen** (int sequence, **DynamicStatus** status)
- **DynamicStatus getDynamicStatusGen** (int sequence) const
- bool **flaggedGen** (int i) const
 - Whether flagged.*
- void **setFlaggedGen** (int i)
- void **unsetFlagged** (int i)

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- int **numberColumns**
size
- CoinBigIndex * **startColumnGen_**
Starts of each column.
- int * **rowGen_**
rows
- double * **elementGen_**
elements
- double * **costGen_**
costs
- int * **fullStartGen_**
start of each set
- unsigned char * **dynamicStatusGen_**
for status and which bound
- int * **idGen_**
identifier for each variable up one level (startColumn_, etc).
- double * **columnLowerGen_**
Optional lower bounds on columns.
- double * **columnUpperGen_**
Optional upper bounds on columns.

3.39.1 Detailed Description

This implements a dynamic matrix when we have a limit on the number of "interesting rows". This version inherits from [ClpDynamicMatrix](#) and knows that the real matrix is gub. This acts just like [ClpDynamicMatrix](#) but generates columns. This "generates" columns by choosing from stored set. It is maent as a starting point as to how you could use shortest path to generate columns.

So it has its own copy of all data needed. It populates ClpDynamicWatrix with enough to allow for gub keys and active variables. In turn [ClpDynamicMatrix](#) populates a CoinPackedMatrix with active columns and rows.

As there is one copy here and one in ClpDynamicmatrix these names end in Gen_

It is obviously more efficient to just use [ClpDynamicMatrix](#) but the ideas is to show how much code a user would have to write.

This does not work very well with bounds

Definition at line 33 of file ClpDynamicExampleMatrix.hpp.

3.39.2 Constructor & Destructor Documentation

3.39.2.1 ClpDynamicExampleMatrix::ClpDynamicExampleMatrix ()

Default constructor.

3.39.2.2 ClpDynamicExampleMatrix::ClpDynamicExampleMatrix (
ClpSimplex * model, int numberSets, int numberColumns, const
int * starts, const double * lower, const double * upper, const int
*** startColumn, const int * row, const double * element, const**
double * cost, const double * columnLower = NULL, const double *
columnUpper = NULL, const unsigned char * status = NULL, const
unsigned char * dynamicStatus = NULL, int numberIds = 0, const int
*** ids = NULL)**

This is the real constructor.

It assumes factorization frequency will not be changed. This resizes model !!!! The contents of original matrix in model will be taken over and original matrix will be sanitized so can be deleted (to avoid a very small memory leak)

3.39.2.3 ClpDynamicExampleMatrix::ClpDynamicExampleMatrix (const ClpDynamicExampleMatrix &)

The copy constructor.

3.39.3 Member Function Documentation**3.39.3.1 virtual void ClpDynamicExampleMatrix::createVariable (ClpSimplex * *model*, int & *bestSequence*) [virtual]**

Creates a variable.

This is called after partial pricing and will modify matrix. Will update bestSequence.

Reimplemented from [ClpDynamicMatrix](#).

3.39.3.2 virtual void ClpDynamicExampleMatrix::packDown (const int * *in*, int *numberToPack*) [virtual]

If addColumn forces compression then this allows descendant to know what to do.

If \geq then entry stayed in, if -1 then entry went out to lower bound.of zero. Entries at upper bound (really nonzero) never go out (at present).

Reimplemented from [ClpDynamicMatrix](#).

3.39.4 Member Data Documentation**3.39.4.1 int* ClpDynamicExampleMatrix::idGen_ [protected]**

identifier for each variable up one level (startColumn_, etc).

This is of length maximumGubColumns_. For this version it is just sequence number at this level

Definition at line 178 of file ClpDynamicExampleMatrix.hpp.

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

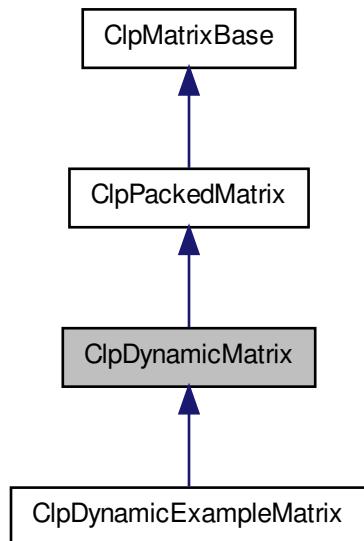
- ClpDynamicExampleMatrix.hpp

3.40 ClpDynamicMatrix Class Reference

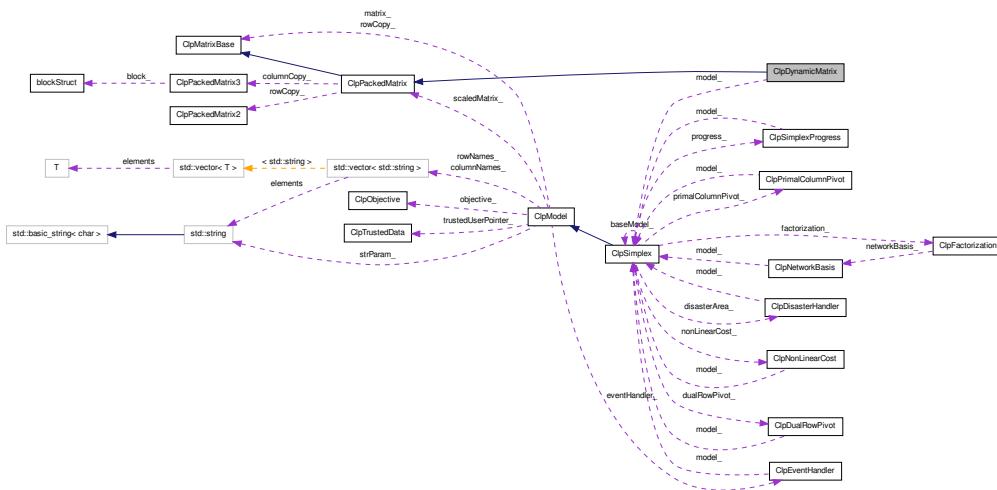
This implements a dynamic matrix when we have a limit on the number of "interesting rows".

```
#include <ClpDynamicMatrix.hpp>
```

Inheritance diagram for ClpDynamicMatrix:



Collaboration diagram for ClpDynamicMatrix:



Public Types

- enum **DynamicStatus**
enums for status of various sorts

Public Member Functions

Main functions provided

- virtual void **partialPricing** (**ClpSimplex** *model, double start, double end, int &bestSequence, int &numberWanted)
Partial pricing.
 - virtual int **updatePivot** (**ClpSimplex** *model, double oldInValue, double oldOutValue)
update information for a pivot (and effective rhs)
 - virtual double * **rhsOffset** (**ClpSimplex** *model, bool forceRefresh=false, bool check=false)
Returns effective RHS offset if it is being used.
 - virtual void **times** (double scalar, const double *x, double *y) const

*Return $y + A * scalar *x$ in y .*

- void **modifyOffset** (int sequence, double amount)
Modifies rhs offset.
- double **keyValue** (int iSet) const
Gets key value when none in small.
- virtual void **dualExpanded** (ClpSimplex *model, CoinIndexedVector *array, double *other, int mode)
mode=0 - Set up before "updateTranspose" and "transposeTimes" for duals using extended updates array (and may use other if dual values pass) mode=1 - Update dual solution after "transposeTimes" using extended rows.
- virtual int **generalExpanded** (ClpSimplex *model, int mode, int &number)
mode=0 - Create list of non-key basics in pivotVariable_ using number as numberBasic in and out mode=1 - Set all key variables as basic mode=2 - return number extra rows needed, number gives maximum number basic mode=3 - before replaceColumn mode=4 - return 1 if can do primal, 2 if dual, 3 if both mode=5 - save any status stuff (when in good state) mode=6 - restore status stuff mode=7 - flag given variable (normally sequenceIn) mode=8 - unflag all variables mode=9 - synchronize costs mode=10 - return 1 if there may be changing bounds on variable (column generation) mode=11 - make sure set is clean (used when a variable rejected - but not flagged) mode=12 - after factorize but before permute stuff mode=13 - at end of simplex to delete stuff
- virtual int **refresh** (ClpSimplex *model)
Purely for column generation and similar ideas.
- virtual void **createVariable** (ClpSimplex *model, int &bestSequence)
Creates a variable.
- virtual double **reducedCost** (ClpSimplex *model, int sequence) const
Returns reduced cost of a variable.
- void **gubCrash** ()
Does gub crash.
- void **writeMps** (const char *name)
Writes out model (without names).
- void **initialProblem** ()
Populates initial matrix from dynamic status.
- int **addColumn** (int numberEntries, const int *row, const double *element, double cost, double lower, double upper, int iSet, **DynamicStatus** status)
Adds in a column to gub structure (called from descendant) and returns sequence.

- virtual void [packDown](#) (const int *, int)
If addColumn forces compression then this allows descendant to know what to do.
- double [columnLower](#) (int sequence) const
Gets lower bound (to simplify coding).
- double [columnUpper](#) (int sequence) const
Gets upper bound (to simplify coding).

Constructors, destructor

- [ClpDynamicMatrix](#) ()
Default constructor.
- [ClpDynamicMatrix](#) ([ClpSimplex](#) *model, int numberSets, int numberColumns, const int *starts, const double *lower, const double *upper, const CoinBigIndex *startColumn, const int *row, const double *element, const double *cost, const double *columnLower=NULL, const double *columnUpper=NULL, const unsigned char *status=NULL, const unsigned char *dynamicStatus=NULL)
This is the real constructor.
- virtual [~ClpDynamicMatrix](#) ()
Destructor.

Copy method

- [ClpDynamicMatrix](#) (const [ClpDynamicMatrix](#) &)
The copy constructor.
- [ClpDynamicMatrix](#) (const [CoinPackedMatrix](#) &)
The copy constructor from an CoinPackedMatrix.
- [ClpDynamicMatrix](#) & **operator=** (const [ClpDynamicMatrix](#) &)
- virtual [ClpMatrixBase](#) * [clone](#) () const
Clone.

gets and sets

- [ClpSimplex::Status getStatus](#) (int sequence) const
Status of row slacks.

- void **setStatus** (int sequence, ClpSimplex::Status status)
- bool **flaggedSlack** (int i) const

Whether flagged slack.
- void **setFlaggedSlack** (int i)
- void **unsetFlaggedSlack** (int i)
- int **numberSets** () const

Number of sets (dynamic rows).
- int **numberGubEntries** () const

Number of possible gub variables.
- int * **startSets** () const

Sets.
- bool **flagged** (int i) const

Whether flagged.
- void **setFlagged** (int i)
- void **unsetFlagged** (int i)
- void **setDynamicStatus** (int sequence, DynamicStatus status)
- DynamicStatus **getDynamicStatus** (int sequence) const
- double **objectiveOffset** () const

Saved value of objective offset.
- CoinBigIndex * **startColumn** () const

Starts of each column.
- int * **row** () const

rows
- double * **element** () const

elements
- double * **cost** () const

costs
- int * **id** () const

ids of active columns (just index here)
- double * **columnLower** () const

Optional lower bounds on columns.
- double * **columnUpper** () const

Optional upper bounds on columns.

- `double * lowerSet () const`
Lower bounds on sets.
- `double * upperSet () const`
Upper bounds on sets.
- `int numberGubColumns () const`
size
- `int firstAvailable () const`
first free
- `int firstDynamic () const`
first dynamic
- `int lastDynamic () const`
number of columns in dynamic model
- `int numberStaticRows () const`
number of rows in original model
- `int numberElements () const`
size of working matrix (max)
- `int * keyVariable () const`
- `void switchOffCheck ()`
Switches off dj checking each factorization (for BIG models).
- `unsigned char * gubRowStatus () const`
Status region for gub slacks.
- `unsigned char * dynamicStatus () const`
Status region for gub variables.
- `int whichSet (int sequence) const`
Returns which set a variable is in.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `double sumDualInfeasibilities_`
Sum of dual infeasibilities.

- double **sumPrimalInfeasibilities_**
Sum of primal infeasibilities.
- double **sumOfRelaxedDualInfeasibilities_**
Sum of Dual infeasibilities using tolerance based on error in duals.
- double **sumOfRelaxedPrimalInfeasibilities_**
Sum of Primal infeasibilities using tolerance based on error in primals.
- double **savedBestGubDual_**
Saved best dual on gub row in pricing.
- int **savedBestSet_**
Saved best set in pricing.
- int * **backToPivotRow_**
Backward pointer to pivot row !!!
- int * **keyVariable_**
Key variable of set (only accurate if none in small problem).
- int * **toIndex_**
Backward pointer to extra row.
- int * **fromIndex_**
- int **numberSets_**
Number of sets (dynamic rows).
- int **numberActiveSets_**
Number of active sets.
- double **objectiveOffset_**
Saved value of objective offset.
- double * **lowerSet_**
Lower bounds on sets.
- double * **upperSet_**
Upper bounds on sets.
- unsigned char * **status_**
Status of slack on set.
- ClpSimplex * **model_**

Pointer back to model.

- int **firstAvailable_**
first free
- int **firstAvailableBefore_**
first free when iteration started
- int **firstDynamic_**
first dynamic
- int **lastDynamic_**
number of columns in dynamic model
- int **numberStaticRows_**
number of rows in original model
- int **numberElements_**
size of working matrix (max)
- int **numberDualInfeasibilities_**
Number of dual infeasibilities.
- int **numberPrimalInfeasibilities_**
Number of primal infeasibilities.
- int **noCheck_**
If pricing will declare victory (i.e.
- double **infeasibilityWeight_**
Infeasibility weight when last full pass done.
- int **numberGubColumns_**
size
- int **maximumGubColumns_**
current maximum number of columns (then compress)
- int **maximumElements_**
current maximum number of elements (then compress)
- int * **startSet_**
Start of each set.
- int * **next_**

next in chain

- CoinBigIndex * **startColumn_**
Starts of each column.
- int * **row_**
rows
- double * **element_**
elements
- double * **cost_**
costs
- int * **id_**
ids of active columns (just index here)
- unsigned char * **dynamicStatus_**
for status and which bound
- double * **columnLower_**
Optional lower bounds on columns.
- double * **columnUpper_**
Optional upper bounds on columns.

3.40.1 Detailed Description

This implements a dynamic matrix when we have a limit on the number of "interesting rows". This version inherits from [ClpPackedMatrix](#) and knows that the real matrix is gub. A later version could use shortest path to generate columns.

Definition at line 20 of file ClpDynamicMatrix.hpp.

3.40.2 Constructor & Destructor Documentation

3.40.2.1 ClpDynamicMatrix::ClpDynamicMatrix()

Default constructor.

3.40.2.2 ClpDynamicMatrix::ClpDynamicMatrix (ClpSimplex * *model*, int *numberSets*, int *numberColumns*, const int * *starts*, const double * *lower*, const double * *upper*, const CoinBigIndex * *startColumn*, const int * *row*, const double * *element*, const double * *cost*, const double * *columnLower* = **NULL, const double * *columnUpper* = **NULL**, const unsigned char * *status* = **NULL**, const unsigned char * *dynamicStatus* = **NULL**)**

This is the real constructor.

It assumes factorization frequency will not be changed. This resizes model !!!! The contents of original matrix in model will be taken over and original matrix will be sanitized so can be deleted (to avoid a very small memory leak)

3.40.2.3 ClpDynamicMatrix::ClpDynamicMatrix (const ClpDynamicMatrix &)

The copy constructor.

3.40.2.4 ClpDynamicMatrix::ClpDynamicMatrix (const CoinPackedMatrix &)

The copy constructor from an CoinPackedMatrix.

3.40.3 Member Function Documentation

3.40.3.1 virtual double* ClpDynamicMatrix::rhsOffset (ClpSimplex * *model*, bool *forceRefresh* = **false, bool *check* = **false**) [virtual]**

Returns effective RHS offset if it is being used.

This is used for long problems or big dynamic or anywhere where going through full columns is expensive. This may re-compute

Reimplemented from [ClpMatrixBase](#).

3.40.3.2 virtual void ClpDynamicMatrix::times (double scalar, const double * x, double * y) const [virtual]

Return $y + A * scalar * x$ in y .

Precondition

x must be of size numColumns()
 y must be of size numRows()

Reimplemented from [ClpPackedMatrix](#).

3.40.3.3 virtual void ClpDynamicMatrix::dualExpanded (ClpSimplex * model, CoinIndexedVector * array, double * other, int mode) [virtual]

mode=0 - Set up before "updateTranspose" and "transposeTimes" for duals using extended updates array (and may use other if dual values pass) mode=1 - Update dual solution after "transposeTimes" using extended rows.

mode=2 - Compute all djs and compute key dual infeasibilities mode=3 - Report on key dual infeasibilities mode=4 - Modify before updateTranspose in partial pricing

Reimplemented from [ClpMatrixBase](#).

3.40.3.4 virtual int ClpDynamicMatrix::refresh (ClpSimplex * model) [virtual]

Purely for column generation and similar ideas.

Allows matrix and any bounds or costs to be updated (sensibly). Returns non-zero if any changes.

Reimplemented from [ClpPackedMatrix](#).

3.40.3.5 virtual void ClpDynamicMatrix::createVariable (ClpSimplex * model, int & bestSequence) [virtual]

Creates a variable.

This is called after partial pricing and will modify matrix. Will update bestSequence.

Reimplemented from [ClpMatrixBase](#).

Reimplemented in [ClpDynamicExampleMatrix](#).

3.40.3.6 virtual void ClpDynamicMatrix::packDown (const int *, int) [inline, virtual]

If addColumn forces compression then this allows descendant to know what to do.

If ≥ 0 then entry stayed in, if -1 then entry went out to lower bound.of zero. Entries at upper bound (really nonzero) never go out (at present).

Reimplemented in [ClpDynamicExampleMatrix](#).

Definition at line 109 of file ClpDynamicMatrix.hpp.

3.40.4 Member Data Documentation

3.40.4.1 int ClpDynamicMatrix::noCheck_ [protected]

If pricing will declare victory (i.e.

no check every factorization). -1 - always check 0 - don't check 1 - in don't check mode but looks optimal

Definition at line 349 of file ClpDynamicMatrix.hpp.

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

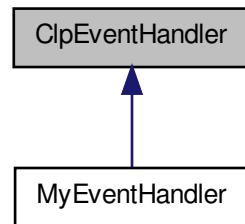
- ClpDynamicMatrix.hpp

3.41 ClpEventHandler Class Reference

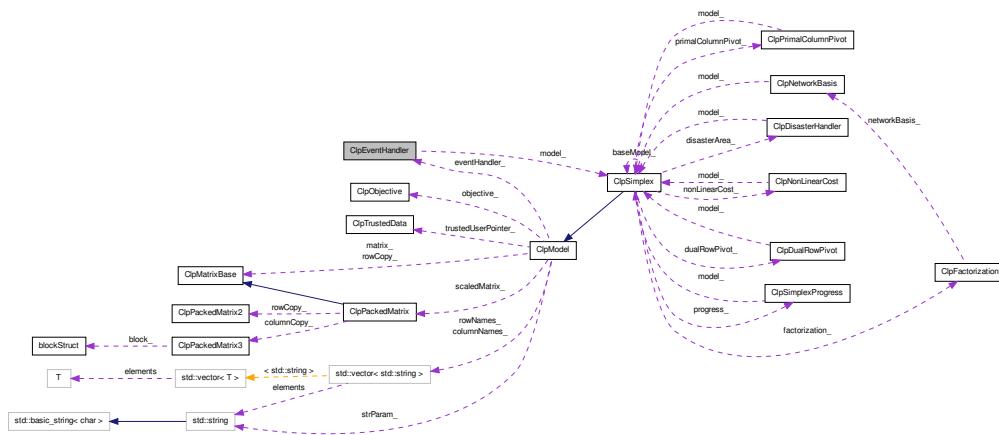
Base class for Clp event handling.

```
#include <ClpEventHandler.hpp>
```

Inheritance diagram for ClpEventHandler:



Collaboration diagram for ClpEventHandler:



Public Types

- enum [Event](#)

enums for what sort of event.

Public Member Functions

Virtual method that the derived classes should provide.

The base class instance does nothing and as `event()` is only useful method it would not be very useful NOT providing one!

- virtual int `event (Event whichEvent)`
This can do whatever it likes.
- virtual int `eventWithInfo (Event whichEvent, void *info)`
This can do whatever it likes.

Constructors, destructor

- `ClpEventHandler (ClpSimplex *model=NULL)`
Default constructor.
- virtual `~ClpEventHandler ()`
Destructor.
- `ClpEventHandler (const ClpEventHandler &)`
- `ClpEventHandler & operator= (const ClpEventHandler &)`
- virtual `ClpEventHandler * clone () const`
Clone.

Sets/gets

- void `setSimplex (ClpSimplex *model)`
set model.
- `ClpSimplex * simplex () const`
Get model.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `ClpSimplex * model_`
Pointer to simplex.

3.41.1 Detailed Description

Base class for Clp event handling. This is just here to allow for event handling. By event I mean a Clp event e.g. end of values pass.

One use would be to let a user handle a system event e.g. Control-C. This could be done by deriving a class [MyEventHandler](#) which knows about such events. If one occurs [MyEventHandler::event\(\)](#) could clear event status and return 3 (stopped).

Clp would then return to user code.

As it is called every iteration this should be fine grained enough.

User can derive and construct from CbcModel - not pretty

Definition at line 27 of file ClpEventHandler.hpp.

3.41.2 Member Enumeration Documentation

3.41.2.1 enum ClpEventHandler::Event

enums for what sort of event.

These will also be returned in [ClpModel::secondaryStatus\(\)](#) as int

Definition at line 34 of file ClpEventHandler.hpp.

3.41.3 Constructor & Destructor Documentation

3.41.3.1 ClpEventHandler::ClpEventHandler (*ClpSimplex * model = NULL*)

Default constructor.

3.41.4 Member Function Documentation

3.41.4.1 virtual int ClpEventHandler::event (*Event whichEvent*) [virtual]

This can do whatever it likes.

If return code -1 then carries on if 0 sets [ClpModel::status\(\)](#) to 5 (stopped by event) and will return to user. At present if <-1 carries on and if >0 acts as if 0 - this may change. For [ClpSolve](#) 2 -> too big return status of -2 and -> too small 3

Reimplemented in [MyEventHandler](#).

3.41.4.2 virtual int ClpEventHandler::eventWithInfo (Event *whichEvent*, void * *info*) [virtual]

This can do whatever it likes.

Return code -1 means no action. This passes in something

3.41.4.3 void ClpEventHandler::setSimplex (ClpSimplex * *model*)

set model.

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

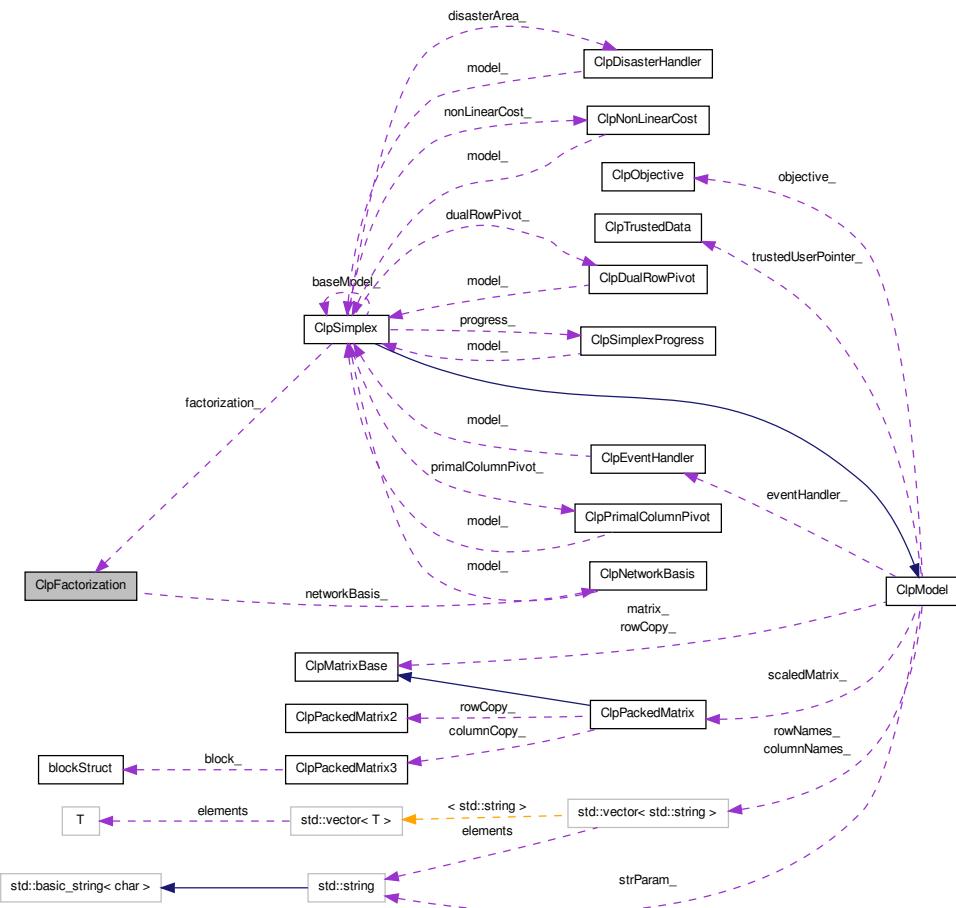
- ClpEventHandler.hpp

3.42 ClpFactorization Class Reference

This just implements CoinFactorization when an [ClpMatrixBase](#) object is passed.

```
#include <ClpFactorization.hpp>
```

Collaboration diagram for ClpFactorization:



Public Member Functions

factorization

- int **factorize** (ClpSimplex *model, int solveType, bool valuesPass)
When part of LP - given by basic variables.

Constructors, destructor

- [ClpFactorization \(\)](#)
Default constructor.
- [~ClpFactorization \(\)](#)
Destructor.

Copy method

- [ClpFactorization \(const CoinFactorization &\)](#)
The copy constructor from an CoinFactorization.
- [ClpFactorization \(const ClpFactorization &, int denseIfSmaller=0\)](#)
The copy constructor.
- [ClpFactorization \(const CoinOtherFactorization &\)](#)
The copy constructor from an CoinOtherFactorization.
- [ClpFactorization & operator= \(const ClpFactorization &\)](#)

rank one updates which do exist

- [int replaceColumn \(const ClpSimplex *model, CoinIndexedVector *regionSparse, CoinIndexedVector *tableauColumn, int pivotRow, double pivotCheck, bool checkBeforeModifying=false, double acceptablePivot=1.0e-8\)](#)
Replaces one Column to basis, returns 0=OK, 1=Probably OK, 2=singular, 3=no room If checkBeforeModifying is true will do all accuracy checks before modifying factorization.

various uses of factorization (return code number elements)

which user may want to know about

- [int updateColumnFT \(CoinIndexedVector *regionSparse, CoinIndexedVector *regionSparse2\)](#)
Updates one column (FTRAN) from region2 Tries to do FT update number returned is negative if no room region1 starts as zero and is zero at end.
- [int updateColumn \(CoinIndexedVector *regionSparse, CoinIndexedVector *regionSparse2, bool noPermute=false\) const](#)
Updates one column (FTRAN) from region2 region1 starts as zero and is zero at end.
- [int updateTwoColumnsFT \(CoinIndexedVector *regionSparse1, CoinIndexedVector *regionSparse2, CoinIndexedVector *regionSparse3, bool noPermuteRegion3=false\)](#)

Updates one column (FTRAN) from region2 Tries to do FT update number returned is negative if no room.

- int `updateColumnForDebug` (CoinIndexedVector *regionSparse, CoinIndexedVector *regionSparse2, bool noPermute=false) const
For debug (no statistics update).
- int `updateColumnTranspose` (CoinIndexedVector *regionSparse, CoinIndexedVector *regionSparse2) const
Updates one column (BTRAN) from region2 region1 starts as zero and is zero at end.

Lifted from CoinFactorization

- int `numberElements` () const
Total number of elements in factorization.
- int * `permute` () const
Returns address of permute region.
- int * `pivotColumn` () const
Returns address of pivotColumn region (also used for permuting).
- int `maximumPivots` () const
Maximum number of pivots between factorizations.
- void `maximumPivots` (int value)
Set maximum number of pivots between factorizations.
- int `pivots` () const
Returns number of pivots since factorization.
- double `areaFactor` () const
Whether larger areas needed.
- void `areaFactor` (double value)
Set whether larger areas needed.
- double `zeroTolerance` () const
Zero tolerance.
- void `zeroTolerance` (double value)
Set zero tolerance.
- void `saferTolerances` (double zeroTolerance, double pivotTolerance)

Set tolerances to safer of existing and given.

- int [sparseThreshold \(\) const](#)
get sparse threshold
- void [sparseThreshold \(int value\)](#)
Set sparse threshold.
- int [status \(\) const](#)
Returns status.
- void [setStatus \(int value\)](#)
Sets status.
- int [numberDense \(\) const](#)
Returns number of dense rows.
- CoinBigIndex [numberElementsU \(\) const](#)
Returns number in U area.
- CoinBigIndex [numberElementsL \(\) const](#)
Returns number in L area.
- CoinBigIndex [numberElementsR \(\) const](#)
Returns number in R area.
- bool [timeToRefactorize \(\) const](#)
- int [messageLevel \(\) const](#)
Level of detail of messages.
- void [messageLevel \(int value\)](#)
Set level of detail of messages.
- void [clearArrays \(\)](#)
Get rid of all memory.
- int [numberRows \(\) const](#)
Number of Rows after factorization.
- int [denseThreshold \(\) const](#)
Gets dense threshold.
- void [setDenseThreshold \(int value\)](#)
Sets dense threshold.

- double **pivotTolerance** () const
Pivot tolerance.
- void **pivotTolerance** (double value)
Set pivot tolerance.
- void **relaxAccuracyCheck** (double value)
Allows change of pivot accuracy check 1.0 == none >1.0 relaxed.
- int **persistenceFlag** () const
Array persistence flag If 0 then as now (delete/new) 1 then only do arrays if bigger needed 2 as 1 but give a bit extra if bigger needed.
- void **setPersistenceFlag** (int value)
- void **almostDestructor** ()
Delete all stuff (leaves as after CoinFactorization()).
- double **adjustedAreaFactor** () const
Returns areaFactor but adjusted for dense.
- void **setBiasLU** (int value)
- void **setForrestTomlin** (bool value)
true if Forrest Tomlin update, false if PFI
- void **setDefaultValues** ()
Sets default values.
- void **forceOtherFactorization** (int which)
If nonzero force use of 1,dense 2,small 3,osl.
- int **goOslThreshold** () const
Get switch to osl if number rows <= this.
- void **setGoOslThreshold** (int value)
Set switch to osl if number rows <= this.
- int **goDenseThreshold** () const
Get switch to dense if number rows <= this.
- void **setGoDenseThreshold** (int value)
Set switch to dense if number rows <= this.
- int **goSmallThreshold** () const
Get switch to small if number rows <= this.

- void `setGoSmallThreshold` (int value)
Set switch to small if number rows <= this.
- void `goDenseOrSmall` (int numberOfRows)
Go over to dense or small code if small enough.
- void `setFactorization` ([ClpFactorization](#) &factorization)
Sets factorization.
- int `isDenseOrSmall` () const
Return 1 if dense code.

other stuff

- void `goSparse` ()
makes a row copy of L for speed and to allow very sparse problems
- void `cleanUp` ()
Cleans up i.e. gets rid of network basis.
- bool `needToReorder` () const
Says whether to redo pivot order.
- bool `networkBasis` () const
Says if a network basis.
- void `getWeights` (int *weights) const
Fills weighted row list.

3.42.1 Detailed Description

This just implements CoinFactorization when an [ClpMatrixBase](#) object is passed. If a network then has a dummy CoinFactorization and a genuine [ClpNetworkBasis](#) object Definition at line 32 of file ClpFactorization.hpp.

3.42.2 Constructor & Destructor Documentation

3.42.2.1 ClpFactorization::ClpFactorization ()

Default constructor.

3.42.2.2 ClpFactorization::ClpFactorization (const CoinFactorization &)

The copy constructor from an CoinFactorization.

3.42.2.3 ClpFactorization::ClpFactorization (const ClpFactorization &, int denseIfSmaller = 0)

The copy constructor.

3.42.2.4 ClpFactorization::ClpFactorization (const CoinOtherFactorization &)

The copy constructor from an CoinOtherFactorization.

3.42.3 Member Function Documentation**3.42.3.1 int ClpFactorization::factorize (ClpSimplex * model, int solveType, bool valuesPass)**

When part of LP - given by basic variables.

Actually does factorization. Arrays passed in have non negative value to say basic. If status is okay, basic variables have pivot row - this is only needed if increasingRows_>1. Allows scaling If status is singular, then basic variables have pivot row and ones thrown out have -1 returns 0 -okay, -1 singular, -2 too many in basis, -99 memory

3.42.3.2 int ClpFactorization::replaceColumn (const ClpSimplex * model, CoinIndexedVector * regionSparse, CoinIndexedVector * tableauColumn, int pivotRow, double pivotCheck, bool checkBeforeModifying = false, double acceptablePivot = 1.0e-8)

Replaces one Column to basis, returns 0=OK, 1=Probably OK, 2=singular, 3=no room
If checkBeforeModifying is true will do all accuracy checks before modifying factorization.

Whether to set this depends on speed considerations. You could just do this on first iteration after factorization and thereafter re-factorize partial update already in U

3.42.3.3 int ClpFactorization::updateTwoColumnsFT (CoinIndexedVector * *regionSparse1*, CoinIndexedVector * *regionSparse2*, CoinIndexedVector * *regionSparse3*, bool *noPermuteRegion3 = false*)

Updates one column (FTRAN) from region2 Tries to do FT update number returned is negative if no room.

Also updates region3 region1 starts as zero and is zero at end

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

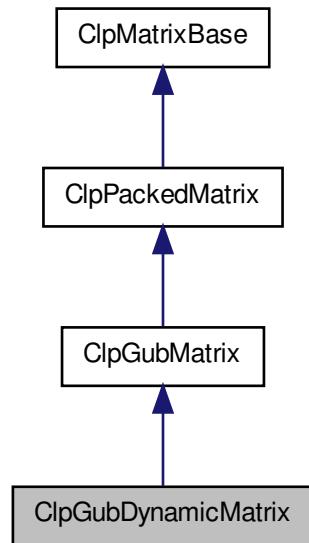
- ClpFactorization.hpp

3.43 ClpGubDynamicMatrix Class Reference

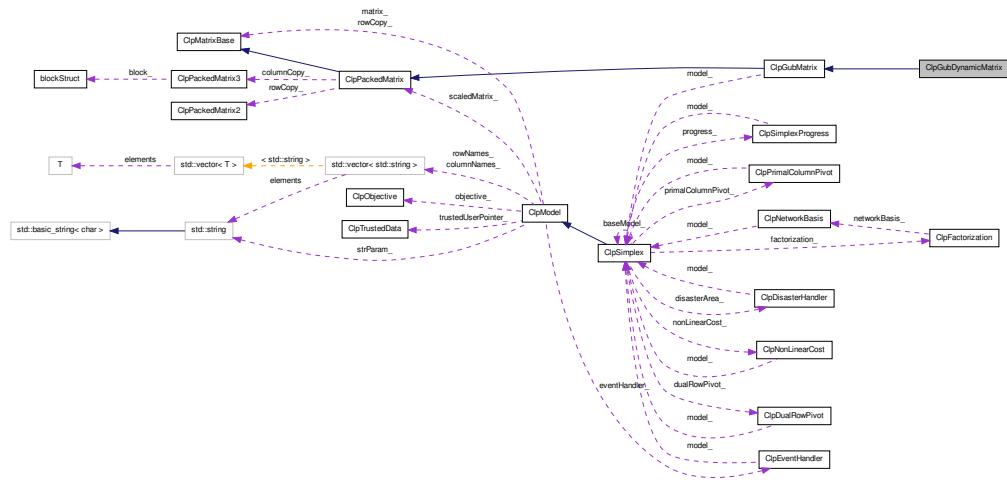
This implements Gub rows plus a [ClpPackedMatrix](#).

```
#include <ClpGubDynamicMatrix.hpp>
```

Inheritance diagram for ClpGubDynamicMatrix:



Collaboration diagram for ClpGubDynamicMatrix:



Public Member Functions

Main functions provided

- virtual void `partialPricing (ClpSimplex *model, double start, double end, int &bestSequence, int &numberWanted)`
Partial pricing.
- virtual int `synchronize (ClpSimplex *model, int mode)`
*This is local to Gub to allow synchronization: mode=0 when status of basis is good
mode=1 when variable is flagged mode=2 when all variables unflagged (returns
number flagged) mode=3 just reset costs (primal) mode=4 correct number of dual
infeasibilities mode=5 return 4 if time to re-factorize mode=8 - make sure set is
clean mode=9 - adjust lower, upper on set by incoming.*
- virtual void `useEffectiveRhs (ClpSimplex *model, bool cheapest=true)`
Sets up an effective RHS and does gub crash if needed.
- virtual int `updatePivot (ClpSimplex *model, double oldInValue, double oldOutValue)`
update information for a pivot (and effective rhs)
- void `insertNonBasic (int sequence, int iSet)`
Add a new variable to a set.

- virtual double * **rhsOffset** (ClpSimplex *model, bool forceRefresh=false, bool check=false)
Returns effective RHS offset if it is being used.
- virtual void **times** (double scalar, const double *x, double *y) const
*Return $y + A * scalar * x$ in y .*
- virtual int **checkFeasible** (ClpSimplex *model, double &sum) const
Just for debug Returns sum and number of primal infeasibilities.
- void **cleanData** (ClpSimplex *model)
Cleans data after setWarmStart.

Constructors, destructor

- **ClpGubDynamicMatrix** ()
Default constructor.
- virtual **~ClpGubDynamicMatrix** ()
Destructor.

Copy method

- **ClpGubDynamicMatrix** (const ClpGubDynamicMatrix &)
The copy constructor.
- **ClpGubDynamicMatrix** (ClpSimplex *model, int numberSets, int numberColumns, const int *starts, const double *lower, const double *upper, const int *startColumn, const int *row, const double *element, const double *cost, const double *lowerColumn=NULL, const double *upperColumn=NULL, const unsigned char *status=NULL)
This is the real constructor.
- **ClpGubDynamicMatrix** & **operator=** (const ClpGubDynamicMatrix &)
- virtual **ClpMatrixBase** * **clone** () const
Clone.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- double **objectiveOffset_**

Saved value of objective offset.

- `CoinBigIndex * startColumn_`
Starts of each column.
- `int * row_`
rows
- `double * element_`
elements
- `double * cost_`
costs
- `int * fullStart_`
full starts
- `int * id_`
ids of active columns (just index here)
- `unsigned char * dynamicStatus_`
for status and which bound
- `double * lowerColumn_`
Optional lower bounds on columns.
- `double * upperColumn_`
Optional upper bounds on columns.
- `double * lowerSet_`
Optional true lower bounds on sets.
- `double * upperSet_`
Optional true upper bounds on sets.
- `int numberGubColumns_`
size
- `int firstAvailable_`
first free
- `int savedFirstAvailable_`
saved first free
- `int firstDynamic_`

first dynamic

- int **lastDynamic_**
number of columns in dynamic model
- int **numberElements_**
size of working matrix (max)

gets and sets

- enum **DynamicStatus**
enums for status of various sorts
- bool **flagged** (int i) const
Whether flagged.
- void **setFlagged** (int i)
To flag a variable.
- void **unsetFlagged** (int i)
- void **setDynamicStatus** (int sequence, **DynamicStatus** status)
- **DynamicStatus getDynamicStatus** (int sequence) const
- double **objectiveOffset** () const
Saved value of objective offset.
- CoinBigIndex * **startColumn** () const
Starts of each column.
- int * **row** () const
rows
- double * **element** () const
elements
- double * **cost** () const
costs
- int * **fullStart** () const
full starts
- int * **id** () const
ids of active columns (just index here)

- double * **lowerColumn** () const
Optional lower bounds on columns.
- double * **upperColumn** () const
Optional upper bounds on columns.
- double * **lowerSet** () const
Optional true lower bounds on sets.
- double * **upperSet** () const
Optional true upper bounds on sets.
- int **numberGubColumns** () const
size
- int **firstAvailable** () const
first free
- void **setFirstAvailable** (int value)
set first free
- int **firstDynamic** () const
first dynamic
- int **lastDynamic** () const
number of columns in dynamic model
- int **numberElements** () const
size of working matrix (max)
- unsigned char * **gubRowStatus** () const
Status region for gub slacks.
- unsigned char * **dynamicStatus** () const
Status region for gub variables.
- int **whichSet** (int sequence) const
Returns which set a variable is in.

3.43.1 Detailed Description

This implements Gub rows plus a [ClpPackedMatrix](#). This a dynamic version which stores the gub part and dynamically creates matrix. All bounds are assumed to be zero and infinity

This is just a simple example for real column generation

Definition at line 20 of file ClpGubDynamicMatrix.hpp.

3.43.2 Constructor & Destructor Documentation

3.43.2.1 ClpGubDynamicMatrix::ClpGubDynamicMatrix ()

Default constructor.

3.43.2.2 ClpGubDynamicMatrix::ClpGubDynamicMatrix (const ClpGubDynamicMatrix &)

The copy constructor.

3.43.2.3 ClpGubDynamicMatrix::ClpGubDynamicMatrix (ClpSimplex * model, int numberSets, int numberColumns, const int * starts, const double * lower, const double * upper, const int * startColumn, const int * row, const double * element, const double * cost, const double * lowerColumn = **NULL**, const double * upperColumn = **NULL**, const unsigned char * status = **NULL**)

This is the real constructor.

It assumes factorization frequency will not be changed. This resizes model !!!!

3.43.3 Member Function Documentation

3.43.3.1 virtual double* ClpGubDynamicMatrix::rhsOffset (ClpSimplex * model, bool forceRefresh = **false**, bool check = **false**) [virtual]

Returns effective RHS offset if it is being used.

This is used for long problems or big gub or anywhere where going through full columns is expensive. This may re-compute

Reimplemented from [ClpGubMatrix](#).

3.43.3.2 virtual void ClpGubDynamicMatrix::times (double scalar, const double * x, double * y) const [virtual]

Return $y + A * scalar * x$ in y .

Precondition

x must be of size numColumns()
 y must be of size numRows()

Reimplemented from [ClpPackedMatrix](#).

3.43.3.3 virtual int ClpGubDynamicMatrix::checkFeasible (ClpSimplex * model, double & sum) const [virtual]

Just for debug Returns sum and number of primal infeasibilities.

Recomputes keys

Reimplemented from [ClpMatrixBase](#).

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

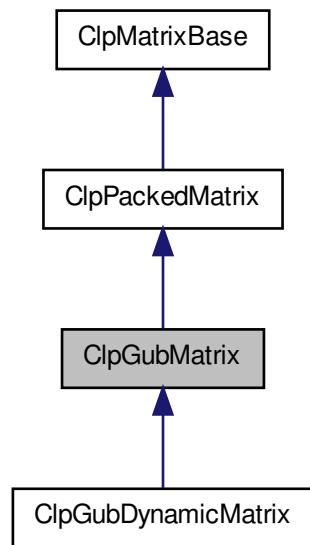
- ClpGubDynamicMatrix.hpp

3.44 ClpGubMatrix Class Reference

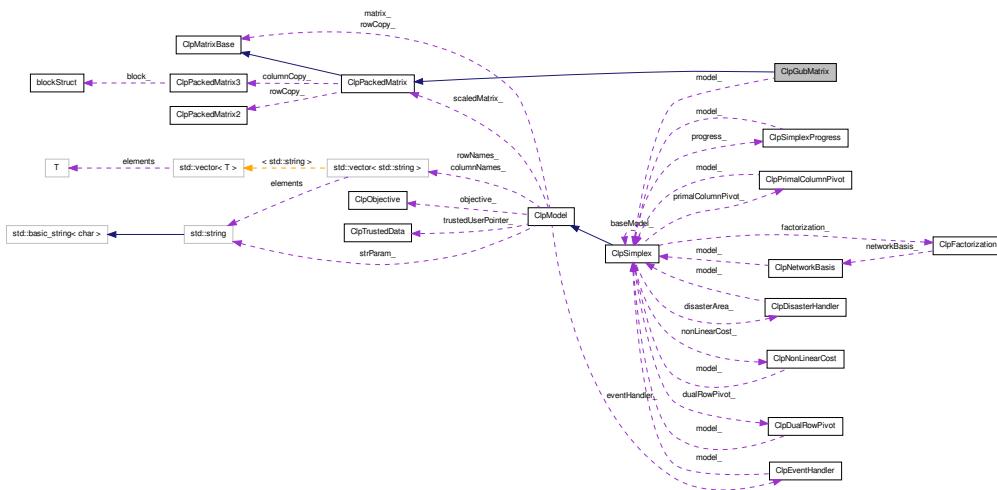
This implements Gub rows plus a [ClpPackedMatrix](#).

```
#include <ClpGubMatrix.hpp>
```

Inheritance diagram for ClpGubMatrix:



Collaboration diagram for ClpGubMatrix:



Public Member Functions

Main functions provided

- virtual `ClpMatrixBase * reverseOrderedCopy () const`
Returns a new matrix in reverse order without gaps (GUB wants NULL).
 - virtual `CoinBigIndex countBasis (const int *whichColumn, int &numberColumnBasic)`
Returns number of elements in column part of basis.
 - virtual void `fillBasis (ClpSimplex *model, const int *whichColumn, int &numberColumnBasic, int *row, int *start, int *rowCount, int *columnCount, CoinFactorizationDouble *element)`
Fills in column part of basis.
 - virtual void `unpack (const ClpSimplex *model, CoinIndexedVector *rowArray, int column) const`
Unpacks a column into an CoinIndexedvector.
 - virtual void `unpackPacked (ClpSimplex *model, CoinIndexedVector *rowArray, int column) const`
Unpacks a column into an CoinIndexedvector in packed format. Note that model is NOT const.

- virtual void `add` (const `ClpSimplex` *model, `CoinIndexedVector` *rowArray, int column, double multiplier) const
Adds multiple of a column into an CoinIndexedvector You can use quickAdd to add to vector.
- virtual void `add` (const `ClpSimplex` *model, double *array, int column, double multiplier) const
Adds multiple of a column into an array.
- virtual void `partialPricing` (`ClpSimplex` *model, double start, double end, int &bestSequence, int &numberWanted)
Partial pricing.
- virtual int `hiddenRows` () const
Returns number of hidden rows e.g. gub.

Matrix times vector methods

- virtual void `transposeTimes` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
*Return $x * scalar * A + y$ in z.*
- virtual void `transposeTimesByRow` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
*Return $x * scalar * A + y$ in z.*
- virtual void `subsetTransposeTimes` (const `ClpSimplex` *model, const `CoinIndexedVector` *x, const `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
*Return $x * A$ in z but just for indices in y.*
- virtual int `extendUpdated` (`ClpSimplex` *model, `CoinIndexedVector` *update, int mode)
expands an updated column to allow for extra rows which the main solver does not know about and returns number added if mode 0.
- virtual void `primalExpanded` (`ClpSimplex` *model, int mode)
*mode=0 - Set up before "update" and "times" for primal solution using extended rows
 mode=1 - Cleanup primal solution after "times" using extended rows.*
- virtual void `dualExpanded` (`ClpSimplex` *model, `CoinIndexedVector` *array, double *other, int mode)
*mode=0 - Set up before "updateTranspose" and "transposeTimes" for duals using extended updates array (and may use other if dual values pass)
 mode=1 - Update dual solution after "transposeTimes" using extended rows.*

- virtual int **generalExpanded** (**ClpSimplex** *model, int mode, int &number)

mode=0 - Create list of non-key basics in pivotVariable_ using number as numberBasic in and out mode=1 - Set all key variables as basic mode=2 - return number extra rows needed, number gives maximum number basic mode=3 - before replaceColumn mode=4 - return 1 if can do primal, 2 if dual, 3 if both mode=5 - save any status stuff (when in good state) mode=6 - restore status stuff mode=7 - flag given variable (normally sequenceIn) mode=8 - unflag all variables mode=9 - synchronize costs mode=10 - return 1 if there may be changing bounds on variable (column generation) mode=11 - make sure set is clean (used when a variable rejected - but not flagged) mode=12 - after factorize but before permute stuff mode=13 - at end of simplex to delete stuff
- virtual int **updatePivot** (**ClpSimplex** *model, double oldInValue, double oldOutValue)

update information for a pivot (and effective rhs)
- virtual void **useEffectiveRhs** (**ClpSimplex** *model, bool cheapest=true)

Sets up an effective RHS and does gub crash if needed.
- virtual double * **rhsOffset** (**ClpSimplex** *model, bool forceRefresh=false, bool check=false)

Returns effective RHS offset if it is being used.
- virtual int **synchronize** (**ClpSimplex** *model, int mode)

This is local to Gub to allow synchronization: mode=0 when status of basis is good mode=1 when variable is flagged mode=2 when all variables unflagged (returns number flagged) mode=3 just reset costs (primal) mode=4 correct number of dual infeasibilities mode=5 return 4 if time to re-factorize mode=6 - return 1 if there may be changing bounds on variable (column generation) mode=7 - do extra restores for column generation mode=8 - make sure set is clean mode=9 - adjust lower, upper on set by incoming.
- virtual void **correctSequence** (const **ClpSimplex** *model, int &sequenceIn, int &sequenceOut)

Correct sequence in and out to give true value.

Constructors, destructor

- **ClpGubMatrix** ()

Default constructor.
- virtual **~ClpGubMatrix** ()

Destructor.

Copy method

- **ClpGubMatrix** (const **ClpGubMatrix** &)

The copy constructor.
- **ClpGubMatrix** (const **CoinPackedMatrix** &)

The copy constructor from an CoinPackedMatrix.
- **ClpGubMatrix** (const **ClpGubMatrix** &wholeModel, int numberRows, const int *whichRows, int numberColumns, const int *whichColumns)

Subset constructor (without gaps).
- **ClpGubMatrix** (const **CoinPackedMatrix** &wholeModel, int numberRows, const int *whichRows, int numberColumns, const int *whichColumns)

Subset constructor (without gaps).
- **ClpGubMatrix** (**CoinPackedMatrix** *matrix)

This takes over ownership (for space reasons).
- **ClpGubMatrix** (**ClpPackedMatrix** *matrix, int numberSets, const int *start, const int *end, const double *lower, const double *upper, const unsigned char *status=NULL)

This takes over ownership (for space reasons) and is the real constructor.
- **ClpGubMatrix** & **operator=** (const **ClpGubMatrix** &)

Clone.
- virtual **ClpMatrixBase** * **subsetClone** (int numberRows, const int *whichRows, int numberColumns, const int *whichColumns) const

Subset clone (without gaps).
- void **redoSet** (**ClpSimplex** *model, int newKey, int oldKey, int iSet)

redoes next_for a set.

gets and sets

- **ClpSimplex::Status getStatus** (int sequence) const

Status.
- void **setStatus** (int sequence, **ClpSimplex::Status** status)

To set the status of a variable.
- void **setFlagged** (int sequence)

To flag a variable.
- void **clearFlagged** (int sequence)

To clear the flagged status of a variable.
- bool **flagged** (int sequence) const

To check if a variable is flagged.
- void **setAbove** (int sequence)

To say key is above ub.

- void **setFeasible** (int sequence)
To say key is feasible.
- void **setBelow** (int sequence)
To say key is below lb.
- double **weight** (int sequence) const
- int * **start** () const
Starts.
- int * **end** () const
End.
- double * **lower** () const
Lower bounds on sets.
- double * **upper** () const
Upper bounds on sets.
- int * **keyVariable** () const
Key variable of set.
- int * **backward** () const
Backward pointer to set number.
- int **numberSets** () const
Number of sets (gub rows).
- void **switchOffCheck** ()
Switches off dj checking each factorization (for BIG models).

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- double **sumDualInfeasibilities_**
Sum of dual infeasibilities.
- double **sumPrimalInfeasibilities_**
Sum of primal infeasibilities.
- double **sumOfRelaxedDualInfeasibilities_**
Sum of Dual infeasibilities using tolerance based on error in duals.

- double **sumOfRelaxedPrimalInfeasibilities_**
Sum of Primal infeasibilities using tolerance based on error in primals.
- double **infeasibilityWeight_**
Infeasibility weight when last full pass done.
- int * **start_**
Starts.
- int * **end_**
End.
- double * **lower_**
Lower bounds on sets.
- double * **upper_**
Upper bounds on sets.
- unsigned char * **status_**
Status of slacks.
- unsigned char * **saveStatus_**
Saved status of slacks.
- int * **savedKeyVariable_**
Saved key variables.
- int * **backward_**
Backward pointer to set number.
- int * **backToPivotRow_**
Backward pointer to pivot row !!!
- double * **changeCost_**
Change in costs for keys.
- int * **keyVariable_**
Key variable of set.
- int * **next_**
Next basic variable in set - starts at key and end with -(set+1).
- int * **toIndex_**
Backward pointer to index in CoinIndexedVector.

- int * **fromIndex_**
- **ClpSimplex * model_**

Pointer back to model.
- int **numberDualInfeasibilities_**

Number of dual infeasibilities.
- int **numberPrimalInfeasibilities_**

Number of primal infeasibilities.
- int **noCheck_**

If pricing will declare victory (i.e.
- int **numberSets_**

Number of sets (gub rows).
- int **saveNumber_**

Number in vector without gub extension.
- int **possiblePivotKey_**

Pivot row of possible next key.
- int **gubSlackIn_**

Gub slack in (set number or -1).
- int **firstGub_**

First gub variables (same as start_[0] at present).
- int **lastGub_**

last gub variable (same as end_[numberSets_-1] at present)
- int **gubType_**

type of gub - 0 not contiguous, 1 contiguous add 8 bit to say no ubs on individual variables

3.44.1 Detailed Description

This implements Gub rows plus a [ClpPackedMatrix](#). There will be a version using [ClpPlusMinusOne](#) matrix but there is no point doing one with [ClpNetworkMatrix](#) (although an embedded network is attractive).

Definition at line 22 of file ClpGubMatrix.hpp.

3.44.2 Constructor & Destructor Documentation

3.44.2.1 ClpGubMatrix::ClpGubMatrix()

Default constructor.

3.44.2.2 ClpGubMatrix::ClpGubMatrix(const ClpGubMatrix &)

The copy constructor.

3.44.2.3 ClpGubMatrix::ClpGubMatrix(const CoinPackedMatrix &)

The copy constructor from an CoinPackedMatrix.

3.44.2.4 ClpGubMatrix::ClpGubMatrix(const ClpGubMatrix & wholeModel, int numberOfRows, const int * whichRows, int numberColumns, const int * whichColumns)

Subset constructor (without gaps).

Duplicates are allowed and order is as given

3.44.3 Member Function Documentation

3.44.3.1 virtual void ClpGubMatrix::unpackPacked(ClpSimplex * model, CoinIndexedVector * rowArray, int column) const [virtual]

Unpacks a column into an CoinIndexedvector in packed format Note that model is NOT const.

Bounds and objective could be modified if doing column generation (just for this variable)

Reimplemented from [ClpPackedMatrix](#).

3.44.3.2 virtual void ClpGubMatrix::transposeTimes (const ClpSimplex * *model*, double *scalar*, const CoinIndexedVector * *x*, CoinIndexedVector * *y*, CoinIndexedVector * *z*) const [virtual]

Return $x * scalar * A + y$ in z .

Can use y as temporary array (will be empty at end) Note - If x packed mode - then z packed mode Squashes small elements and knows about [ClpSimplex](#)

Reimplemented from [ClpPackedMatrix](#).

3.44.3.3 virtual void ClpGubMatrix::transposeTimesByRow (const ClpSimplex * *model*, double *scalar*, const CoinIndexedVector * *x*, CoinIndexedVector * *y*, CoinIndexedVector * *z*) const [virtual]

Return $x * scalar * A + y$ in z .

Can use y as temporary array (will be empty at end) Note - If x packed mode - then z packed mode Squashes small elements and knows about [ClpSimplex](#). This version uses row copy

Reimplemented from [ClpPackedMatrix](#).

3.44.3.4 virtual void ClpGubMatrix::subsetTransposeTimes (const ClpSimplex * *model*, const CoinIndexedVector * *x*, const CoinIndexedVector * *y*, CoinIndexedVector * *z*) const [virtual]

Return $x * A$ in z but just for indices in y .

Note - z always packed mode

Reimplemented from [ClpPackedMatrix](#).

3.44.3.5 virtual int ClpGubMatrix::extendUpdated (ClpSimplex * *model*, CoinIndexedVector * *update*, int *mode*) [virtual]

expands an updated column to allow for extra rows which the main solver does not know about and returns number added if mode 0.

If mode 1 deletes extra entries

This active in Gub

Reimplemented from [ClpMatrixBase](#).

**3.44.3.6 virtual void ClpGubMatrix::primalExpanded (ClpSimplex * *model*,
int *mode*) [virtual]**

mode=0 - Set up before "update" and "times" for primal solution using extended rows
mode=1 - Cleanup primal solution after "times" using extended rows.

mode=2 - Check (or report on) primal infeasibilities

Reimplemented from [ClpMatrixBase](#).

**3.44.3.7 virtual void ClpGubMatrix::dualExpanded (ClpSimplex * *model*,
CoinIndexedVector * *array*, double * *other*, int *mode*) [virtual]**

mode=0 - Set up before "updateTranspose" and "transposeTimes" for duals using ex-
tended updates array (and may use other if dual values pass)
mode=1 - Update dual solution after "transposeTimes" using extended rows.

mode=2 - Compute all djs and compute key dual infeasibilities
mode=3 - Report on key dual infeasibilities
mode=4 - Modify before updateTranspose in partial pricing

Reimplemented from [ClpMatrixBase](#).

**3.44.3.8 virtual double* ClpGubMatrix::rhsOffset (ClpSimplex * *model*, bool
forceRefresh = **false**, bool *check* = **false**) [virtual]**

Returns effective RHS offset if it is being used.

This is used for long problems or big gub or anywhere where going through full
columns is expensive. This may re-compute

Reimplemented from [ClpMatrixBase](#).

Reimplemented in [ClpGubDynamicMatrix](#).

**3.44.3.9 virtual ClpMatrixBase* ClpGubMatrix::subsetClone (int
numberRows, const int * *whichRows*, int *numberColumns*, const int *
whichColumns) const [virtual]**

Subset clone (without gaps).

Duplicates are allowed and order is as given

Reimplemented from [ClpPackedMatrix](#).

3.44.3.10 void ClpGubMatrix::redoSet (ClpSimplex * *model*, int *newKey*, int *oldKey*, int *iSet*)

redoes next_ for a set.

3.44.4 Member Data Documentation

3.44.4.1 int* ClpGubMatrix::next_ [mutable, protected]

Next basic variable in set - starts at key and end with -(set+1).

Now changes to -(nonbasic+1). next_ has extra space for 2* longest set

Definition at line 323 of file ClpGubMatrix.hpp.

3.44.4.2 int ClpGubMatrix::noCheck_ [protected]

If pricing will declare victory (i.e.

no check every factorization). -1 - always check 0 - don't check 1 - in don't check mode but looks optimal

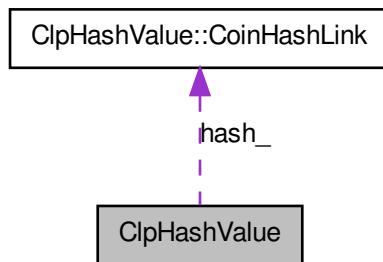
Definition at line 339 of file ClpGubMatrix.hpp.

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

- ClpGubMatrix.hpp

3.45 ClpHashValue Class Reference

Collaboration diagram for ClpHashValue:



Classes

- struct [CoinHashLink](#)

Data.

Public Member Functions

Useful methods

- int [index](#) (double value) const
Return index or -1 if not found.
- int [addValue](#) (double value)
Add value to list and return index.
- int [numberEntries](#) () const
Number of different entries.

Constructors, destructor

- [ClpHashValue](#) ()
Default constructor.

- [ClpHashValue \(ClpSimplex *model\)](#)
Useful constructor.
- virtual [~ClpHashValue \(\)](#)
Destructor.

Copy method

- [ClpHashValue \(const ClpHashValue &\)](#)
The copy constructor.
- [ClpHashValue & operator= \(const ClpHashValue &\)](#)
=

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- [CoinHashLink * hash_](#)
Hash table.
- int [numberHash_](#)
Number of entries in hash table.
- int [maxHash_](#)
Maximum number of entries in hash table i.e. size.
- int [lastUsed_](#)
Last used space.

3.45.1 Detailed Description

Definition at line 288 of file ClpNode.hpp.

3.45.2 Constructor & Destructor Documentation

3.45.2.1 ClpHashValue::ClpHashValue ()

Default constructor.

3.45.2.2 ClpHashValue::ClpHashValue (ClpSimplex * *model*)

Useful constructor.

3.45.2.3 ClpHashValue::ClpHashValue (const ClpHashValue &)

The copy constructor.

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

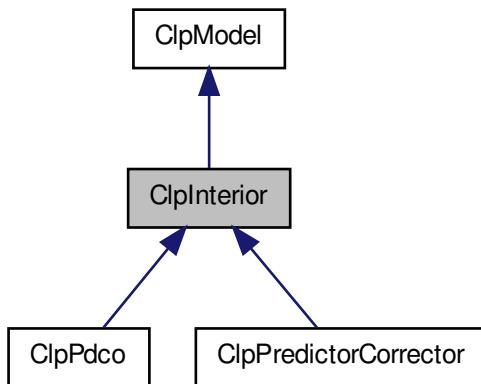
- ClpNode.hpp

3.46 ClpInterior Class Reference

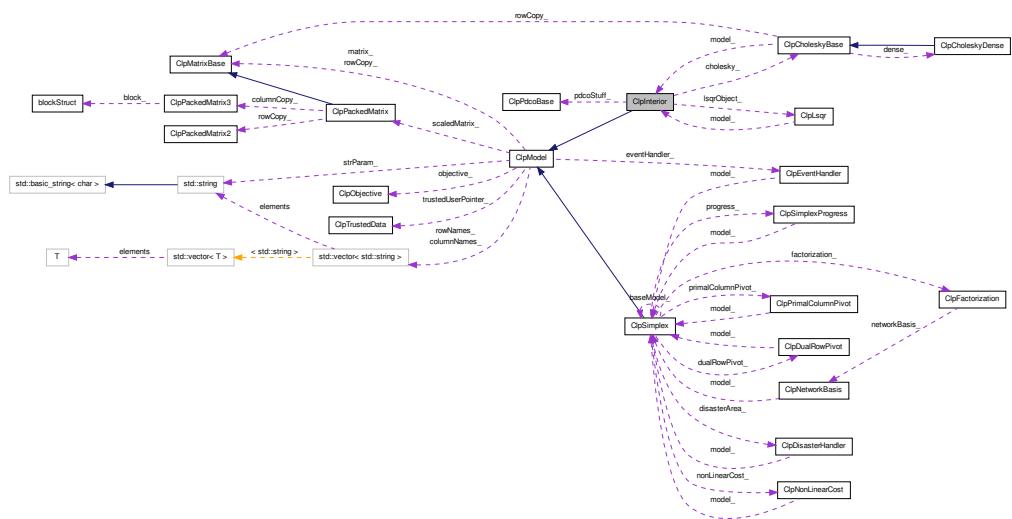
This solves LPs using interior point methods.

```
#include <ClpInterior.hpp>
```

Inheritance diagram for ClpInterior:



Collaboration diagram for ClpInterior:



Public Member Functions

Constructors and destructor and copy

- [ClpInterior \(\)](#)
Default constructor.
- [ClpInterior \(const ClpInterior &\)](#)
Copy constructor.
- [ClpInterior \(const ClpModel &\)](#)
Copy constructor from model.
- [ClpInterior \(const ClpModel *wholeModel, int numberOfRows, const int *whichRows, int numberColumns, const int *whichColumns, bool dropNames=true, bool dropIntegers=true\)](#)
Subproblem constructor.
- [ClpInterior & operator= \(const ClpInterior &rhs\)](#)
Assignment operator. This copies the data.
- [~ClpInterior \(\)](#)
Destructor.

- void **loadProblem** (const [ClpMatrixBase](#) &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)

Loads a problem (the constraints on the rows are given by lower and upper bounds).

- void **loadProblem** (const [CoinPackedMatrix](#) &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)
- void **loadProblem** (const int numcols, const int numrows, const [CoinBigIndex](#) *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)

Just like the other [loadProblem\(\)](#) method except that the matrix is given in a standard column major ordered format (without gaps).

- void **loadProblem** (const int numcols, const int numrows, const [CoinBigIndex](#) *start, const int *index, const double *value, const int *length, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)

This one is for after presolve to save memory.

- int **readMps** (const char *filename, bool keepNames=false, bool ignoreErrors=false)

Read an mps file from the given filename.

- void **borrowModel** ([ClpModel](#) &otherModel)

Borrow model.

- void **returnModel** ([ClpModel](#) &otherModel)

Return model - updates any scalars.

Functions most useful to user

- int **pdco** ()

Pdco algorithm - see [ClpPdco.hpp](#) for method.

- int **pdco** ([ClpPdcoBase](#) *stuff, [Options](#) &options, [Info](#) &info, [Outfo](#) &outfo)
- int **primalDual** ()

Primal-Dual Predictor-Corrector barrier.

most useful gets and sets

- bool **primalFeasible** () const

If problem is primal feasible.

- bool **dualFeasible** () const
If problem is dual feasible.
- int **algorithm** () const
Current (or last) algorithm.
- void **setAlgorithm** (int value)
Set algorithm.
- CoinWorkDouble **sumDualInfeasibilities** () const
Sum of dual infeasibilities.
- CoinWorkDouble **sumPrimalInfeasibilities** () const
Sum of primal infeasibilities.
- CoinWorkDouble **dualObjective** () const
dualObjective.
- CoinWorkDouble **primalObjective** () const
primalObjective.
- CoinWorkDouble **diagonalNorm** () const
diagonalNorm
- CoinWorkDouble **linearPerturbation** () const
linearPerturbation
- void **setLinearPerturbation** (CoinWorkDouble value)
- CoinWorkDouble **projectionTolerance** () const
projectionTolerance
- void **setProjectionTolerance** (CoinWorkDouble value)
- CoinWorkDouble **diagonalPerturbation** () const
diagonalPerturbation
- void **setDiagonalPerturbation** (CoinWorkDouble value)
- CoinWorkDouble **gamma** () const
gamma
- void **setGamma** (CoinWorkDouble value)
- CoinWorkDouble **delta** () const
delta
- void **setDelta** (CoinWorkDouble value)

- CoinWorkDouble **complementarityGap** () const
Complementarity Gap.
- CoinWorkDouble **largestPrimalError** () const
Largest error on Ax-b.
- CoinWorkDouble **largestDualError** () const
Largest error on basic duals.
- int **maximumBarrierIterations** () const
Maximum iterations.
- void **setMaximumBarrierIterations** (int value)
- void **setCholesky** (ClpCholeskyBase *cholesky)
Set cholesky (and delete present one).
- int **numberFixed** () const
Return number fixed to see if worth presolving.
- void **fixFixed** (bool reallyFix=true)
fix variables interior says should be.
- CoinWorkDouble * **primalR** () const
Primal erturbation vector.
- CoinWorkDouble * **dualR** () const
Dual erturbation vector.

public methods

- CoinWorkDouble **rawObjectiveValue** () const
Raw objective value (so always minimize).
- int **isColumn** (int sequence) const
Returns 1 if sequence indicates column.
- int **sequenceWithin** (int sequence) const
Returns sequence number within section.
- void **checkSolution** ()
Checks solution.
- CoinWorkDouble **quadraticDjs** (CoinWorkDouble *djRegion, const CoinWorkDouble *solution, CoinWorkDouble scaleFactor)

Modifies djs to allow for quadratic.

- void **setFixed** (int sequence)

To say a variable is fixed.

- void **clearFixed** (int sequence)
- bool **fixed** (int sequence) const
- void **setFlagged** (int sequence)

To flag a variable.

- void **clearFlagged** (int sequence)
- bool **flagged** (int sequence) const
- void **setFixedOrFree** (int sequence)

To say a variable is fixed OR free.

- void **clearFixedOrFree** (int sequence)
- bool **fixedOrFree** (int sequence) const
- void **setLowerBound** (int sequence)

To say a variable has lower bound.

- void **clearLowerBound** (int sequence)
- bool **lowerBound** (int sequence) const
- void **setUpUpperBound** (int sequence)

To say a variable has upper bound.

- void **clearUpperBound** (int sequence)
- bool **upperBound** (int sequence) const
- void **setFakeLower** (int sequence)

To say a variable has fake lower bound.

- void **clearFakeLower** (int sequence)
- bool **fakeLower** (int sequence) const
- void **setFakeUpper** (int sequence)

To say a variable has fake upper bound.

- void **clearFakeUpper** (int sequence)
- bool **fakeUpper** (int sequence) const

Protected Member Functions

protected methods

- void **gutsOfDelete** ()

Does most of deletion.

- void **gutsOfCopy** (const ClpInterior &rhs)

Does most of copying.

- bool [createWorkingData \(\)](#)
Returns true if data looks okay, false if not.
- void [deleteWorkingData \(\)](#)
- bool [sanityCheck \(\)](#)
Sanity check on input rim data.
- int [housekeeping \(\)](#)
This does housekeeping.

Friends

- void [ClpInteriorUnitTest](#) (const std::string &mpsDir, const std::string &netlibDir)
A function that tests the methods in the [ClpInterior](#) class.

data. Many arrays have a row part and a column part.

There is a single array with both - columns then rows and then normally two arrays pointing to rows and columns.

The single array is the owner of memory

- CoinWorkDouble [largestPrimalError_](#)
Largest error on Ax-b.
- CoinWorkDouble [largestDualError_](#)
Largest error on basic duals.
- CoinWorkDouble [sumDualInfeasibilities_](#)
Sum of dual infeasibilities.
- CoinWorkDouble [sumPrimalInfeasibilities_](#)
Sum of primal infeasibilities.
- CoinWorkDouble [worstComplementarity_](#)
Worst complementarity.
- CoinWorkDouble * [lower_](#)
Working copy of lower bounds (Owner of arrays below).

- CoinWorkDouble * **rowLowerWork_**
Row lower bounds - working copy.
- CoinWorkDouble * **columnLowerWork_**
Column lower bounds - working copy.
- CoinWorkDouble * **upper_**
Working copy of upper bounds (Owner of arrays below).
- CoinWorkDouble * **rowUpperWork_**
Row upper bounds - working copy.
- CoinWorkDouble * **columnUpperWork_**
Column upper bounds - working copy.
- CoinWorkDouble * **cost_**
Working copy of objective.
- ClpLsqr * **lsqrObject_**
Pointer to Lsqr object.
- ClpPdcoBase * **pdcoStuff_**
Pointer to stuff.
- CoinWorkDouble **mu_**
Below here is standard barrier stuff mu.
- CoinWorkDouble **objectiveNorm_**
objectiveNorm.
- CoinWorkDouble **rhsNorm_**
rhsNorm.
- CoinWorkDouble **solutionNorm_**
solutionNorm.
- CoinWorkDouble **dualObjective_**
dualObjective.
- CoinWorkDouble **primalObjective_**
primalObjective.

- CoinWorkDouble [diagonalNorm_](#)
diagonalNorm.
- CoinWorkDouble [stepLength_](#)
stepLength
- CoinWorkDouble [linearPerturbation_](#)
linearPerturbation
- CoinWorkDouble [diagonalPerturbation_](#)
diagonalPerturbation
- CoinWorkDouble [gamma_](#)
- CoinWorkDouble [delta_](#)
- CoinWorkDouble [targetGap_](#)
targetGap
- CoinWorkDouble [projectionTolerance_](#)
projectionTolerance
- CoinWorkDouble [maximumRHSError_](#)
maximumRHSError. maximum Ax
- CoinWorkDouble [maximumBoundInfeasibility_](#)
maximumBoundInfeasibility.
- CoinWorkDouble [maximumDualError_](#)
maximumDualError.
- CoinWorkDouble [diagonalScaleFactor_](#)
diagonalScaleFactor.
- CoinWorkDouble [scaleFactor_](#)
scaleFactor. For scaling objective
- CoinWorkDouble [actualPrimalStep_](#)
actualPrimalStep
- CoinWorkDouble [actualDualStep_](#)
actualDualStep

- CoinWorkDouble **smallestInfeasibility_**
smallestInfeasibility
- CoinWorkDouble **historyInfeasibility_** [LENGTH_HISTORY]
- CoinWorkDouble **complementarityGap_**
complementarityGap.
- CoinWorkDouble **baseObjectiveNorm_**
baseObjectiveNorm
- CoinWorkDouble **worstDirectionAccuracy_**
worstDirectionAccuracy
- CoinWorkDouble **maximumRHSChange_**
maximumRHSChange
- CoinWorkDouble * **errorRegion_**
errorRegion. i.e. Ax
- CoinWorkDouble * **rhsFixRegion_**
rhsFixRegion.
- CoinWorkDouble * **upperSlack_**
upperSlack
- CoinWorkDouble * **lowerSlack_**
lowerSlack
- CoinWorkDouble * **diagonal_**
diagonal
- CoinWorkDouble * **solution_**
solution
- CoinWorkDouble * **workArray_**
work array
- CoinWorkDouble * **deltaX_**
delta X
- CoinWorkDouble * **deltaY_**
delta Y

- CoinWorkDouble * `deltaZ_`
deltaZ.
- CoinWorkDouble * `deltaW_`
deltaW.
- CoinWorkDouble * `deltaSU_`
deltaS.
- CoinWorkDouble * `deltaSL_`
- CoinWorkDouble * `primalR_`
Primal regularization array.
- CoinWorkDouble * `dualR_`
Dual regularization array.
- CoinWorkDouble * `rhsB_`
rhs B
- CoinWorkDouble * `rhsU_`
rhsU.
- CoinWorkDouble * `rhsL_`
rhsL.
- CoinWorkDouble * `rhsZ_`
rhsZ.
- CoinWorkDouble * `rhsW_`
rhsW.
- CoinWorkDouble * `rhsC_`
rhs C
- CoinWorkDouble * `zVec_`
zVec
- CoinWorkDouble * `wVec_`
wVec
- `ClpCholeskyBase` * `cholesky_`

cholesky.

- int **numberComplementarityPairs_**
numberComplementarityPairs i.e. ones with lower and/or upper bounds (not fixed)
- int **numberComplementarityItems_**
numberComplementarityItems_ i.e. number of active bounds
- int **maximumBarrierIterations_**
Maximum iterations.
- bool **gonePrimalFeasible_**
gonePrimalFeasible.
- bool **goneDualFeasible_**
goneDualFeasible.
- int **algorithm_**
Which algorithm being used.
- CoinWorkDouble **xsize_**
- CoinWorkDouble **zsize_**
- CoinWorkDouble * **rhs_**
Rhs.
- CoinWorkDouble * **x_**
- CoinWorkDouble * **y_**
- CoinWorkDouble * **dj_**

3.46.1 Detailed Description

This solves LPs using interior point methods. It inherits from [ClpModel](#) and all its arrays are created at algorithm time.

Definition at line 72 of file ClpInterior.hpp.

3.46.2 Constructor & Destructor Documentation

3.46.2.1 ClpInterior::ClpInterior (const ClpModel * *wholeModel*, int *numberRows*, const int * *whichRows*, int *numberColumns*, const int * *whichColumns*, bool *dropNames* = **true**, bool *dropIntegers* = **true**)

Subproblem constructor.

A subset of whole model is created from the row and column lists given. The new order is given by list order and duplicates are allowed. Name and integer information can be dropped

3.46.3 Member Function Documentation

**3.46.3.1 void ClpInterior::loadProblem (const ClpMatrixBase & *matrix*,
const double * *collb*, const double * *colub*, const double * *obj*, const
double * *rowlb*, const double * *rowub*, const double * *rowObjective* =
NULL)**

Loads a problem (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- *colub*: all columns have upper bound infinity
- *collb*: all columns have lower bound 0
- *rowub*: all rows have upper bound infinity
- *rowlb*: all rows have lower bound -infinity
- *obj*: all variables have 0 objective coefficient

Reimplemented from [ClpModel](#).

**3.46.3.2 void ClpInterior::loadProblem (const int *numcols*, const int
numrows, const CoinBigIndex * *start*, const int * *index*, const double
* *value*, const double * *collb*, const double * *colub*, const double *
obj, const double * *rowlb*, const double * *rowub*, const double *
rowObjective = *NULL*)**

Just like the other [loadProblem\(\)](#) method except that the matrix is given in a standard column major ordered format (without gaps).

Reimplemented from [ClpModel](#).

3.46.3.3 void ClpInterior::borrowModel (ClpModel & *otherModel*)

Borrow model.

This is so we don't have to copy large amounts of data around. It assumes a derived class wants to overwrite an empty model with a real one - while it does an algorithm. This is same as [ClpModel](#) one.

Reimplemented from [ClpModel](#).

3.46.3.4 void ClpInterior::fixFixed (bool *reallyFix* = **true**)

fix variables interior says should be.

If *reallyFix* false then just set values to exact bounds

3.46.3.5 CoinWorkDouble ClpInterior::quadraticDjs (CoinWorkDouble * *djRegion*, const CoinWorkDouble * *solution*, CoinWorkDouble *scaleFactor*)

Modifies djs to allow for quadratic.

returns quadratic offset

3.46.4 Friends And Related Function Documentation

3.46.4.1 void ClpInteriorUnitTests (const std::string & *mpsDir*, const std::string & *netlibDir*) [friend]

A function that tests the methods in the [ClpInterior](#) class.

The only reason for it not to be a member method is that this way it doesn't have to be compiled into the library. And that's a gain, because the library should be compiled with optimization on, but this method should be compiled with debugging.

It also does some testing of [ClpFactorization](#) class

3.46.5 Member Data Documentation

3.46.5.1 CoinWorkDouble ClpInterior::mu_ [protected]

Below here is standard barrier stuff mu.

Definition at line 441 of file ClpInterior.hpp.

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

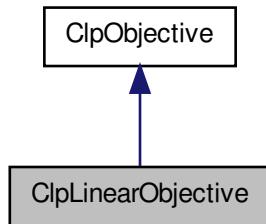
- ClpInterior.hpp

3.47 ClpLinearObjective Class Reference

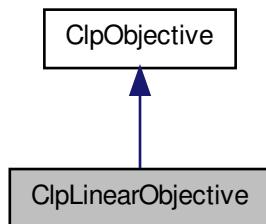
Linear Objective Class.

```
#include <ClpLinearObjective.hpp>
```

Inheritance diagram for ClpLinearObjective:



Collaboration diagram for ClpLinearObjective:



Public Member Functions

Stuff

- virtual double * [gradient](#) (const [ClpSimplex](#) *model, const double *solution, double &offset, bool refresh, int includeLinear=2)
Returns objective coefficients.
- virtual double [reducedGradient](#) ([ClpSimplex](#) *model, double *region, bool useFeasibleCosts)
Returns reduced gradient.Returns an offset (to be added to current one).
- virtual double [stepLength](#) ([ClpSimplex](#) *model, const double *solution, const double *change, double maximumTheta, double ¤tObj, double &predictedObj, double &thetaObj)
*Returns step length which gives minimum of objective for solution + theta * change vector up to maximum theta.*
- virtual double [objectiveValue](#) (const [ClpSimplex](#) *model, const double *solution) const
Return objective value (without any [ClpModel](#) offset) (model may be NULL).
- virtual void [resize](#) (int newNumberColumns)
Resize objective.
- virtual void [deleteSome](#) (int numberToDelete, const int *which)
Delete columns in objective.
- virtual void [reallyScale](#) (const double *columnScale)
Scale objective.

Constructors and destructors

- [ClpLinearObjective](#) ()
Default Constructor.
- [ClpLinearObjective](#) (const double *objective, int numberColumns)
Constructor from objective.
- [ClpLinearObjective](#) (const [ClpLinearObjective](#) &)
Copy constructor.
- [ClpLinearObjective](#) (const [ClpLinearObjective](#) &rhs, int numberColumns, const int *whichColumns)
Subset constructor.

- `ClpLinearObjective & operator= (const ClpLinearObjective &rhs)`
Assignment operator.
- `virtual ~ClpLinearObjective ()`
Destructor.
- `virtual ClpObjective * clone () const`
Clone.
- `virtual ClpObjective * subsetClone (int numberColumns, const int *whichColumns) const`
Subset clone.

3.47.1 Detailed Description

Linear Objective Class.

Definition at line 17 of file ClpLinearObjective.hpp.

3.47.2 Constructor & Destructor Documentation

3.47.2.1 `ClpLinearObjective::ClpLinearObjective (const ClpLinearObjective & rhs, int numberColumns, const int * whichColumns)`

Subset constructor.

Duplicates are allowed and order is as given.

3.47.3 Member Function Documentation

3.47.3.1 `virtual double* ClpLinearObjective::gradient (const ClpSimplex * model, const double * solution, double & offset, bool refresh, int includeLinear = 2) [virtual]`

Returns objective coefficients.

Offset is always set to 0.0. All other parameters unused.

Implements `ClpObjective`.

3.47.3.2 virtual double ClpLinearObjective::stepLength (ClpSimplex * *model*, const double * *solution*, const double * *change*, double *maximumTheta*, double & *currentObj*, double & *predictedObj*, double & *thetaObj*) [virtual]

Returns step length which gives minimum of objective for solution + theta * change vector up to maximum theta.

arrays are numberColumns+numberRows Also sets current objective, predicted and at maximumTheta

Implements [ClpObjective](#).

3.47.3.3 virtual ClpObjective* ClpLinearObjective::subsetClone (int *numberColumns*, const int * *whichColumns*) const [virtual]

Subset clone.

Duplicates are allowed and order is as given.

Reimplemented from [ClpObjective](#).

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

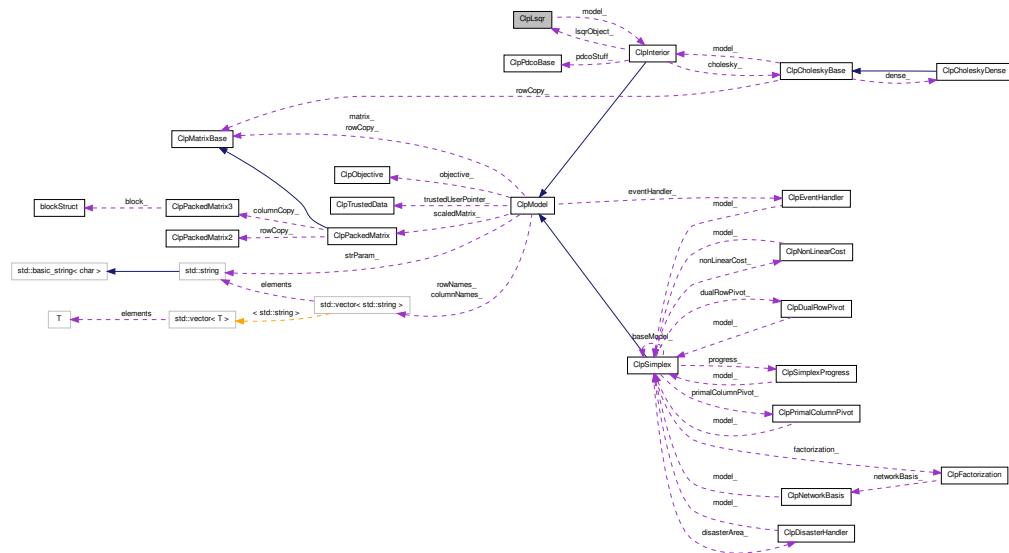
- ClpLinearObjective.hpp

3.48 ClpLsqr Class Reference

This class implements LSQR.

```
#include <ClpLsqr.hpp>
```

Collaboration diagram for ClpLsqr:



Public Member Functions

Constructors and destructors

- **ClpLsqr ()**
Default constructor.
- **ClpLsqr (ClpInterior *model)**
Constructor for use with Pdco model (note modified for pdco!!!!).
- **ClpLsqr (const ClpLsqr &)**
Copy constructor.
- **ClpLsqr & operator= (const ClpLsqr &rhs)**
Assignment operator. This copies the data.
- **~ClpLsqr ()**
Destructor.

Methods

- bool `setParam` (char *parmName, int parmValue)
Set an int parameter.
- void `do_lsqr` (CoinDenseVector< double > &b, double damp, double atol, double btol, double conlim, int itnlim, bool show, `Info` info, CoinDenseVector< double > &x, int *istop, int *itn, `Outfo` *outfo, bool precon, CoinDenseVector< double > &Pr)
Call the Lsqr algorithm.
- void `matVecMult` (int, CoinDenseVector< double > *, CoinDenseVector< double > *)
Matrix-vector multiply - implemented by user.
- void `matVecMult` (int, CoinDenseVector< double > &, CoinDenseVector< double > &)
- void `borrowDiag1` (double *array)
diag1 - we just borrow as it is part of a CoinDenseVector<double>

Public Attributes

Public member data

- int `nrows_`
Row dimension of matrix.
- int `ncols_`
Column dimension of matrix.
- `ClpInterior` * `model_`
Pointer to Model object for this instance.
- double * `diag1_`
Diagonal array 1.
- double `diag2_`
Constant diagonal 2.

3.48.1 Detailed Description

This class implements LSQR.

```
LSQR solves Ax = b or min ||b - Ax||_2 if damp = 0,
or min || (b) - ( A )x || otherwise.
```

```

|| (0)      (damp I) ||2
A is an m by n matrix defined by user provided routines
matVecMult(mode, y, x)
which performs the matrix-vector operations where y and x
are references or pointers to CoinDenseVector objects.
If mode = 1, matVecMult must return y = Ax without altering x.
If mode = 2, matVecMult must return y = A'x without altering x.

-----
LSQR uses an iterative (conjugate-gradient-like) method.
For further information, see
1. C. C. Paige and M. A. Saunders (1982a).
   LSQR: An algorithm for sparse linear equations and sparse least squares,
   ACM TOMS 8(1), 43-71.
2. C. C. Paige and M. A. Saunders (1982b).
   Algorithm 583. LSQR: Sparse linear equations and least squares problems,
   ACM TOMS 8(2), 195-209.
3. M. A. Saunders (1995). Solution of sparse rectangular systems using
   LSQR and CRAIG, BIT 35, 588-604.

Input parameters:

atol, btol are stopping tolerances. If both are 1.0e-9 (say),
the final residual norm should be accurate to about 9 digits.
(The final x will usually have fewer correct digits,
depending on cond(A) and the size of damp.)
conlim is also a stopping tolerance. lsqr terminates if an estimate
of cond(A) exceeds conlim. For compatible systems Ax = b,
conlim could be as large as 1.0e+12 (say). For least-squares
problems, conlim should be less than 1.0e+8.
Maximum precision can be obtained by setting
atol = btol = conlim = zero, but the number of iterations
may then be excessive.
itnlim is an explicit limit on iterations (for safety).
show = 1 gives an iteration log,
show = 0 suppresses output.
info is a structure special to pdco.m, used to test if
was small enough, and continuing if necessary with smaller atol.

Output parameters:
x is the final solution.
*istop gives the reason for termination.
*istop = 1 means x is an approximate solution to Ax = b.
= 2 means x approximately solves the least-squares problem.
rnorm = norm(r) if damp = 0, where r = b - Ax,
= sqrt( norm(r)**2 + damp**2 * norm(x)**2 ) otherwise.
xnorm = norm(x).
var estimates diag( inv(A'A) ). Omitted in this special version.
outfo is a structure special to pdco.m, returning information
about whether atol had to be reduced.

Other potential output parameters:
anorm, acond, arnorm, xnorm
```

Definition at line 76 of file ClpLsqr.hpp.

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

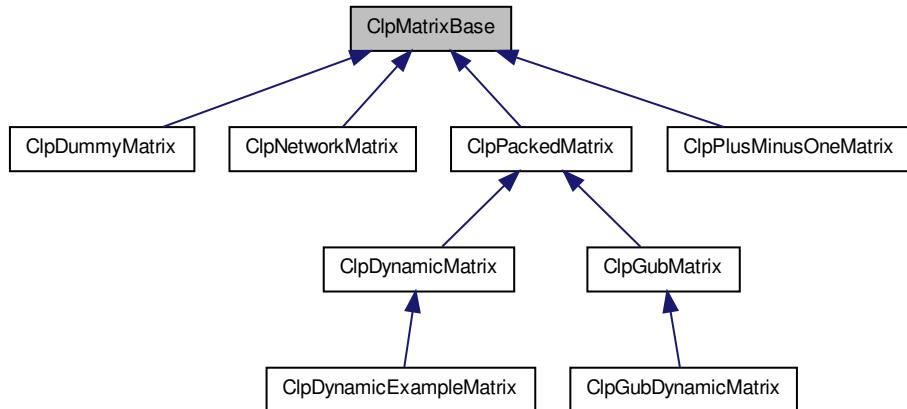
- ClpLsqr.hpp

3.49 ClpMatrixBase Class Reference

Abstract base class for Clp Matrices.

```
#include <ClpMatrixBase.hpp>
```

Inheritance diagram for ClpMatrixBase:



Public Member Functions

Virtual methods that the derived classes must provide

- virtual CoinPackedMatrix * [getPackedMatrix](#) () const =0
Return a complete CoinPackedMatrix.
- virtual bool [isColOrdered](#) () const =0
Whether the packed matrix is column major ordered or not.
- virtual CoinBigIndex [getNumElements](#) () const =0
Number of entries in the packed matrix.
- virtual int [getNumCols](#) () const =0

Number of columns.

- virtual int `getNumRows () const =0`

Number of rows.

- virtual const double * `getElements () const =0`

A vector containing the elements in the packed matrix.

- virtual const int * `getIndices () const =0`

A vector containing the minor indices of the elements in the packed matrix.

- virtual const CoinBigIndex * `getVectorStarts () const =0`

- virtual const int * `getVectorLengths () const =0`

The lengths of the major-dimension vectors.

- virtual int `getVectorLength (int index) const`

The length of a single major-dimension vector.

- virtual void `deleteCols (const int numDel, const int *indDel)=0`

Delete the columns whose indices are listed in `indDel`.

- virtual void `deleteRows (const int numDel, const int *indDel)=0`

Delete the rows whose indices are listed in `indDel`.

- virtual void `appendCols (int number, const CoinPackedVectorBase *const *columns)`

Append Columns.

- virtual void `appendRows (int number, const CoinPackedVectorBase *const *rows)`

Append Rows.

- virtual void `modifyCoefficient (int row, int column, double newElement, bool keepZero=false)`

Modify one element of packed matrix.

- virtual int `appendMatrix (int number, int type, const CoinBigIndex *starts, const int *index, const double *element, int numberOther=-1)`

Append a set of rows/columns to the end of the matrix.

- virtual `ClpMatrixBase * reverseOrderedCopy () const`

Returns a new matrix in reverse order without gaps Is allowed to return NULL if doesn't want to have row copy.

- virtual CoinBigIndex `countBasis (const int *whichColumn, int &numberColumnBasic)=0`

Returns number of elements in column part of basis.

- virtual void `fillBasis` (`ClpSimplex` *model, const int *whichColumn, int &numberColumnBasic, int *row, int *start, int *rowCount, int *columnCount, CoinFactorizationDouble *element)=0
Fills in column part of basis.
- virtual int `scale` (`ClpModel` *, const `ClpSimplex` *=NULL) const
Creates scales for column copy (rowCopy in model may be modified) default does not allow scaling returns non-zero if no scaling done.
- virtual void `scaleRowCopy` (`ClpModel` *) const
Scales rowCopy if column copy scaled Only called if scales already exist.
- virtual bool `canGetRowCopy` () const
Returns true if can create row copy.
- virtual `ClpMatrixBase` * `scaledColumnCopy` (`ClpModel` *) const
Realy really scales column copy Only called if scales already exist.
- virtual bool `allElementsInRange` (`ClpModel` *, double, double, int=15)
Checks if all elements are in valid range.
- virtual void `setDimensions` (int numrows, int numcols)
Set the dimensions of the matrix.
- virtual void `rangeOfElements` (double &smallestNegative, double &largestNegative, double &smallestPositive, double &largestPositive)
Returns largest and smallest elements of both signs.
- virtual void `unpack` (const `ClpSimplex` *model, CoinIndexedVector *rowArray, int column) const =0
Unpacks a column into an CoinIndexedvector.
- virtual void `unpackPacked` (`ClpSimplex` *model, CoinIndexedVector *rowArray, int column) const =0
Unpacks a column into an CoinIndexedvector in packed format Note that model is NOT const.
- virtual int `refresh` (`ClpSimplex` *)
Purely for column generation and similar ideas.
- virtual void `reallyScale` (const double *rowScale, const double *columnScale)
- virtual CoinBigIndex * `dubiousWeights` (const `ClpSimplex` *model, int *inputWeights) const
Given positive integer weights for each row fills in sum of weights for each column (and slack).

- virtual void `add` (const `ClpSimplex` *model, `CoinIndexedVector` *rowArray, int column, double multiplier) const =0
Adds multiple of a column into an CoinIndexedvector You can use quickAdd to add to vector.
- virtual void `add` (const `ClpSimplex` *model, double *array, int column, double multiplier) const =0
Adds multiple of a column into an array.
- virtual void `releasePackedMatrix` () const =0
Allow any parts of a created CoinPackedMatrix to be deleted.
- virtual bool `canDoPartialPricing` () const
Says whether it can do partial pricing.
- virtual int `hiddenRows` () const
Returns number of hidden rows e.g. gub.
- virtual void `partialPricing` (`ClpSimplex` *model, double start, double end, int &bestSequence, int &numberWanted)
Partial pricing.
- virtual int `extendUpdated` (`ClpSimplex` *model, `CoinIndexedVector` *update, int mode)
expands an updated column to allow for extra rows which the main solver does not know about and returns number added.
- virtual void `primalExpanded` (`ClpSimplex` *model, int mode)
utility primal function for dealing with dynamic constraints mode=0 - Set up before "update" and "times" for primal solution using extended rows mode=1 - Cleanup primal solution after "times" using extended rows.
- virtual void `dualExpanded` (`ClpSimplex` *model, `CoinIndexedVector` *array, double *other, int mode)
utility dual function for dealing with dynamic constraints mode=0 - Set up before "updateTranspose" and "transposeTimes" for duals using extended updates array (and may use other if dual values pass) mode=1 - Update dual solution after "transposeTimes" using extended rows.
- virtual int `generalExpanded` (`ClpSimplex` *model, int mode, int &number)
general utility function for dealing with dynamic constraints mode=0 - Create list of non-key basics in pivotVariable_ using number as numberBasic in and out mode=1 - Set all key variables as basic mode=2 - return number extra rows needed, number gives maximum number basic mode=3 - before replaceColumn mode=4 - return 1 if can do primal, 2 if dual, 3 if both mode=5 - save any status stuff (when in good state) mode=6 - restore status stuff mode=7 - flag given

variable (normally sequenceIn) mode=8 - unflag all variables mode=9 - synchronize costs and bounds mode=10 - return 1 if there may be changing bounds on variable (column generation) mode=11 - make sure set is clean (used when a variable rejected - but not flagged) mode=12 - after factorize but before permute stuff mode=13 - at end of simplex to delete stuff

- virtual int `updatePivot` (`ClpSimplex` *model, double oldInValue, double oldOutValue)

update information for a pivot (and effective rhs)
- virtual void `createVariable` (`ClpSimplex` *model, int &bestSequence)

Creates a variable.
- virtual int `checkFeasible` (`ClpSimplex` *model, double &sum) const

Just for debug if odd type matrix.
- double `reducedCost` (`ClpSimplex` *model, int sequence) const

Returns reduced cost of a variable.
- virtual void `correctSequence` (const `ClpSimplex` *model, int &sequenceIn, int &sequenceOut)

Correct sequence in and out to give true value (if both -1 maybe do whole matrix).

Matrix times vector methods

They can be faster if scalar is +- 1 Also for simplex I am not using basic/non-basic split

- virtual void `times` (double scalar, const double *x, double *y) const =0

*Return y + A * x * scalar in y.*
- virtual void `times` (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale) const

And for scaling - default aborts for when scaling not supported (unless pointers NULL when as normal).
- virtual void `transposeTimes` (double scalar, const double *x, double *y) const =0

*Return y + x * scalar * A in y.*
- virtual void `transposeTimes` (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale, double *spare=NULL) const

And for scaling - default aborts for when scaling not supported (unless pointers NULL when as normal).

- virtual void `transposeTimes` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const =0
*Return $x * scalar *A + y$ in z.*
- virtual void `subsetTransposeTimes` (const `ClpSimplex` *model, const `CoinIndexedVector` *x, const `CoinIndexedVector` *y, `CoinIndexedVector` *z) const =0
*Return $x * A$ in z but just for indices in y.*
- virtual bool `canCombine` (const `ClpSimplex` *, const `CoinIndexedVector` *) const
Returns true if can combine transposeTimes and subsetTransposeTimes and if it would be faster.
- virtual void `transposeTimes2` (const `ClpSimplex` *model, const `CoinIndexedVector` *pi1, `CoinIndexedVector` *dj1, const `CoinIndexedVector` *pi2, `CoinIndexedVector` *spare, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor)
Updates two arrays for steepest and does devex weights (need not be coded).
- virtual void `subsetTimes2` (const `ClpSimplex` *model, `CoinIndexedVector` *dj1, const `CoinIndexedVector` *pi2, `CoinIndexedVector` *dj2, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor)
Updates second array for steepest and does devex weights (need not be coded).
- virtual void `listTransposeTimes` (const `ClpSimplex` *model, double *x, int *y, int number, double *z) const
*Return $x * A$ in z but just for number indices in y.*

Other

Clone

- virtual `ClpMatrixBase` * `clone` () const =0
- virtual `ClpMatrixBase` * `subsetClone` (int numberRows, const int *whichRows, int numberColumns, const int *whichColumns) const
Subset clone (without gaps).
- virtual void `backToBasics` ()
Gets rid of any mutable by products.
- int `type` () const
Returns type.

- void **setType** (int newtype)
Sets type.
- void **useEffectiveRhs** (ClpSimplex *model)
Sets up an effective RHS.
- virtual double * **rhsOffset** (ClpSimplex *model, bool forceRefresh=false, bool check=false)
Returns effective RHS offset if it is being used.
- int **lastRefresh** () const
If rhsOffset used this is iteration last refreshed.
- int **refreshFrequency** () const
If rhsOffset used this is refresh frequency (0==off).
- void **setRefreshFrequency** (int value)
- bool **skipDualCheck** () const
whether to skip dual checks most of time
- void **setSkipDualCheck** (bool yes)
- int **minimumObjectsScan** () const
Partial pricing tuning parameter - minimum number of "objects" to scan.
- void **setMinimumObjectsScan** (int value)
- int **minimumGoodReducedCosts** () const
Partial pricing tuning parameter - minimum number of negative reduced costs to get.
- void **setMinimumGoodReducedCosts** (int value)
- double **startFraction** () const
Current start of search space in matrix (as fraction).
- void **setStartFraction** (double value)
- double **endFraction** () const
Current end of search space in matrix (as fraction).
- void **setEndFraction** (double value)
- double **savedBestDj** () const
Current best reduced cost.
- void **setSavedBestDj** (double value)
- int **originalWanted** () const
Initial number of negative reduced costs wanted.
- void **setOriginalWanted** (int value)

- int **currentWanted** () const
Current number of negative reduced costs which we still need.
- void **setCurrentWanted** (int value)
- int **savedBestSequence** () const
Current best sequence.
- void **setSavedBestSequence** (int value)

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- double * **rhsOffset_**
Effective RHS offset if it is being used.
- double **startFraction_**
Current start of search space in matrix (as fraction).
- double **endFraction_**
Current end of search space in matrix (as fraction).
- double **savedBestDj_**
Best reduced cost so far.
- int **originalWanted_**
Initial number of negative reduced costs wanted.
- int **currentWanted_**
Current number of negative reduced costs which we still need.
- int **savedBestSequence_**
Saved best sequence in pricing.
- int **type_**
type (may be useful)
- int **lastRefresh_**
If rhsOffset used this is iteration last refreshed.
- int **refreshFrequency_**
If rhsOffset used this is refresh frequency (0==off).
- int **minimumObjectsScan_**

Partial pricing tuning parameter - minimum number of "objects" to scan.

- int **minimumGoodReducedCosts_**
Partial pricing tuning parameter - minimum number of negative reduced costs to get.
- int **trueSequenceIn_**
True sequence in (i.e. from larger problem).
- int **trueSequenceOut_**
True sequence out (i.e. from larger problem).
- bool **skipDualCheck_**
whether to skip dual checks most of time

Constructors, destructor

NOTE: All constructors are protected.

There's no need to expose them, after all, this is an abstract class.

- virtual ~**ClpMatrixBase** ()
Destructor (has to be public).
- **ClpMatrixBase** ()
Default constructor.
- **ClpMatrixBase** (const **ClpMatrixBase** &)
- **ClpMatrixBase** & **operator=** (const **ClpMatrixBase** &)

3.49.1 Detailed Description

Abstract base class for Clp Matrices. Since this class is abstract, no object of this type can be created.

If a derived class provides all methods then all Clp algorithms should work. Some can be very inefficient e.g. `getElements` etc is only used for tightening bounds for dual and the copies are deleted. Many methods can just be dummy i.e. `abort()`; if not all features are being used. So if column generation was being done then it makes no sense to do steepest edge so there would be no point providing `subsetTransposeTimes`.

Definition at line 30 of file `ClpMatrixBase.hpp`.

3.49.2 Constructor & Destructor Documentation

3.49.2.1 ClpMatrixBase::ClpMatrixBase () [protected]

Default constructor.

3.49.3 Member Function Documentation

3.49.3.1 virtual bool ClpMatrixBase::isColOrdered () const [pure virtual]

Whether the packed matrix is column major ordered or not.

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.2 virtual CoinBigIndex ClpMatrixBase::getNumElements () const [pure virtual]

Number of entries in the packed matrix.

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.3 virtual int ClpMatrixBase::getNumCols () const [pure virtual]

Number of columns.

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.4 virtual int ClpMatrixBase::getNumRows () const [pure virtual]

Number of rows.

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.5 virtual const double* ClpMatrixBase::getElements () const [pure virtual]

A vector containing the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.6 virtual const int* ClpMatrixBase::getIndices () const [pure virtual]

A vector containing the minor indices of the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.7 virtual const int* ClpMatrixBase::getVectorLengths () const [pure virtual]

The lengths of the major-dimension vectors.

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.8 virtual int ClpMatrixBase::getVectorLength (int index) const [virtual]

The length of a single major-dimension vector.

Reimplemented in [ClpPackedMatrix](#).

3.49.3.9 virtual void ClpMatrixBase::deleteCols (const int *numDel*, const int * *indDel*) [pure virtual]

Delete the columns whose indices are listed in *indDel*.

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.10 virtual void ClpMatrixBase::deleteRows (const int *numDel*, const int * *indDel*) [pure virtual]

Delete the rows whose indices are listed in *indDel*.

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.11 virtual void ClpMatrixBase::modifyCoefficient (int *row*, int *column*, double *newElement*, bool *keepZero = false*) [virtual]

Modify one element of packed matrix.

An element may be added. This works for either ordering If the new element is zero it will be deleted unless *keepZero* true

Reimplemented in [ClpPackedMatrix](#).

3.49.3.12 virtual int ClpMatrixBase::appendMatrix (int *number*, int *type*, const CoinBigIndex * *starts*, const int * *index*, const double * *element*, int *numberOther = -1*) [virtual]

Append a set of rows/columns to the end of the matrix.

Returns number of errors i.e. if any of the new rows/columns contain an index that's larger than the number of columns-1/rows-1 (if *numberOther*>0) or duplicates If 0 then rows, 1 if columns

Reimplemented in [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.13 virtual ClpMatrixBase* ClpMatrixBase::scaledColumnCopy (ClpModel *) const [inline, virtual]

Really really scales column copy Only called if scales already exist.

Up to user to delete

Reimplemented in [ClpPackedMatrix](#).

Definition at line 118 of file ClpMatrixBase.hpp.

3.49.3.14 virtual bool ClpMatrixBase::allElementsInRange (ClpModel *, double, double, int = 15) [inline, virtual]

Checks if all elements are in valid range.

Can just return true if you are not paranoid. For Clp I will probably expect no zeros. Code can modify matrix to get rid of small elements. check bits (can be turned off to save time) : 1 - check if matrix has gaps 2 - check if zero elements 4 - check and compress duplicates 8 - report on large and small

Reimplemented in [ClpPackedMatrix](#).

Definition at line 132 of file ClpMatrixBase.hpp.

3.49.3.15 virtual void ClpMatrixBase::setDimensions (int numrows, int numcols) [virtual]

Set the dimensions of the matrix.

In effect, append new empty columns/rows to the matrix. A negative number for either dimension means that that dimension doesn't change. Otherwise the new dimensions MUST be at least as large as the current ones otherwise an exception is thrown.

Reimplemented in [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.16 virtual void ClpMatrixBase::rangeOfElements (double & *smallestNegative*, double & *largestNegative*, double & *smallestPositive*, double & *largestPositive*) [virtual]

Returns largest and smallest elements of both signs.

Largest refers to largest absolute value. If returns zeros then can't tell anything

Reimplemented in [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.17 virtual void ClpMatrixBase::unpackPacked (ClpSimplex * *model*, CoinIndexedVector * *rowArray*, int *column*) const [pure virtual]

Unpacks a column into an CoinIndexedvector in packed format Note that model is NOT const.

Bounds and objective could be modified if doing column generation (just for this variable)

Implemented in [ClpDummyMatrix](#), [ClpGubMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.18 virtual int ClpMatrixBase::refresh (ClpSimplex *) [inline, virtual]

Purely for column generation and similar ideas.

Allows matrix and any bounds or costs to be updated (sensibly). Returns non-zero if any changes.

Reimplemented in [ClpDynamicMatrix](#), and [ClpPackedMatrix](#).

Definition at line 164 of file ClpMatrixBase.hpp.

3.49.3.19 virtual CoinBigIndex* ClpMatrixBase::dubiousWeights (const ClpSimplex * *model*, int * *inputWeights*) const [virtual]

Given positive integer weights for each row fills in sum of weights for each column (and slack).

Returns weights vector Default returns vector of ones

Reimplemented in [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.20 virtual int ClpMatrixBase::extendUpdated (*ClpSimplex * model,* *CoinIndexedVector * update, int mode*) [virtual]

expands an updated column to allow for extra rows which the main solver does not know about and returns number added.

This will normally be a no-op - it is in for GUB but may get extended to general non-overlapping and embedded networks.

mode 0 - extend mode 1 - delete etc

Reimplemented in [ClpGubMatrix](#).

3.49.3.21 virtual void ClpMatrixBase::primalExpanded (*ClpSimplex * model,* *int mode*) [virtual]

utility primal function for dealing with dynamic constraints mode=0 - Set up before "update" and "times" for primal solution using extended rows mode=1 - Cleanup primal solution after "times" using extended rows.

mode=2 - Check (or report on) primal infeasibilities

Reimplemented in [ClpGubMatrix](#).

3.49.3.22 virtual void ClpMatrixBase::dualExpanded (*ClpSimplex * model,* *CoinIndexedVector * array, double * other, int mode*) [virtual]

utility dual function for dealing with dynamic constraints mode=0 - Set up before "updateTranspose" and "transposeTimes" for duals using extended updates array (and may use other if dual values pass) mode=1 - Update dual solution after "transposeTimes" using extended rows.

mode=2 - Compute all djs and compute key dual infeasibilities mode=3 - Report on key dual infeasibilities mode=4 - Modify before updateTranspose in partial pricing

Reimplemented in [ClpDynamicMatrix](#), and [ClpGubMatrix](#).

**3.49.3.23 virtual int ClpMatrixBase::generalExpanded (ClpSimplex * *model*,
int *mode*, int & *number*) [virtual]**

general utility function for dealing with dynamic constraints
mode=0 - Create list of non-key basics in pivotVariable_ using *number* as numberBasic in and out
mode=1 - Set all key variables as basic
mode=2 - return *number* extra rows needed, *number* gives maximum number basic
mode=3 - before replaceColumn
mode=4 - return 1 if can do primal, 2 if dual, 3 if both
mode=5 - save any status stuff (when in good state)
mode=6 - restore status stuff
mode=7 - flag given variable (normally sequenceIn)
mode=8 - unflag all variables
mode=9 - synchronize costs and bounds
mode=10 - return 1 if there may be changing bounds on variable (column generation)
mode=11 - make sure set is clean (used when a variable rejected - but not flagged)
mode=12 - after factorize but before permute stuff
mode=13 - at end of simplex to delete stuff

Reimplemented in [ClpDynamicMatrix](#), and [ClpGubMatrix](#).

**3.49.3.24 virtual void ClpMatrixBase::createVariable (ClpSimplex * *model*,
int & *bestSequence*) [virtual]**

Creates a variable.

This is called after partial pricing and may modify matrix. May update bestSequence.

Reimplemented in [ClpDynamicExampleMatrix](#), and [ClpDynamicMatrix](#).

**3.49.3.25 virtual int ClpMatrixBase::checkFeasible (ClpSimplex * *model*,
double & *sum*) const [virtual]**

Just for debug if odd type matrix.

Returns number of primal infeasibilities.

Reimplemented in [ClpGubDynamicMatrix](#).

**3.49.3.26 virtual void ClpMatrixBase::times (double *scalar*, const double * *x*,
double * *y*) const [pure virtual]**

Return *y* + *A* * *x* * *scalar* in *y*.

Precondition

`x` must be of size `numColumns()`
`y` must be of size `numRows()`

Implemented in [ClpDummyMatrix](#), [ClpDynamicMatrix](#), [ClpGubDynamicMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.27 virtual void ClpMatrixBase::transposeTimes (double scalar, const double * x, double * y) const [pure virtual]

Return `y + x * scalar * A` in `y`.

Precondition

`x` must be of size `numRows()`
`y` must be of size `numColumns()`

Implemented in [ClpDummyMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.28 virtual void ClpMatrixBase::transposeTimes (const ClpSimplex * model, double scalar, const CoinIndexedVector * x, CoinIndexedVector * y, CoinIndexedVector * z) const [pure virtual]

Return `x * scalar * A + y` in `z`.

Can use `y` as temporary array (will be empty at end) Note - If `x` packed mode - then `z` packed mode Squashes small elements and knows about [ClpSimplex](#)

Implemented in [ClpDummyMatrix](#), [ClpGubMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.29 virtual void ClpMatrixBase::subsetTransposeTimes (const ClpSimplex * model, const CoinIndexedVector * x, const CoinIndexedVector * y, CoinIndexedVector * z) const [pure virtual]

Return `x * A` in `z` but just for indices in `y`.

This is only needed for primal steepest edge. Note - `z` always packed mode

Implemented in [ClpDummyMatrix](#), [ClpGubMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.30 virtual void ClpMatrixBase::listTransposeTimes (const ClpSimplex * model, double * x, int * y, int number, double * z) const [virtual]

Return $x \cdot A$ in z but just for number indices in y .

Default cheats with fake CoinIndexedVector and then calls subsetTransposeTimes

3.49.3.31 virtual ClpMatrixBase* ClpMatrixBase::subsetClone (int numberRows, const int * whichRows, int numberColumns, const int * whichColumns) const [virtual]

Subset clone (without gaps).

Duplicates are allowed and order is as given. Derived classes need not provide this as it may not always make sense

Reimplemented in [ClpGubMatrix](#), [ClpNetworkMatrix](#), [ClpPackedMatrix](#), and [ClpPlusMinusOneMatrix](#).

3.49.3.32 int ClpMatrixBase::type () const [inline]

Returns type.

The types which code may need to know about are: 1 - [ClpPackedMatrix](#) 11 - [ClpNetworkMatrix](#) 12 - [ClpPlusMinusOneMatrix](#)

Definition at line 362 of file ClpMatrixBase.hpp.

3.49.3.33 virtual double* ClpMatrixBase::rhsOffset (ClpSimplex * model, bool forceRefresh = false, bool check = false) [virtual]

Returns effective RHS offset if it is being used.

This is used for long problems or big gub or anywhere where going through full columns is expensive. This may re-compute

Reimplemented in [ClpDynamicMatrix](#), [ClpGubDynamicMatrix](#), and [ClpGubMatrix](#).

3.49.3.34 int ClpMatrixBase::minimumObjectsScan() const [inline]

Partial pricing tuning parameter - minimum number of "objects" to scan.

e.g. number of Gub sets but could be number of variables

Definition at line 396 of file ClpMatrixBase.hpp.

3.49.4 Member Data Documentation**3.49.4.1 double* ClpMatrixBase::rhsOffset_ [protected]**

Effective RHS offset if it is being used.

This is used for long problems or big gub or anywhere where going through full columns is expensive

Definition at line 480 of file ClpMatrixBase.hpp.

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

- ClpMatrixBase.hpp

3.50 ClpMessage Class Reference

This deals with Clp messages (as against Osi messages etc).

```
#include <ClpMessage.hpp>
```

Public Member Functions**Constructors etc**

- [ClpMessage \(Language language=us_en\)](#)
Constructor.

3.50.1 Detailed Description

This deals with Clp messages (as against Osi messages etc).

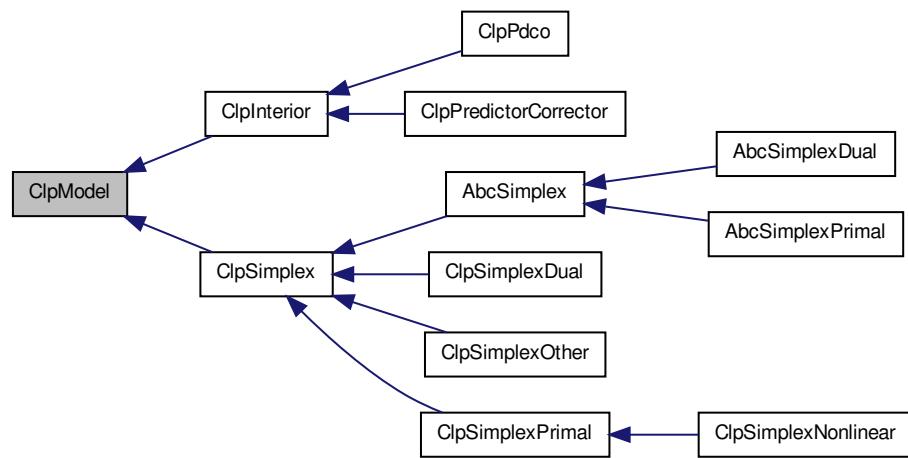
Definition at line 119 of file ClpMessage.hpp.

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

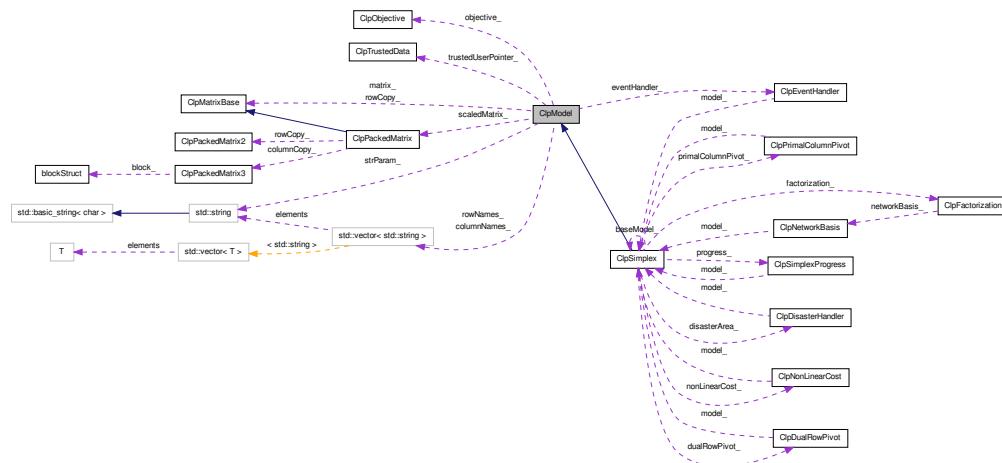
- ClpMessage.hpp

3.51 ClpModel Class Reference

Inheritance diagram for ClpModel:



Collaboration diagram for ClpModel:



Public Member Functions

- const double * **rowScale** () const
Scaling.
- double **objectiveScale** () const
Scaling of objective.
- double **rhsScale** () const
Scaling of rhs and bounds.
- void **scaling** (int mode=1)
Sets or unsets scaling, 0 -off, 1 equilibrium, 2 geometric, 3 auto, 4 auto-but-as-initialSolve-in-bab.
- void **unscale** ()
If we constructed a "really" scaled model then this reverses the operation.
- int **scalingFlag** () const
Gets scalingFlag.
- double * **objective** () const
Objective.

- `double * rowObjective () const`
Row Objective.
- `double * columnLower () const`
Column Lower.
- `double * columnUpper () const`
Column Upper.
- `CoinPackedMatrix * matrix () const`
Matrix (if not ClpPackedmatrix be careful about memory leak.
- `int getNumElements () const`
Number of elements in matrix.
- `double getSmallElementValue () const`
Small element value - elements less than this set to zero, default is 1.0e-20.
- `ClpMatrixBase * rowCopy () const`
Row Matrix.
- `void setNewRowCopy (ClpMatrixBase *newCopy)`
Set new row matrix.
- `ClpMatrixBase * clpMatrix () const`
Clp Matrix.
- `ClpPackedMatrix * clpScaledMatrix () const`
Scaled ClpPackedMatrix.
- `void setClpScaledMatrix (ClpPackedMatrix *scaledMatrix)`
Sets pointer to scaled ClpPackedMatrix.
- `ClpPackedMatrix * swapScaledMatrix (ClpPackedMatrix *scaledMatrix)`
Swaps pointer to scaled ClpPackedMatrix.
- `void replaceMatrix (ClpMatrixBase *matrix, bool deleteCurrent=false)`
Replace Clp Matrix (current is not deleted unless told to and new is used) So up to user to delete current.
- `void replaceMatrix (CoinPackedMatrix *newmatrix, bool deleteCurrent=false)`

Replace Clp Matrix (current is not deleted unless told to and new is used) So up to user to delete current.

- double **objectiveValue** () const
Objective value.
- char * **integerInformation** () const
Integer information.
- double * **infeasibilityRay** (bool fullRay=false) const
Infeasibility/unbounded ray (NULL returned if none/wrong) Up to user to use delete [] on these arrays.
- double * **ray** () const
For advanced users - no need to delete - sign not changed.
- bool **rayExists** () const
just test if infeasibility or unbounded Ray exists
- void **deleteRay** ()
just delete ray if exists
- const double * **internalRay** () const
*Access internal ray storage. Users should call **infeasibilityRay()** or **unboundedRay()** instead.*
- bool **statusExists** () const
See if status (i.e. basis) array exists (partly for OsiClp).
- unsigned char * **statusArray** () const
Return address of status (i.e. basis) array (char[numberRows+numberColumns]).
- unsigned char * **statusCopy** () const
Return copy of status (i.e.
- void **copyinStatus** (const unsigned char *statusArray)
Copy in status (basis) vector.
- void **setUserPointer** (void *pointer)
User pointer for whatever reason.
- void **setTrustedUserPointer** (ClpTrustedData *pointer)
Trusted user pointer.

- int **whatsChanged** () const
What has changed in model (only for masochistic users).
- int **numberThreads** () const
Number of threads (not really being used).

Constructors and destructor

Note - copy methods copy ALL data so can chew up memory until other copy is freed

- **ClpModel** (bool emptyMessages=false)
Default constructor.
- **ClpModel** (const **ClpModel** &rhs, int scalingMode=-1)
Copy constructor.
- **ClpModel** & **operator=** (const **ClpModel** &rhs)
Assignment operator. This copies the data.
- **ClpModel** (const **ClpModel** *wholeModel, int numberOfRows, const int *whichRows, int numberColumns, const int *whichColumns, bool dropNames=true, bool dropIntegers=true)
Subproblem constructor.
- **~ClpModel** ()
Destructor.

Load model - loads some stuff and initializes others

- void **loadProblem** (const **ClpMatrixBase** &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)
Loads a problem (the constraints on the rows are given by lower and upper bounds).
- void **loadProblem** (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)
- void **loadProblem** (const int numcols, const int numrows, const CoinBigIndex *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)

Just like the other `loadProblem()` method except that the matrix is given in a standard column major ordered format (without gaps).

- int `loadProblem` (CoinModel &modelObject, bool tryPlusMinusOne=false)
This loads a model from a coinModel object - returns number of errors.
- void `loadProblem` (const int numcols, const int numrows, const CoinBigIndex *start, const int *index, const double *value, const int *length, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)
This one is for after presolve to save memory.
- void `loadQuadraticObjective` (const int numberColumns, const CoinBigIndex *start, const int *column, const double *element)
Load up quadratic objective.
- void `loadQuadraticObjective` (const CoinPackedMatrix &matrix)
- void `deleteQuadraticObjective` ()
Get rid of quadratic objective.
- void `setRowObjective` (const double *rowObjective)
This just loads up a row objective.
- int `readMps` (const char *filename, bool keepNames=false, bool ignoreErrors=false)
Read an mps file from the given filename.
- int `readGMPL` (const char *filename, const char *dataName, bool keepNames=false)
Read GMPL files from the given filenames.
- void `copyInIntegerInformation` (const char *information)
Copy in integer informations.
- void `deleteIntegerInformation` ()
Drop integer informations.
- void `setContinuous` (int index)
Set the index-th variable to be a continuous variable.
- void `setInteger` (int index)
Set the index-th variable to be an integer variable.
- bool `isInteger` (int index) const
Return true if the index-th variable is an integer variable.

- void **resize** (int newNumberRows, int newNumberColumns)
Resizes rim part of model.
- void **deleteRows** (int number, const int *which)
Deletes rows.
- void **addRow** (int numberInRow, const int *columns, const double *elements, double rowLower=-COIN_DBL_MAX, double rowUpper=COIN_DBL_MAX)
Add one row.
- void **addRows** (int number, const double *rowLower, const double *rowUpper, const CoinBigIndex *rowStarts, const int *columns, const double *elements)
Add rows.
- void **addRows** (int number, const double *rowLower, const double *rowUpper, const CoinBigIndex *rowStarts, const int *rowLengths, const int *columns, const double *elements)
Add rows.
- void **addRows** (int number, const double *rowLower, const double *rowUpper, const CoinPackedVectorBase *const *rows)
- int **addRows** (const CoinBuild &buildObject, bool tryPlusMinusOne=false, bool checkDuplicates=true)
Add rows from a build object.
- int **addRows** (CoinModel &modelObject, bool tryPlusMinusOne=false, bool checkDuplicates=true)
Add rows from a model object.
- void **deleteColumns** (int number, const int *which)
Deletes columns.
- void **deleteRowsAndColumns** (int numberOfRows, const int *whichRows, int numberOfColumns, const int *whichColumns)
Deletes rows AND columns (keeps old sizes).
- void **addColumn** (int numberInColumn, const int *rows, const double *elements, double columnLower=0.0, double columnUpper=COIN_DBL_MAX, double objective=0.0)
Add one column.
- void **addColumns** (int number, const double *columnLower, const double *columnUpper, const double *objective, const CoinBigIndex *columnStarts, const int *rows, const double *elements)

Add columns.

- void **addColumns** (int number, const double *columnLower, const double *columnUpper, const double *objective, const CoinBigIndex *columnStarts, const int *columnLengths, const int *rows, const double *elements)
- void **addColumns** (int number, const double *columnLower, const double *columnUpper, const double *objective, const CoinPackedVectorBase *const *columns)
- int **addColumns** (const CoinBuild &buildObject, bool tryPlusMinusOne=false, bool checkDuplicates=true)

Add columns from a build object If tryPlusMinusOne then will try adding as +1 matrix if no matrix exists.

- int **addColumns** (CoinModel &modelObject, bool tryPlusMinusOne=false, bool checkDuplicates=true)

Add columns from a model object.

- void **modifyCoefficient** (int row, int column, double newElement, bool keepZero=false)

Modify one element of a matrix.

- void **chgRowLower** (const double *rowLower)

Change row lower bounds.

- void **chgRowUpper** (const double *rowUpper)

Change row upper bounds.

- void **chgColumnLower** (const double *columnLower)

Change column lower bounds.

- void **chgColumnUpper** (const double *columnUpper)

Change column upper bounds.

- void **chgObjCoefficients** (const double *objIn)

Change objective coefficients.

- void **borrowModel** (ClpModel &otherModel)

Borrow model.

- void **returnModel** (ClpModel &otherModel)

Return model - nulls all arrays so can be deleted safely also updates any scalars.

- void **createEmptyMatrix** ()

Create empty ClpPackedMatrix.

- int **cleanMatrix** (double threshold=1.0e-20)

Really clean up matrix (if [ClpPackedMatrix](#)).

- void [copy](#) (const [ClpMatrixBase](#) *from, [ClpMatrixBase](#) *&to)
Copy contents - resizing if necessary - otherwise re-use memory.
- void [dropNames](#) ()
Drops names - makes lengthnames 0 and names empty.
- void [copyNames](#) (const std::vector< std::string > &rowNames, const std::vector< std::string > &columnNames)
Copies in names.
- void [copyRowNames](#) (const std::vector< std::string > &rowNames, int first, int last)
Copies in Row names - modifies names first .. last-1.
- void [copyColumnNames](#) (const std::vector< std::string > &columnNames, int first, int last)
Copies in Column names - modifies names first .. last-1.
- void [copyRowNames](#) (const char *const *rowNames, int first, int last)
Copies in Row names - modifies names first .. last-1.
- void [copyColumnNames](#) (const char *const *columnNames, int first, int last)
Copies in Column names - modifies names first .. last-1.
- void [setRowName](#) (int rowIndex, std::string &name)
Set name of row.
- void [setColumnName](#) (int colIndex, std::string &name)
Set name of col.
- int [findNetwork](#) (char *rotate, double fractionNeeded=0.75)
Find a network subset.
- CoinModel * [createCoinModel](#) () const
This creates a coinModel object.
- int [writeMps](#) (const char *filename, int formatType=0, int numberAcross=2, double objSense=0.0) const
Write the problem in MPS format to the specified file.

gets and sets

- int **numberRows** () const
Number of rows.
- int **getNumRows** () const
- int **getNumCols** () const
Number of columns.
- int **numberColumns** () const
- double **primalTolerance** () const
Primal tolerance to use.
- void **setPrimalTolerance** (double value)
- double **dualTolerance** () const
Dual tolerance to use.
- void **setDualTolerance** (double value)
- double **primalObjectiveLimit** () const
Primal objective limit.
- void **setPrimalObjectiveLimit** (double value)
- double **dualObjectiveLimit** () const
Dual objective limit.
- void **setDualObjectiveLimit** (double value)
- double **objectiveOffset** () const
Objective offset.
- void **setObjectiveOffset** (double value)
- double **presolveTolerance** () const
Presolve tolerance to use.
- const std::string & **problemName** () const
- int **numberIterations** () const
Number of iterations.
- int **getIterationCount** () const
- void **setNumberIterations** (int numberIterationsNew)
- int **solveType** () const
Solve type - 1 simplex, 2 simplex interface, 3 Interior.
- void **setSolveType** (int type)
- int **maximumIterations** () const
Maximum number of iterations.
- void **setMaximumIterations** (int value)
- double **maximumSeconds** () const

Maximum time in seconds (from when set called).

- void **setMaximumSeconds** (double value)
- bool **hitMaximumIterations** () const

Returns true if hit maximum iterations (or time).

- int **status** () const

Status of problem: -1 - unknown e.g.

- int **problemStatus** () const

- void **setProblemStatus** (int problemStatusNew)

Set problem status.

- int **secondaryStatus** () const

Secondary status of problem - may get extended 0 - none 1 - primal infeasible because dual limit reached OR (probably primal infeasible but can't prove it - main status was 4) 2 - scaled problem optimal - unscaled problem has primal infeasibilities 3 - scaled problem optimal - unscaled problem has dual infeasibilities 4 - scaled problem optimal - unscaled problem has primal and dual infeasibilities 5 - giving up in primal with flagged variables 6 - failed due to empty problem check 7 - postSolve says not optimal 8 - failed due to bad element check 9 - status was 3 and stopped on time 100 up - translation of enum from ClpEventHandler.

- void **setSecondaryStatus** (int newstatus)
- bool **isAbandoned** () const

Are there any numerical difficulties?

- bool **isProvenOptimal** () const

Is optimality proven?

- bool **isProvenPrimalInfeasible** () const

Is primal infeasibility proven?

- bool **isProvenDualInfeasible** () const

Is dual infeasibility proven?

- bool **isPrimalObjectiveLimitReached** () const

Is the given primal objective limit reached?

- bool **isDualObjectiveLimitReached** () const

Is the given dual objective limit reached?

- bool **isIterationLimitReached** () const

Iteration limit reached?

- double **optimizationDirection** () const

Direction of optimization (1 - minimize, -1 - maximize, 0 - ignore.

- double **getObjSense () const**
- void **setOptimizationDirection** (double value)
- double * **primalRowSolution () const**

Primal row solution.

- const double * **getRowActivity () const**
- double * **primalColumnSolution () const**

Primal column solution.

- const double * **getColSolution () const**
- void **setColSolution** (const double *input)
- double * **dualRowSolution () const**

Dual row solution.

- const double * **getRowPrice () const**
- double * **dualColumnSolution () const**

Reduced costs.

- const double * **getReducedCost () const**
- double * **rowLower () const**

Row lower.

- const double * **getRowLower () const**
- double * **rowUpper () const**

Row upper.

- const double * **getRowUpper () const**

Changing bounds on variables and constraints

- void **setObjectiveCoefficient** (int elementIndex, double elementValue)

Set an objective function coefficient.

- void **setObjCoeff** (int elementIndex, double elementValue)

Set an objective function coefficient.

- void **setColumnLower** (int elementIndex, double elementValue)

Set a single column lower bound

Use -DBL_MAX for -infinity.

- void **setColumnUpper** (int elementIndex, double elementValue)

Set a single column upper bound

Use DBL_MAX for infinity.

- void **setColumnBounds** (int elementIndex, double lower, double upper)

Set a single column lower and upper bound.

- void [setColumnSetBounds](#) (const int *indexFirst, const int *indexLast, const double *boundList)

Set the bounds on a number of columns simultaneously

The default implementation just invokes [setColLower\(\)](#) and [setColUpper\(\)](#) over and over again.

- void [setColLower](#) (int elementIndex, double elementValue)

Set a single column lower bound

Use -DBL_MAX for -infinity.

- void [setColUpper](#) (int elementIndex, double elementValue)

Set a single column upper bound

Use DBL_MAX for infinity.

- void [setColBounds](#) (int elementIndex, double lower, double upper)

Set a single column lower and upper bound.

- void [setColSetBounds](#) (const int *indexFirst, const int *indexLast, const double *boundList)

Set the bounds on a number of columns simultaneously

- void [setRowLower](#) (int elementIndex, double elementValue)

Set a single row lower bound

Use -DBL_MAX for -infinity.

- void [setRowUpper](#) (int elementIndex, double elementValue)

Set a single row upper bound

Use DBL_MAX for infinity.

- void [setRowBounds](#) (int elementIndex, double lower, double upper)

Set a single row lower and upper bound.

- void [setRowSetBounds](#) (const int *indexFirst, const int *indexLast, const double *boundList)

Set the bounds on a number of rows simultaneously

Message handling

- void [passInMessageHandler](#) (CoinMessageHandler *handler)

Pass in Message handler (not deleted at end).

- CoinMessageHandler * [pushMessageHandler](#) (CoinMessageHandler *handler, bool &oldDefault)

Pass in Message handler (not deleted at end) and return current.

- void [popMessageHandler](#) (CoinMessageHandler *oldHandler, bool oldDefault)
back to previous message handler
- void [newLanguage](#) (CoinMessages::Language language)
Set language.
- void [setLanguage](#) (CoinMessages::Language language)
- void [setDefaultMessageHandler](#) ()
Overrides message handler with a default one.
- CoinMessageHandler * [messageHandler](#) () const
Return handler.
- CoinMessages [messages](#) () const
Return messages.
- CoinMessages * [messagesPointer](#) ()
Return pointer to messages.
- CoinMessages [coinMessages](#) () const
Return Coin messages.
- CoinMessages * [coinMessagesPointer](#) ()
Return pointer to Coin messages.
- void [setLogLevel](#) (int value)
Amount of print out: 0 - none 1 - just final 2 - just factorizations 3 - as 2 plus a bit more 4 - verbose above that 8,16,32 etc just for selective debug.
- int [logLevel](#) () const
- bool [defaultHandler](#) () const
Return true if default handler.
- void [passInEventHandler](#) (const ClpEventHandler *eventHandler)
Pass in Event handler (cloned and deleted at end).
- ClpEventHandler * [eventHandler](#) () const
Event handler.
- CoinThreadRandom * [randomNumberGenerator](#) ()
Thread specific random number generator.
- CoinThreadRandom & [mutableRandomNumberGenerator](#) ()

Thread specific random number generator.

- void **setRandomSeed** (int value)
Set seed for thread specific random number generator.
- int **lengthNames** () const
length of names (0 means no names)
- void **setLengthNames** (int value)
length of names (0 means no names)
- const std::vector< std::string > * **rowNames** () const
Row names.
- const std::string & **rowName** (int iRow) const
- std::string **getRowName** (int iRow) const
Return name or Rnnnnnnn.
- const std::vector< std::string > * **columnNames** () const
Column names.
- const std::string & **columnName** (int iColumn) const
- std::string **getColumnName** (int iColumn) const
Return name or Cnnnnnnn.
- **ClpObjective** * **objectiveAsObject** () const
Objective methods.
- void **setObjective** (**ClpObjective** *objective)
- void **setObjectivePointer** (**ClpObjective** *newobjective)
- int **emptyProblem** (int *infeasNumber=NULL, double *infeasSum=NULL, bool printMessage=true)
Solve a problem with no elements - return status and dual and primal infeasibilities.

Matrix times vector methods

They can be faster if scalar is +- 1 These are covers so user need not worry about scaling Also for simplex I am not using basic/non-basic split

- void **times** (double scalar, const double *x, double *y) const
*Return y + A * x * scalar in y.*
- void **transposeTimes** (double scalar, const double *x, double *y) const
*Return y + x * scalar * A in y.*

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the volume algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

once it has been decided where solver sits this may be redone

- bool **setIntParam** (ClpIntParam key, int value)
Set an integer parameter.
- bool **setDblParam** (ClpDblParam key, double value)
Set an double parameter.
- bool **setStrParam** (ClpStrParam key, const std::string &value)
Set an string parameter.
- bool **getIntParam** (ClpIntParam key, int &value) const
• bool **getDblParam** (ClpDblParam key, double &value) const
• bool **getStrParam** (ClpStrParam key, std::string &value) const
• void **generateCpp** (FILE *fp)
Create C++ lines to get to current state.
- unsigned int **specialOptions** () const
For advanced options 1 - Don't keep changing infeasibility weight 2 - Keep non-LinearCost round solves 4 - Force outgoing variables to exact bound (primal) 8 - Safe to use dense initial factorization 16 -Just use basic variables for operation if column generation 32 -Create ray even in BAB 64 -Treat problem as feasible until last minute (i.e.
- void **setSpecialOptions** (unsigned int value)
- bool **inCbcBranchAndBound** () const

Protected Member Functions

private or protected methods

- void **gutsOfDelete** (int type)
Does most of deletion (0 = all, 1 = most).

- void **gutsOfCopy** (const **ClpModel** &rhs, int trueCopy=1)
Does most of copying If trueCopy 0 then just points to arrays If -1 leaves as much as possible.
- void **getRowBound** (int iRow, double &lower, double &upper) const
gets lower and upper bounds on rows
- void **gutsOfLoadModel** (int numberOfRows, int numberColumns, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)
puts in format I like - 4 array matrix - may make row copy
- void **gutsOfScaling** ()
Does much of scaling.
- double **rawObjectiveValue** () const
Objective value - always minimize.
- bool **permanentArrays** () const
If we are using maximumRows_ and Columns_.
- void **startPermanentArrays** ()
Start using maximumRows_ and Columns_.
- void **stopPermanentArrays** ()
Stop using maximumRows_ and Columns_.
- const char *const * **rowNamesAsChar** () const
*Create row names as char **.*
- const char *const * **columnNamesAsChar** () const
*Create column names as char **.*
- void **deleteNamesAsChar** (const char *const *names, int number) const
*Delete char * version of names.*
- void **onStopped** ()
On stopped - sets secondary status.

Protected Attributes

data

- double **optimizationDirection_**

Direction of optimization (1 - minimize, -1 - maximize, 0 - ignore.

- double `dblParam_` [ClpLastDblParam]
Array of double parameters.
- double `objectiveValue_`
Objective value.
- double `smallElement_`
Small element value.
- double `objectiveScale_`
Scaling of objective.
- double `rhsScale_`
Scaling of rhs and bounds.
- int `numberRows_`
Number of rows.
- int `numberColumns_`
Number of columns.
- double * `rowActivity_`
Row activities.
- double * `columnActivity_`
Column activities.
- double * `dual_`
Duals.
- double * `reducedCost_`
Reduced costs.
- double * `rowLower_`
Row lower.
- double * `rowUpper_`
Row upper.
- ClpObjective * `objective_`
Objective.
- double * `rowObjective_`

Row Objective (? sign) - may be NULL.

- double * **columnLower_**
Column Lower.
- double * **columnUpper_**
Column Upper.
- ClpMatrixBase * **matrix_**
Packed matrix.
- ClpMatrixBase * **rowCopy_**
Row copy if wanted.
- ClpPackedMatrix * **scaledMatrix_**
Scaled packed matrix.
- double * **ray_**
Infeasible/unbounded ray.
- double * **rowScale_**
Row scale factors for matrix.
- double * **columnScale_**
Column scale factors.
- double * **inverseRowScale_**
Inverse row scale factors for matrix (end of rowScale_).
- double * **inverseColumnScale_**
Inverse column scale factors for matrix (end of columnScale_).
- int **scalingFlag_**
Scale flag, 0 none, 1 equilibrium, 2 geometric, 3, auto, 4 dynamic, 5 geometric on rows.
- unsigned char * **status_**
Status (i.e.
- char * **integerType_**
Integer information.
- void * **userPointer_**
User pointer for whatever reason.

- **ClpTrustedData * trustedUserPointer_**
Trusted user pointer e.g. for heuristics.
- **int intParam_ [ClpLastIntParam]**
Array of integer parameters.
- **int numberIterations_**
Number of iterations.
- **int solveType_**
Solve type - 1 simplex, 2 simplex interface, 3 Interior.
- **unsigned int whatsChanged_**
- **int problemStatus_**
Status of problem.
- **int secondaryStatus_**
Secondary status of problem.
- **int lengthNames_**
length of names (0 means no names)
- **int numberThreads_**
Number of threads (not very operational).
- **unsigned int specialOptions_**
For advanced options See get and set for meaning.
- **CoinMessageHandler * handler_**
Message handler.
- **bool defaultHandler_**
Flag to say if default handler (so delete).
- **CoinThreadRandom randomNumberGenerator_**
Thread specific random number generator.
- **ClpEventHandler * eventHandler_**
Event handler.
- **std::vector< std::string > rowNames_**
Row names.
- **std::vector< std::string > columnNames_**
Column names.

- CoinMessages [messages_](#)
Messages.
- CoinMessages [coinMessages_](#)
Coin messages.
- int [maximumColumns_](#)
Maximum number of columns in model.
- int [maximumRows_](#)
Maximum number of rows in model.
- int [maximumInternalColumns_](#)
Maximum number of columns (internal arrays) in model.
- int [maximumInternalRows_](#)
Maximum number of rows (internal arrays) in model.
- CoinPackedMatrix [baseMatrix_](#)
Base packed matrix.
- CoinPackedMatrix [baseRowCopy_](#)
Base row copy.
- double * [savedRowScale_](#)
Saved row scale factors for matrix.
- double * [savedColumnScale_](#)
Saved column scale factors.
- std::string [strParam_](#) [ClpLastStrParam]
Array of string parameters.

3.51.1 Detailed Description

Definition at line 38 of file ClpModel.hpp.

3.51.2 Constructor & Destructor Documentation

3.51.2.1 ClpModel::ClpModel (const ClpModel & rhs, int scalingMode = -1)

Copy constructor.

May scale depending on mode -1 leave mode as is 0 -off, 1 equilibrium, 2 geometric, 3, auto, 4 auto-but-as-initialSolve-in-bab

```
3.51.2.2 ClpModel::ClpModel ( const ClpModel * wholeModel, int
    numberRows, const int * whichRows, int numberColumns, const int *
    whichColumns, bool dropNames = true, bool dropIntegers = true )
```

Subproblem constructor.

A subset of whole model is created from the row and column lists given. The new order is given by list order and duplicates are allowed. Name and integer information can be dropped

3.51.3 Member Function Documentation

```
3.51.3.1 void ClpModel::loadProblem ( const ClpMatrixBase & matrix, const
    double * collb, const double * colub, const double * obj, const double
    * rowlb, const double * rowub, const double * rowObjective = NULL )
```

Loads a problem (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Reimplemented in [ClpInterior](#), and [ClpSimplex](#).

```
3.51.3.2 void ClpModel::loadProblem ( const int numcols, const int numrows,
    const CoinBigIndex * start, const int * index, const double * value,
    const double * collb, const double * colub, const double * obj, const
    double * rowlb, const double * rowub, const double * rowObjective =
    NULL )
```

Just like the other [loadProblem\(\)](#) method except that the matrix is given in a standard column major ordered format (without gaps).

Reimplemented in [ClpInterior](#), and [ClpSimplex](#).

3.51.3.3 int ClpModel::loadProblem (CoinModel & *modelObject*, bool *tryPlusMinusOne = false*)

This loads a model from a coinModel object - returns number of errors.

modelObject not const as may be changed as part of process If *tryPlusMinusOne* then will try adding as +1 matrix

Reimplemented in [ClpSimplex](#).

3.51.3.4 void ClpModel::loadQuadraticObjective (const int *numberColumns*, const CoinBigIndex * *start*, const int * *column*, const double * *element*)

Load up quadratic objective.

This is stored as a CoinPackedMatrix

3.51.3.5 int ClpModel::addRows (const CoinBuild & *buildObject*, bool *tryPlusMinusOne = false*, bool *checkDuplicates = true*)

Add rows from a build object.

If *tryPlusMinusOne* then will try adding as +1 matrix if no matrix exists. Returns number of errors e.g. duplicates

3.51.3.6 int ClpModel::addRows (CoinModel & *modelObject*, bool *tryPlusMinusOne = false*, bool *checkDuplicates = true*)

Add rows from a model object.

returns -1 if object in bad state (i.e. has column information) otherwise number of errors.

modelObject non const as can be regularized as part of build If *tryPlusMinusOne* then will try adding as +1 matrix if no matrix exists.

3.51.3.7 int ClpModel::addColumns (const CoinBuild & buildObject, bool tryPlusMinusOne = **false, bool checkDuplicates = **true**)**

Add columns from a build object If tryPlusMinusOne then will try adding as +-1 matrix if no matrix exists.

Returns number of errors e.g. duplicates

3.51.3.8 int ClpModel::addColumns (CoinModel & modelObject, bool tryPlusMinusOne = **false, bool checkDuplicates = **true**)**

Add columns from a model object.

returns -1 if object in bad state (i.e. has row information) otherwise number of errors
modelObject non const as can be regularized as part of build If tryPlusMinusOne then
will try adding as +-1 matrix if no matrix exists.

3.51.3.9 void ClpModel::borrowModel (ClpModel & otherModel)

Borrow model.

This is so we don't have to copy large amounts of data around. It assumes a derived class wants to overwrite an empty model with a real one - while it does an algorithm

Reimplemented in [ClpInterior](#), and [ClpSimplex](#).

3.51.3.10 int ClpModel::cleanMatrix (double threshold = **1.0e-20)**

Really clean up matrix (if [ClpPackedMatrix](#)).

a) eliminate all duplicate AND small elements in matrix b) remove all gaps and set extraGap_ and extraMajor_ to 0.0 c) reallocate arrays and make max lengths equal to lengths d) orders elements returns number of elements eliminated or -1 if not [ClpPackedMatrix](#)

3.51.3.11 int ClpModel::findNetwork (char * rotate, double fractionNeeded = **0.75)**

Find a network subset.

rotate array should be numberRows. On output -1 not in network 0 in network as is 1 in network with signs swapped Returns number of network rows

3.51.3.12 int ClpModel::writeMps (const char * *filename*, int *formatType* = 0, int *numberAcross* = 2, double *objSense* = 0.0) const

Write the problem in MPS format to the specified file.

Row and column names may be null. formatType is

- 0 - normal
- 1 - extra accuracy
- 2 - IEEE hex

Returns non-zero on I/O error

3.51.3.13 int ClpModel::solveType () const [inline]

Solve type - 1 simplex, 2 simplex interface, 3 Interior.

Definition at line 373 of file ClpModel.hpp.

3.51.3.14 int ClpModel::status () const [inline]

Status of problem: -1 - unknown e.g.

before solve or if postSolve says not optimal 0 - optimal 1 - primal infeasible 2 - dual infeasible 3 - stopped on iterations or time 4 - stopped due to errors 5 - stopped by event handler (virtual int [ClpEventHandler::event\(\)](#))

Definition at line 400 of file ClpModel.hpp.

3.51.3.15 void ClpModel::setColumnLower (int *elementIndex*, double *elementValue*)

Set a single column lower bound

Use -DBL_MAX for -infinity.

Reimplemented in [AbcSimplex](#), and [ClpSimplex](#).

3.51.3.16 void ClpModel::setColumnUpper (int *elementIndex*, double *elementValue*)

Set a single column upper bound

Use DBL_MAX for infinity.

Reimplemented in [AbcSimplex](#), and [ClpSimplex](#).

3.51.3.17 void ClpModel::setColumnSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*)

Set the bounds on a number of columns simultaneously

The default implementation just invokes [setColLower\(\)](#) and [setColUpper\(\)](#) over and over again.

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes

boundList the new lower/upper bound pairs for the variables

Reimplemented in [AbcSimplex](#), and [ClpSimplex](#).

3.51.3.18 void ClpModel::setColLower (int *elementIndex*, double *elementValue*) [inline]

Set a single column lower bound

Use -DBL_MAX for -infinity.

Reimplemented in [AbcSimplex](#), and [ClpSimplex](#).

Definition at line 543 of file ClpModel.hpp.

3.51.3.19 void ClpModel::setColUpper (int *elementIndex*, double *elementValue*) [inline]

Set a single column upper bound

Use DBL_MAX for infinity.

Reimplemented in [AbcSimplex](#), and [ClpSimplex](#).

Definition at line 548 of file ClpModel.hpp.

3.51.3.20 void ClpModel::setColSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [inline]

Set the bounds on a number of columns simultaneously

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes

boundList the new lower/upper bound pairs for the variables

Reimplemented in [AbcSimplex](#), and [ClpSimplex](#).

Definition at line 564 of file ClpModel.hpp.

3.51.3.21 void ClpModel::setRowLower (int *elementIndex*, double *elementValue*)

Set a single row lower bound

Use -DBL_MAX for -infinity.

Reimplemented in [AbcSimplex](#), and [ClpSimplex](#).

3.51.3.22 void ClpModel::setRowUpper (int *elementIndex*, double *elementValue*)

Set a single row upper bound

Use DBL_MAX for infinity.

Reimplemented in [AbcSimplex](#), and [ClpSimplex](#).

3.51.3.23 void ClpModel::setRowSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*)

Set the bounds on a number of rows simultaneously

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the constraints whose *either* bound changes
boundList the new lower/upper bound pairs for the constraints

Reimplemented in [AbcSimplex](#), and [ClpSimplex](#).

3.51.3.24 void ClpModel::unscale ()

If we constructed a "really" scaled model then this reverses the operation.

Quantities may not be exactly as they were before due to rounding errors

3.51.3.25 void ClpModel::replaceMatrix (ClpMatrixBase * *matrix*, bool *deleteCurrent* = **false)**

Replace Clp Matrix (current is not deleted unless told to and new is used) So up to user to delete current.

This was used where matrices were being rotated. [ClpModel](#) takes ownership.

3.51.3.26 void ClpModel::replaceMatrix (CoinPackedMatrix * *newmatrix*, bool *deleteCurrent* = **false) [inline]**

Replace Clp Matrix (current is not deleted unless told to and new is used) So up to user to delete current.

This was used where matrices were being rotated. This version changes CoinPacked-Matrix to [ClpPackedMatrix](#). [ClpModel](#) takes ownership.

Definition at line 747 of file ClpModel.hpp.

3.51.3.27 double* ClpModel::infeasibilityRay (bool fullRay = `false`) const

Infeasibility/unbounded ray (NULL returned if none/wrong) Up to user to use delete [] on these arrays.

Reimplemented in [ClpSimplex](#).

3.51.3.28 unsigned char* ClpModel::statusCopy () const

Return copy of status (i.e. basis) array (char[numberRows+numberColumns]), use delete []

3.51.3.29 void ClpModel::times (double scalar, const double * x, double * y) const

Return $y + A * x * scalar$ in y .

Precondition

x must be of size numColumns()
 y must be of size numRows()

3.51.3.30 void ClpModel::transposeTimes (double scalar, const double * x, double * y) const

Return $y + x * scalar * A$ in y .

Precondition

x must be of size numRows()
 y must be of size numColumns()

3.51.3.31 unsigned int ClpModel::specialOptions () const [inline]

For advanced options 1 - Don't keep changing infeasibility weight 2 - Keep nonLinearCost round solves 4 - Force outgoing variables to exact bound (primal) 8 - Safe to use dense initial factorization 16 -Just use basic variables for operation if column generation 32 -Create ray even in BAB 64 -Treat problem as feasible until last minute (i.e.

minimize infeasibilities) 128 - Switch off all matrix sanity checks 256 - No row copy 512 - If not in values pass, solution guaranteed, skip as much as possible 1024 - In branch and bound 2048 - Don't bother to re-factorize if < 20 iterations 4096 - Skip some optimality checks 8192 - Do Primal when cleaning up primal 16384 - In fast dual (so we can switch off things) 32768 - called from Osi 65536 - keep arrays around as much as possible (also use maximumR/C) 131072 - transposeTimes is -1.0 and can skip basic and fixed 262144 - extra copy of scaled matrix 524288 - Clp fast dual 1048576 - don't need to finish dual (can return 3) 2097152 - zero costs! NOTE - many applications can call Clp but there may be some short cuts which are taken which are not guaranteed safe from all applications. Vetted applications will have a bit set and the code may test this At present I expect a few such applications - if too many I will have to re-think. It is up to application owner to change the code if she/he needs these short cuts. I will not debug unless in Coin repository. See COIN_CLP_VETTED comments. 0x01000000 is Cbc (and in branch and bound) 0x02000000 is in a different branch and bound

Definition at line 1050 of file ClpModel.hpp.

3.51.4 Member Data Documentation

3.51.4.1 `unsigned char* ClpModel::status_ [protected]`

Status (i.e.

basis) Region. I know that not all algorithms need a status array, but it made sense for things like crossover and put all permanent stuff in one place. No assumption is made about what is in status array (although it might be good to reserve bottom 3 bits (i.e. 0-7 numeric) for classic status). This is number of columns + number of rows long (in that order).

Definition at line 1169 of file ClpModel.hpp.

3.51.4.2 `int ClpModel::solveType_ [protected]`

Solve type - 1 simplex, 2 simplex interface, 3 Interior.

Definition at line 1181 of file ClpModel.hpp.

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

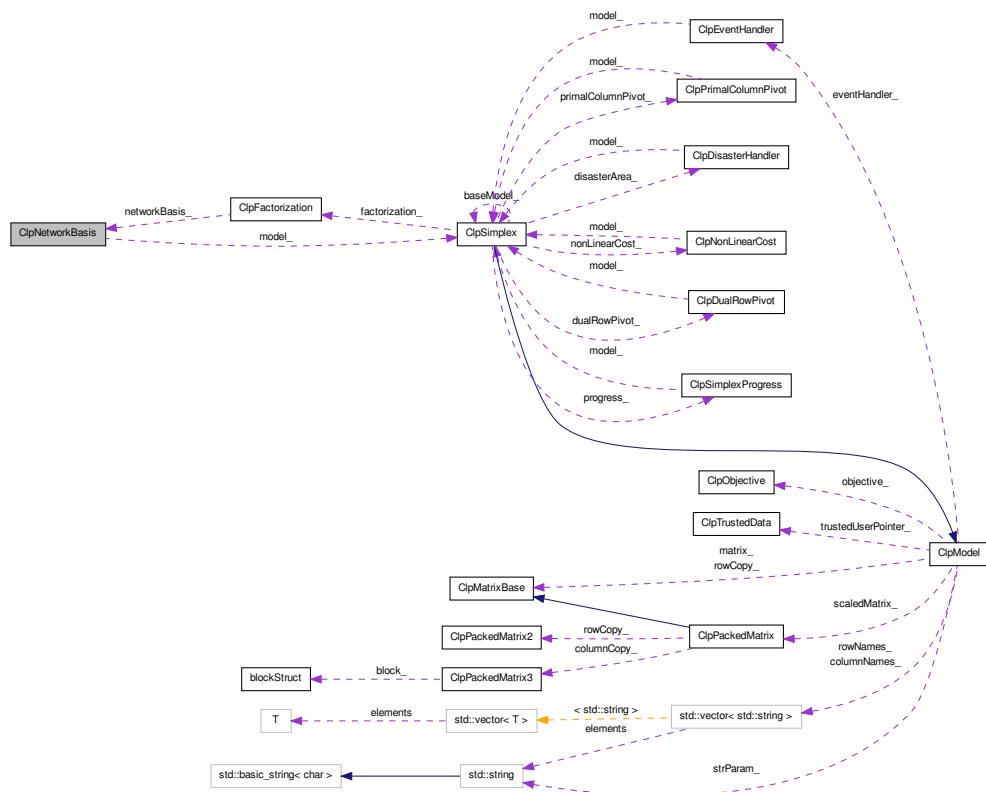
- ClpModel.hpp

3.52 ClpNetworkBasis Class Reference

This deals with Factorization and Updates for network structures.

```
#include <ClpNetworkBasis.hpp>
```

Collaboration diagram for ClpNetworkBasis:



Public Member Functions

Constructors and destructor and copy

- [ClpNetworkBasis \(\)](#)
Default constructor.
- [ClpNetworkBasis \(const ClpSimplex *model, int numberOfRows, const CoinFactorizationDouble *pivotRegion, const int *permuteBack, const CoinBigIndex *startColumn, const int *numberInColumn, const int *indexRow, const CoinFactorizationDouble *element\)](#)
Constructor from CoinFactorization.
- [ClpNetworkBasis \(const ClpNetworkBasis &other\)](#)
Copy constructor.
- [~ClpNetworkBasis \(\)](#)
Destructor.
- [ClpNetworkBasis & operator= \(const ClpNetworkBasis &other\)](#)
= copy

Do factorization

- [int factorize \(const ClpMatrixBase *matrix, int rowIsBasic\[\], int columnIsBasic\[\]\)](#)
When part of LP - given by basic variables.

rank one updates which do exist

- [int replaceColumn \(CoinIndexedVector *column, int pivotRow\)](#)
Replaces one Column to basis, returns 0=OK, 1=Probably OK, 2=singular!!

various uses of factorization (return code number elements)

which user may want to know about

- [double updateColumn \(CoinIndexedVector *regionSparse, CoinIndexedVector *regionSparse2, int pivotRow\)](#)
Updates one column (FTRAN) from region, Returns pivot value if "pivotRow" >=0.
- [int updateColumn \(CoinIndexedVector *regionSparse, double array\[\]\)](#)
const
Updates one column (FTRAN) to/from array For large problems you should ALWAYS know where the nonzeros are, so please try and migrate to previous method after you have got code working using this simple method - thank you! (the only exception is if you know input is dense e.g.

- int `updateColumnTranspose` (CoinIndexedVector *regionSparse, double array[]) const

Updates one column transpose (BTRAN) For large problems you should ALWAYS know where the nonzeros are, so please try and migrate to previous method after you have got code working using this simple method - thank you! (the only exception is if you know input is dense e.g.

- int `updateColumnTranspose` (CoinIndexedVector *regionSparse, CoinIndexedVector *regionSparse2) const

Updates one column (BTRAN) from region2.

3.52.1 Detailed Description

This deals with Factorization and Updates for network structures.

Definition at line 26 of file ClpNetworkBasis.hpp.

3.52.2 Member Function Documentation

3.52.2.1 int ClpNetworkBasis::factorize (const ClpMatrixBase * *matrix*, int *rowIsBasic*[], int *columnIsBasic*[])

When part of LP - given by basic variables.

Actually does factorization. Arrays passed in have non negative value to say basic. If status is okay, basic variables have pivot row - this is only needed if increasingRows_ >1. If status is singular, then basic variables have pivot row and ones thrown out have -1 returns 0 -okay, -1 singular, -2 too many in basis

3.52.2.2 int ClpNetworkBasis::updateColumn (CoinIndexedVector * *regionSparse*, double *array*[]) const

Updates one column (FTRAN) to/from array For large problems you should ALWAYS know where the nonzeros are, so please try and migrate to previous method after you have got code working using this simple method - thank you! (the only exception is if you know input is dense e.g.

rhs)

3.52.2.3 int ClpNetworkBasis::updateColumnTranspose (CoinIndexedVector * *regionSparse*, double *array[]*) const

Updates one column transpose (BTRAN) For large problems you should ALWAYS know where the nonzeros are, so please try and migrate to previous method after you have got code working using this simple method - thank you! (the only exception is if you know input is dense e.g.

dense objective) returns number of nonzeros

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

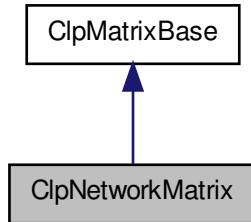
- ClpNetworkBasis.hpp

3.53 ClpNetworkMatrix Class Reference

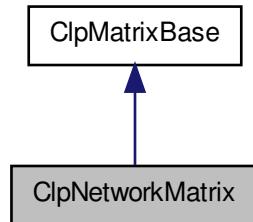
This implements a simple network matrix as derived from [ClpMatrixBase](#).

```
#include <ClpNetworkMatrix.hpp>
```

Inheritance diagram for ClpNetworkMatrix:



Collaboration diagram for ClpNetworkMatrix:



Public Member Functions

Useful methods

- virtual CoinPackedMatrix * [getPackedMatrix](#) () const
Return a complete CoinPackedMatrix.
- virtual bool [isColOrdered](#) () const
Whether the packed matrix is column major ordered or not.
- virtual CoinBigIndex [getNumElements](#) () const
Number of entries in the packed matrix.
- virtual int [getNumCols](#) () const
Number of columns.
- virtual int [getNumRows](#) () const
Number of rows.
- virtual const double * [getElements](#) () const
A vector containing the elements in the packed matrix.
- virtual const int * [getIndices](#) () const
A vector containing the minor indices of the elements in the packed matrix.
- virtual const CoinBigIndex * [getVectorStarts](#) () const
- virtual const int * [getVectorLengths](#) () const
The lengths of the major-dimension vectors.

- virtual void `deleteCols` (const int numDel, const int *indDel)
Delete the columns whose indices are listed in indDel.
- virtual void `deleteRows` (const int numDel, const int *indDel)
Delete the rows whose indices are listed in indDel.
- virtual void `appendCols` (int number, const CoinPackedVectorBase *const *columns)
Append Columns.
- virtual void `appendRows` (int number, const CoinPackedVectorBase *const *rows)
Append Rows.
- virtual int `appendMatrix` (int number, int type, const CoinBigIndex *starts, const int *index, const double *element, int numberOther=-1)
Append a set of rows/columns to the end of the matrix.
- virtual `ClpMatrixBase * reverseOrderedCopy () const`
Returns a new matrix in reverse order without gaps.
- virtual CoinBigIndex `countBasis` (const int *whichColumn, int &numberColumnBasic)
Returns number of elements in column part of basis.
- virtual void `fillBasis (ClpSimplex *model, const int *whichColumn, int &numberColumnBasic, int *row, int *start, int *rowCount, int *columnCount, CoinFactorizationDouble *element)`
Fills in column part of basis.
- virtual CoinBigIndex * `dubiousWeights` (const `ClpSimplex *model, int *inputWeights`) const
Given positive integer weights for each row fills in sum of weights for each column (and slack).
- virtual void `rangeOfElements` (double &smallestNegative, double &largestNegative, double &smallestPositive, double &largestPositive)
Returns largest and smallest elements of both signs.
- virtual void `unpack` (const `ClpSimplex *model, CoinIndexedVector *rowArray, int column`) const
Unpacks a column into an CoinIndexedvector.
- virtual void `unpackPacked` (`ClpSimplex *model, CoinIndexedVector *rowArray, int column`) const

Unpacks a column into an CoinIndexedvector in packed format Note that model is NOT const.

- virtual void `add` (const `ClpSimplex` *model, `CoinIndexedVector` *rowArray, int column, double multiplier) const
Adds multiple of a column into an CoinIndexedvector You can use quickAdd to add to vector.
- virtual void `add` (const `ClpSimplex` *model, double *array, int column, double multiplier) const
Adds multiple of a column into an array.
- virtual void `releasePackedMatrix` () const
Allow any parts of a created CoinMatrix to be deleted.
- virtual bool `canDoPartialPricing` () const
Says whether it can do partial pricing.
- virtual void `partialPricing` (`ClpSimplex` *model, double start, double end, int &bestSequence, int &numberWanted)
Partial pricing.

Matrix times vector methods

- virtual void `times` (double scalar, const double *x, double *y) const
*Return y + A * scalar *x in y.*
- virtual void `times` (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale) const
And for scaling.
- virtual void `transposeTimes` (double scalar, const double *x, double *y) const
*Return y + x * scalar * A in y.*
- virtual void `transposeTimes` (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale, double *spare=NULL) const
And for scaling.
- virtual void `transposeTimes` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
*Return x * scalar * A + y in z.*

- virtual void `subsetTransposeTimes` (const `ClpSimplex` *model, const `CoinIndexedVector` *x, const `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
Return $x \cdot A$ in z but just for indices in y.

Other

- bool `trueNetwork` () const
Return true if really network, false if has slacks.

Constructors, destructor

- `ClpNetworkMatrix` ()
Default constructor.
- `ClpNetworkMatrix` (int numberColumns, const int *head, const int *tail)
Constructor from two arrays.
- virtual `~ClpNetworkMatrix` ()
Destructor.

Copy method

- `ClpNetworkMatrix` (const `ClpNetworkMatrix` &)
The copy constructor.
- `ClpNetworkMatrix` (const `CoinPackedMatrix` &)
The copy constructor from an CoinNetworkMatrix.
- `ClpNetworkMatrix` & `operator=` (const `ClpNetworkMatrix` &)
- virtual `ClpMatrixBase` * `clone` () const
Clone.
- `ClpNetworkMatrix` (const `ClpNetworkMatrix` &wholeModel, int numberRows, const int *whichRows, int numberColumns, const int *whichColumns)
Subset constructor (without gaps).
- virtual `ClpMatrixBase` * `subsetClone` (int numberRows, const int *whichRows, int numberColumns, const int *whichColumns) const
Subset clone (without gaps).

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- CoinPackedMatrix * **matrix_**

For fake CoinPackedMatrix.

- int * **lengths_**
- int * **indices_**

Data -1, then +1 rows in pairs (row== -1 if one entry).

- int **numberRows_**

Number of rows.

- int **numberColumns_**

Number of columns.

- bool **trueNetwork_**

True if all entries have two elements.

3.53.1 Detailed Description

This implements a simple network matrix as derived from [ClpMatrixBase](#). If you want more sophisticated version then you could inherit from this. Also you might want to allow networks with gain

Definition at line 19 of file ClpNetworkMatrix.hpp.

3.53.2 Constructor & Destructor Documentation

3.53.2.1 ClpNetworkMatrix::ClpNetworkMatrix()

Default constructor.

3.53.2.2 ClpNetworkMatrix::ClpNetworkMatrix(const ClpNetworkMatrix &)

The copy constructor.

3.53.2.3 ClpNetworkMatrix::ClpNetworkMatrix (const CoinPackedMatrix &)

The copy constructor from an CoinNetworkMatrix.

3.53.2.4 ClpNetworkMatrix::ClpNetworkMatrix (const ClpNetworkMatrix & *wholeModel*, int *numberRows*, const int * *whichRows*, int *numberColumns*, const int * *whichColumns*)

Subset constructor (without gaps).

Duplicates are allowed and order is as given

3.53.3 Member Function Documentation**3.53.3.1 virtual bool ClpNetworkMatrix::isColOrdered () const [inline, virtual]**

Whether the packed matrix is column major ordered or not.

Implements [ClpMatrixBase](#).

Definition at line 27 of file ClpNetworkMatrix.hpp.

3.53.3.2 virtual CoinBigIndex ClpNetworkMatrix::getNumElements () const [inline, virtual]

Number of entries in the packed matrix.

Implements [ClpMatrixBase](#).

Definition at line 31 of file ClpNetworkMatrix.hpp.

3.53.3.3 virtual int ClpNetworkMatrix::getNumCols () const [inline, virtual]

Number of columns.

Implements [ClpMatrixBase](#).

Definition at line 35 of file ClpNetworkMatrix.hpp.

3.53.3.4 virtual int ClpNetworkMatrix::getNumRows () const [inline, virtual]

Number of rows.

Implements [ClpMatrixBase](#).

Definition at line 39 of file ClpNetworkMatrix.hpp.

3.53.3.5 virtual const double* ClpNetworkMatrix::getElements () const [virtual]

A vector containing the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implements [ClpMatrixBase](#).

3.53.3.6 virtual const int* ClpNetworkMatrix::getIndices () const [inline, virtual]

A vector containing the minor indices of the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implements [ClpMatrixBase](#).

Definition at line 53 of file ClpNetworkMatrix.hpp.

3.53.3.7 virtual const int* ClpNetworkMatrix::getVectorLengths () const [virtual]

The lengths of the major-dimension vectors.

Implements [ClpMatrixBase](#).

3.53.3.8 virtual void ClpNetworkMatrix::deleteCols (const int *numDel*, const int * *indDel*) [virtual]

Delete the columns whose indices are listed in *indDel*.

Implements [ClpMatrixBase](#).

3.53.3.9 virtual void ClpNetworkMatrix::deleteRows (const int *numDel*, const int * *indDel*) [virtual]

Delete the rows whose indices are listed in *indDel*.

Implements [ClpMatrixBase](#).

3.53.3.10 virtual int ClpNetworkMatrix::appendMatrix (int *number*, int *type*, const CoinBigIndex * *starts*, const int * *index*, const double * *element*, int *numberOther* = -1) [virtual]

Append a set of rows/columns to the end of the matrix.

Returns number of errors i.e. if any of the new rows/columns contain an index that's larger than the number of columns-1/rows-1 (if *numberOther*>0) or duplicates If 0 then rows, 1 if columns

Reimplemented from [ClpMatrixBase](#).

3.53.3.11 virtual CoinBigIndex* ClpNetworkMatrix::dubiousWeights (const ClpSimplex * *model*, int * *inputWeights*) const [virtual]

Given positive integer weights for each row fills in sum of weights for each column (and slack).

Returns weights vector

Reimplemented from [ClpMatrixBase](#).

```
3.53.3.12 virtual void ClpNetworkMatrix::rangeOfElements ( double  
    & smallestNegative, double & largestNegative, double &  
    smallestPositive, double & largestPositive ) [virtual]
```

Returns largest and smallest elements of both signs.

Largest refers to largest absolute value.

Reimplemented from [ClpMatrixBase](#).

```
3.53.3.13 virtual void ClpNetworkMatrix::unpackPacked ( ClpSimplex  
    * model, CoinIndexedVector * rowArray, int column ) const  
    [virtual]
```

Unpacks a column into an CoinIndexedvector in packed format Note that model is NOT const.

Bounds and objective could be modified if doing column generation (just for this variable)

Implements [ClpMatrixBase](#).

```
3.53.3.14 virtual void ClpNetworkMatrix::times ( double scalar, const double  
    * x, double * y ) const [virtual]
```

Return *y* + *A* * *scalar* **x* in *y*.

Precondition

x must be of size numColumns()
y must be of size numRows()

Implements [ClpMatrixBase](#).

```
3.53.3.15 virtual void ClpNetworkMatrix::transposeTimes ( double scalar,  
    const double * x, double * y ) const [virtual]
```

Return *y* + *x* * *scalar* * *A* in *y*.

Precondition

x must be of size numRows ()
y must be of size numColumns ()

Implements [ClpMatrixBase](#).

**3.53.3.16 virtual void ClpNetworkMatrix::transposeTimes (const
ClpSimplex * model, double scalar, const CoinIndexedVector
* x, CoinIndexedVector * y, CoinIndexedVector * z) const
[virtual]**

Return $x * \text{scalar} * A + y$ in z.

Can use y as temporary array (will be empty at end) Note - If x packed mode - then z packed mode Squashes small elements and knows about [ClpSimplex](#)

Implements [ClpMatrixBase](#).

**3.53.3.17 virtual void ClpNetworkMatrix::subsetTransposeTimes (const
ClpSimplex * model, const CoinIndexedVector * x, const
CoinIndexedVector * y, CoinIndexedVector * z) const
[virtual]**

Return $x * A$ in z but just for indices in y.

Note - z always packed mode

Implements [ClpMatrixBase](#).

**3.53.3.18 virtual ClpMatrixBase* ClpNetworkMatrix::subsetClone (int
numberRows, const int * whichRows, int numberColumns, const int
* whichColumns) const [virtual]**

Subset clone (without gaps).

Duplicates are allowed and order is as given

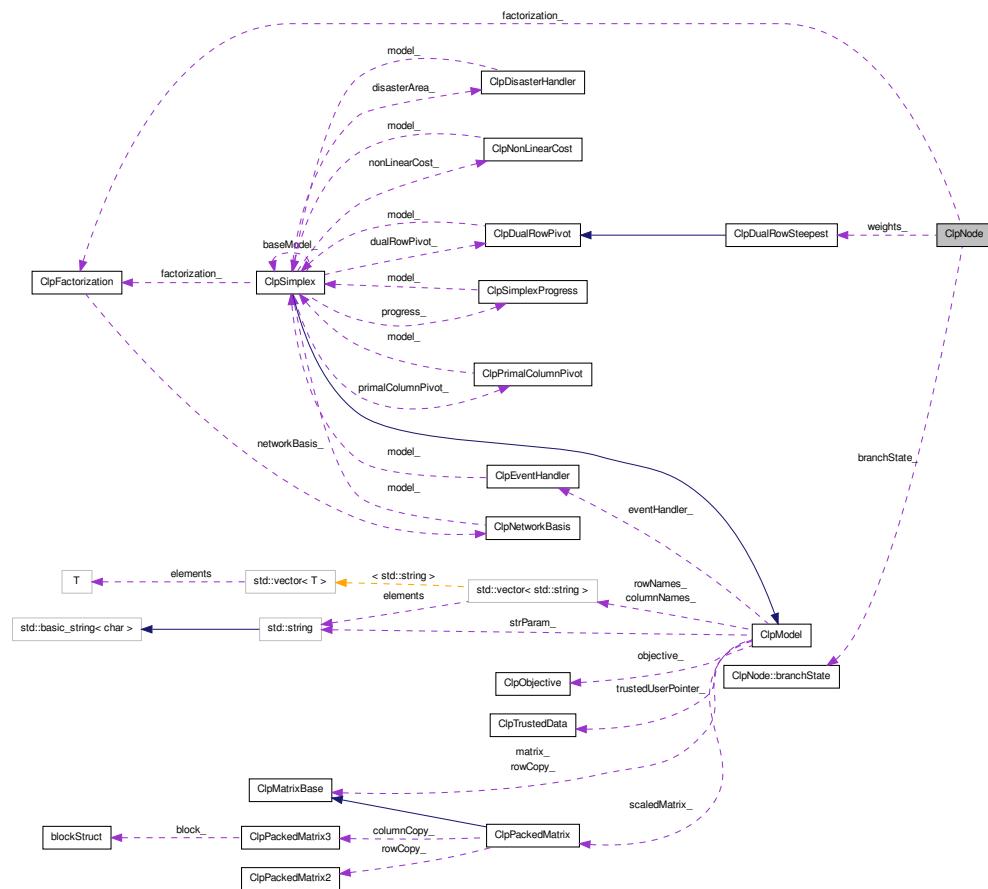
Reimplemented from [ClpMatrixBase](#).

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

- ClpNetworkMatrix.hpp

3.54 ClpNode Class Reference

Collaboration diagram for ClpNode:



Classes

- struct [branchState](#)

Public Member Functions

Useful methods

- void [applyNode](#) (ClpSimplex *model, int doBoundsEtc)

Applies node to model 0 - just tree bounds 1 - tree bounds and basis etc 2 - saved bounds and basis etc.

- void [chooseVariable](#) ([ClpSimplex](#) *model, [ClpNodeStuff](#) *info)
Choose a new variable.
- int [fixOnReducedCosts](#) ([ClpSimplex](#) *model)
Fix on reduced costs.
- void [createArrays](#) ([ClpSimplex](#) *model)
Create odd arrays.
- void [cleanUpForCrunch](#) ()
Clean up as crunch is different model.

Gets and sets

- double [objectiveValue](#) () const
Objective value.
- void [setObjectiveValue](#) (double value)
Set objective value.
- const double * [primalSolution](#) () const
Primal solution.
- const double * [dualSolution](#) () const
Dual solution.
- double [branchingValue](#) () const
Initial value of integer variable.
- double [sumInfeasibilities](#) () const
Sum infeasibilities.
- int [numberInfeasibilities](#) () const
Number infeasibilities.
- int [depth](#) () const
Relative depth.
- double [estimatedSolution](#) () const
Estimated solution value.

- int **way** () const
Way for integer variable -1 down, +1 up.
- bool **fathomed** () const
Return true if branch exhausted.
- void **changeState** ()
Change state of variable i.e. go other way.
- int **sequence** () const
Sequence number of integer variable (-1 if none).
- bool **oddArraysExist** () const
If odd arrays exist.
- const unsigned char * **statusArray** () const
Status array.

Constructors, destructor

- **ClpNode** ()
Default constructor.
- **ClpNode** (ClpSimplex *model, const ClpNodeStuff *stuff, int depth)
Constructor from model.
- void **gutsOfConstructor** (ClpSimplex *model, const ClpNodeStuff *stuff, int arraysExist, int depth)
Does work of constructor (partly so gdb will work).
- virtual ~**ClpNode** ()
Destructor.

Copy methods (at present illegal - will abort)

- **ClpNode** (const **ClpNode** &)
The copy constructor.
- **ClpNode** & **operator=** (const **ClpNode** &)
Operator =.

Protected Attributes

Data

- double `branchingValue_`
Initial value of integer variable.
- double `objectiveValue_`
Value of objective.
- double `sumInfeasibilities_`
Sum of infeasibilities.
- double `estimatedSolution_`
Estimated solution value.
- `ClpFactorization * factorization_`
Factorization.
- `ClpDualRowSteepest * weights_`
Steepest edge weights.
- unsigned char * `status_`
Status vector.
- double * `primalSolution_`
Primal solution.
- double * `dualSolution_`
Dual solution.
- int * `lower_`
Integer lower bounds (only used in fathomMany).
- int * `upper_`
Integer upper bounds (only used in fathomMany).
- int * `pivotVariables_`
Pivot variables for factorization.
- int * `fixed_`
Variables fixed by reduced costs (at end of branch) 0x10000000 added if fixed to UB.
- `branchState branchState_`

State of branch.

- int **sequence_**
Sequence number of integer variable (-1 if none).
- int **numberInfeasibilities_**
Number of infeasibilities.
- int **depth_**
Relative depth.
- int **numberFixed_**
Number fixed by reduced cost.
- int **flags_**
Flags - 1 duals scaled.
- int **maximumFixed_**
Maximum number fixed by reduced cost.
- int **maximumRows_**
Maximum rows so far.
- int **maximumColumns_**
Maximum columns so far.
- int **maximumIntegers_**
Maximum Integers so far.

3.54.1 Detailed Description

Definition at line 19 of file ClpNode.hpp.

3.54.2 Constructor & Destructor Documentation

3.54.2.1 ClpNode::ClpNode()

Default constructor.

3.54.2.2 ClpNode::ClpNode (const ClpNode &)

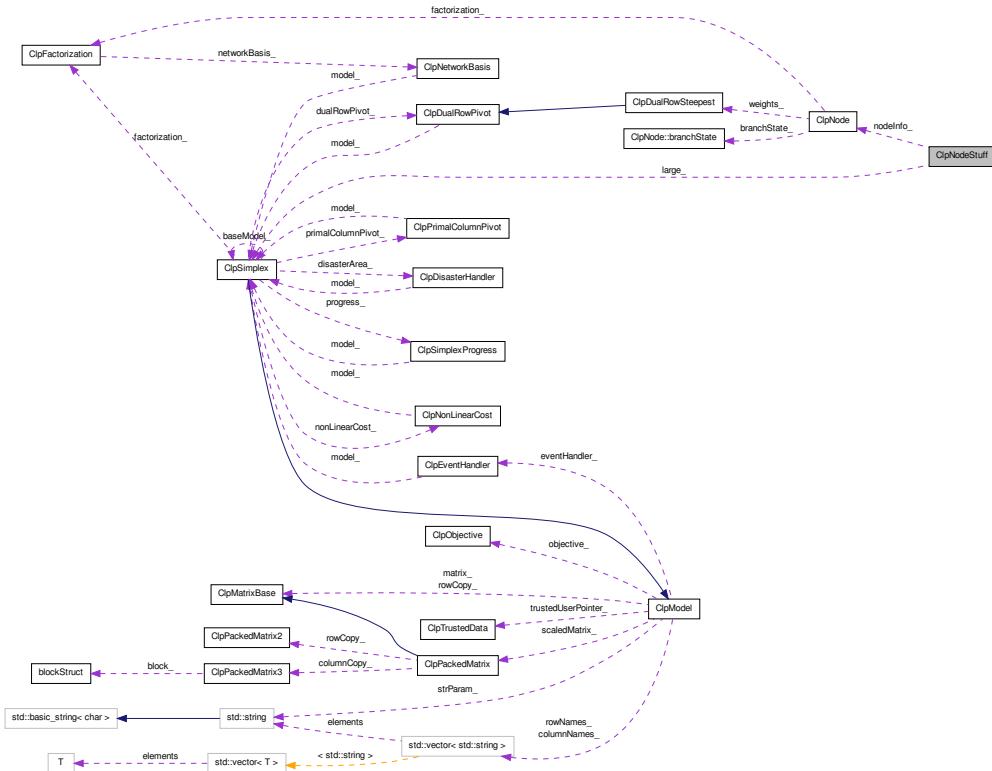
The copy constructor.

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

- ClpNode.hpp

3.55 ClpNodeStuff Class Reference

Collaboration diagram for ClpNodeStuff:



Public Member Functions

Constructors, destructor

- [ClpNodeStuff \(\)](#)
Default constructor.
- [virtual ~ClpNodeStuff \(\)](#)
Destructor.

Copy methods (only copies ints etc, nulls arrays)

- [ClpNodeStuff \(const ClpNodeStuff &\)](#)
The copy constructor.
- [ClpNodeStuff & operator= \(const ClpNodeStuff &\)](#)
Operator =.
- [void zap \(int type\)](#)
Zaps stuff 1 - arrays, 2 ints, 3 both.

Fill methods

- [void fillPseudoCosts \(const double *down, const double *up, const int *priority, const int *numberDown, const int *numberUp, const int *numberDownInfeasible, const int *numberUpInfeasible, int number\)](#)
Fill with pseudocosts.
- [void update \(int way, int sequence, double change, bool feasible\)](#)
Update pseudo costs.
- [int maximumNodes \(\) const](#)
Return maximum number of nodes.
- [int maximumSpace \(\) const](#)
Return maximum space for nodes.

Public Attributes

Data

- [double integerTolerance_](#)
Integer tolerance.
- [double integerIncrement_](#)
Integer increment.

- double **smallChange_**
Small change in branch.
- double * **downPseudo_**
Down pseudo costs.
- double * **upPseudo_**
Up pseudo costs.
- int * **priority_**
Priority.
- int * **numberDown_**
Number of times down.
- int * **numberUp_**
Number of times up.
- int * **numberDownInfeasible_**
Number of times down infeasible.
- int * **numberUpInfeasible_**
Number of times up infeasible.
- double * **saveCosts_**
Copy of costs (local).
- **ClpNode ** nodeInfo_**
Array of ClpNodes.
- **ClpSimplex * large_**
Large model if crunched.
- int * **whichRow_**
Which rows in large model.
- int * **whichColumn_**
Which columns in large model.
- CoinMessageHandler * **handler_**
Cbc's message handler.
- int **nBound_**
Number bounds in large model.

- int `saveOptions_`
Save of specialOptions_ (local).
- int `solverOptions_`
Options to pass to solver 1 - create external reduced costs for columns 2 - create external reduced costs for rows 4 - create external row activity (columns always done) Above only done if feasible 32 - just create up to nDepth_+1 nodes 65536 - set if activated.
- int `maximumNodes_`
Maximum number of nodes to do.
- int `numberBeforeTrust_`
Number before trust from CbcModel.
- int `stateOfSearch_`
State of search from CbcModel.
- int `nDepth_`
Number deep.
- int `nNodes_`
Number nodes returned (-1 if fathom aborted).
- int `numberNodesExplored_`
Number of nodes explored.
- int `numberIterations_`
Number of iterations.
- int `presolveType_`
Type of presolve - 0 none, 1 crunch.
- int `startingDepth_`
Depth passed in.
- int `nodeCalled_`
Node at which called.

3.55.1 Detailed Description

Definition at line 176 of file ClpNode.hpp.

3.55.2 Constructor & Destructor Documentation

3.55.2.1 ClpNodeStuff::ClpNodeStuff()

Default constructor.

3.55.2.2 ClpNodeStuff::ClpNodeStuff(const ClpNodeStuff &)

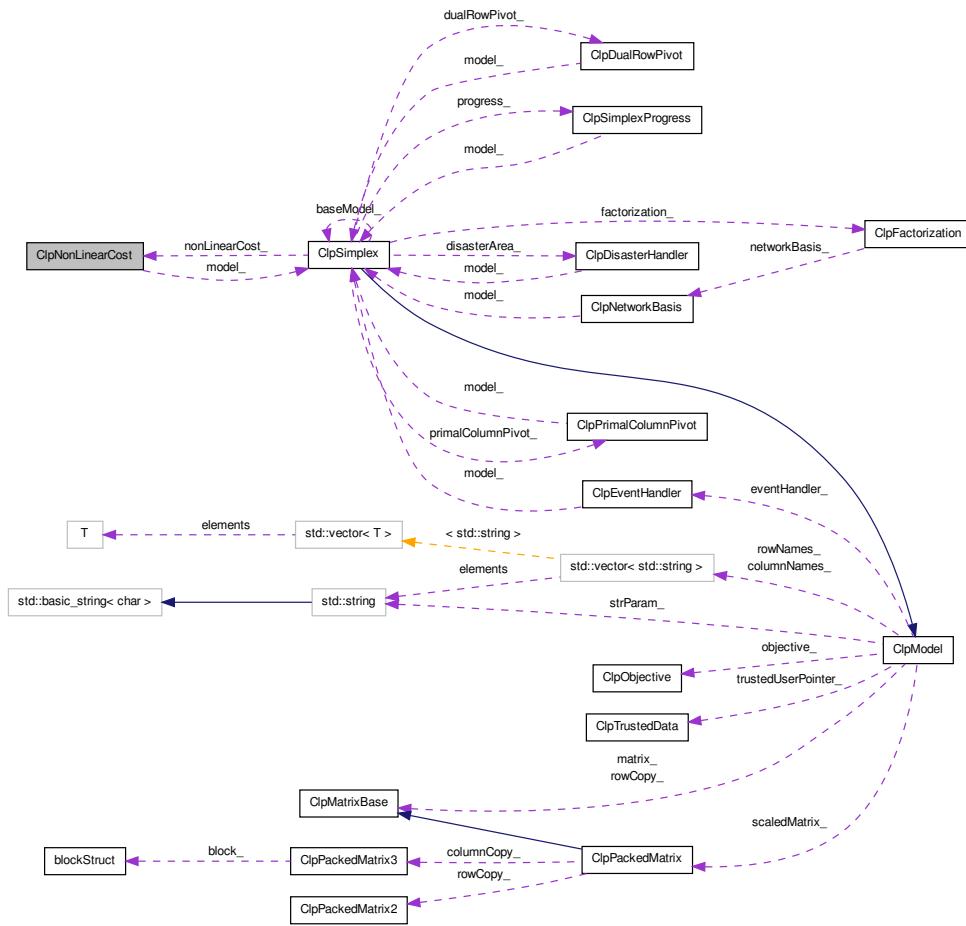
The copy constructor.

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

- ClpNode.hpp

3.56 ClpNonLinearCost Class Reference

Collaboration diagram for ClpNonLinearCost:



Public Member Functions

Constructors, destructor

- `ClpNonLinearCost ()`

Default constructor.

- **ClpNonLinearCost** (*ClpSimplex* *model, int method=1)
Constructor from simplex.
- **ClpNonLinearCost** (*ClpSimplex* *model, const int *starts, const double *lower, const double *cost)
Constructor from simplex and list of non-linearities (columns only) First lower of each column has to match real lower Last lower has to be <= upper (if == then cost ignored) This could obviously be changed to make more user friendly.
- **~ClpNonLinearCost** ()
Destructor.
- **ClpNonLinearCost** (const **ClpNonLinearCost** &)
- **ClpNonLinearCost** & **operator=** (const **ClpNonLinearCost** &)

Actual work in primal

- void **checkInfeasibilities** (double oldTolerance=0.0)
Changes infeasible costs and computes number and cost of infeas Puts all non-basic (non free) variables to bounds and all free variables to zero if oldTolerance is non-zero
– but does not move those <= oldTolerance away.
- void **checkInfeasibilities** (int numberInArray, const int *index)
Changes infeasible costs for each variable The indices are row indices and need converting to sequences.
- void **checkChanged** (int numberInArray, CoinIndexedVector *update)
Puts back correct infeasible costs for each variable The input indices are row indices and need converting to sequences for costs.
- void **goThru** (int numberInArray, double multiplier, const int *index, const double *work, double *rhs)
Goes through one bound for each variable.
- void **goBack** (int numberInArray, const int *index, double *rhs)
Takes off last iteration (i.e.
- void **goBackAll** (const CoinIndexedVector *update)
Puts back correct infeasible costs for each variable The input indices are row indices and need converting to sequences for costs.
- void **zapCosts** ()
Temporary zeroing of feasible costs.
- void **refreshCosts** (const double *columnCosts)
Refreshes costs always makes row costs zero.

- void **feasibleBounds** ()

Puts feasible bounds into lower and upper.
- void **refresh** ()

Refresh - assuming regions OK.
- double **setOne** (int sequence, double solutionValue)

Sets bounds and cost for one variable Returns change in cost May need to be inline for speed.
- void **setOne** (int sequence, double solutionValue, double lowerValue, double upperValue, double costValue=0.0)

Sets bounds and infeasible cost and true cost for one variable This is for gub and column generation etc.
- int **setOneOutgoing** (int sequence, double &solutionValue)

Sets bounds and cost for outgoing variable may change value Returns direction.
- double **nearest** (int sequence, double solutionValue)

Returns nearest bound.
- double **changeInCost** (int sequence, double alpha) const

Returns change in cost - one down if alpha >0.0, up if <0.0 Value is current - new.
- double **changeUpInCost** (int sequence) const
- double **changeDownInCost** (int sequence) const
- double **changeInCost** (int sequence, double alpha, double &rhs)

This also updates next bound.
- double **lower** (int sequence) const

Returns current lower bound.
- double **upper** (int sequence) const

Returns current upper bound.
- double **cost** (int sequence) const

Returns current cost.

Gets and sets

- int **numberInfeasibilities** () const

Number of infeasibilities.
- double **changeInCost** () const

Change in cost.

- double **feasibleCost** () const
Feasible cost.
- double **feasibleReportCost** () const
Feasible cost with offset and direction (i.e. for reporting).
- double **sumInfeasibilities** () const
Sum of infeasibilities.
- double **largestInfeasibility** () const
Largest infeasibility.
- double **averageTheta** () const
Average theta.
- void **setAverageTheta** (double value)
- void **setChangeInCost** (double value)
- void **setMethod** (int value)
- bool **lookBothWays** () const
See if may want to look both ways.

Private functions to deal with infeasible regions

- bool **infeasible** (int i) const
- void **setInfeasible** (int i, bool trueFalse)
- unsigned char * **statusArray** () const
- void **validate** ()
For debug.

3.56.1 Detailed Description

Definition at line 78 of file ClpNonLinearCost.hpp.

3.56.2 Constructor & Destructor Documentation

3.56.2.1 ClpNonLinearCost::ClpNonLinearCost (ClpSimplex * *model*, int *method* = 1)

Constructor from simplex.

This will just set up wasteful arrays for linear, but later may do dual analysis and even finding duplicate columns .

3.56.3 Member Function Documentation

**3.56.3.1 void ClpNonLinearCost::checkChanged (int *numberInArray*,
CoinIndexedVector * *update*)**

Puts back correct infeasible costs for each variable The input indices are row indices and need converting to sequences for costs.

On input array is empty (but indices exist). On exit just changed costs will be stored as normal CoinIndexedVector

**3.56.3.2 void ClpNonLinearCost::goThru (int *numberInArray*, double
multiplier, const int * *index*, const double * *work*, double * *rhs*)**

Goes through one bound for each variable.

If multiplier*work[iRow]>0 goes down, otherwise up. The indices are row indices and need converting to sequences Temporary offsets may be set Rhs entries are increased

**3.56.3.3 void ClpNonLinearCost::goBack (int *numberInArray*, const int *
index, double * *rhs*)**

Takes off last iteration (i.e.

offsets closer to 0)

**3.56.3.4 void ClpNonLinearCost::goBackAll (const CoinIndexedVector *
update)**

Puts back correct infeasible costs for each variable The input indices are row indices and need converting to sequences for costs.

At the end of this all temporary offsets are zero

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

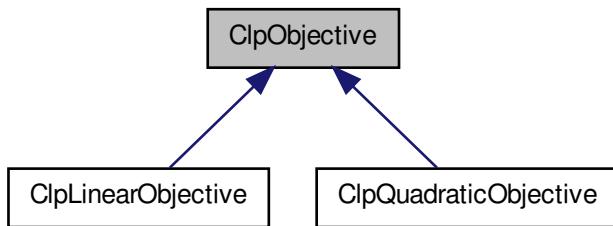
- ClpNonLinearCost.hpp

3.57 ClpObjective Class Reference

Objective Abstract Base Class.

```
#include <ClpObjective.hpp>
```

Inheritance diagram for ClpObjective:



Public Member Functions

Stuff

- virtual double * [gradient](#) (const [ClpSimplex](#) *model, const double *solution, double &offset, bool refresh, int includeLinear=2)=0
Returns gradient.
- virtual double [reducedGradient](#) ([ClpSimplex](#) *model, double *region, bool useFeasibleCosts)=0
Returns reduced gradient.Returns an offset (to be added to current one).
- virtual double [stepLength](#) ([ClpSimplex](#) *model, const double *solution, const double *change, double maximumTheta, double ¤tObj, double &predictedObj, double &thetaObj)=0
*Returns step length which gives minimum of objective for solution + theta * change vector up to maximum theta.*
- virtual double [objectiveValue](#) (const [ClpSimplex](#) *model, const double *solution) const =0
Return objective value (without any [ClpModel](#) offset) (model may be NULL).
- virtual void [resize](#) (int newNumberColumns)=0

Resize objective.

- virtual void `deleteSome` (int numberToDelete, const int *which)=0
Delete columns in objective.
- virtual void `reallyScale` (const double *columnScale)=0
Scale objective.
- virtual int `markNonlinear` (char *which)
Given a zeroed array sets nonlinear columns to 1.
- virtual void `newXValues` ()
Say we have new primal solution - so may need to recompute.

Constructors and destructors

- `ClpObjective ()`
Default Constructor.
- `ClpObjective (const ClpObjective &)`
Copy constructor.
- `ClpObjective & operator= (const ClpObjective &rhs)`
Assignment operator.
- virtual `~ClpObjective ()`
Destructor.
- virtual `ClpObjective * clone () const =0`
Clone.
- virtual `ClpObjective * subsetClone (int numberColumns, const int *whichColumns) const`
Subset clone.

Other

- int `type () const`
Returns type (above 63 is extra information).
- void `setType (int value)`
Sets type (above 63 is extra information).

- int **activated** () const
Whether activated.
- void **setActivated** (int value)
Set whether activated.
- double **nonlinearOffset** () const
Objective offset.

Protected Attributes

Protected member data

- double **offset_**
Value of non-linear part of objective.
- int **type_**
Type of objective - linear is 1.
- int **activated_**
Whether activated.

3.57.1 Detailed Description

Objective Abstract Base Class. Abstract Base Class for describing an objective function

Definition at line 19 of file ClpObjective.hpp.

3.57.2 Member Function Documentation

**3.57.2.1 virtual double* ClpObjective::gradient (const ClpSimplex * *model*,
const double * *solution*, double & *offset*, bool *refresh*, int
includeLinear = 2) [pure virtual]**

Returns gradient.

If Linear then solution may be NULL, also returns an offset (to be added to current one) If refresh is false then uses last solution Uses model for scaling includeLinear 0 - no, 1 as is, 2 as feasible

Implemented in [ClpLinearObjective](#), and [ClpQuadraticObjective](#).

```
3.57.2.2 virtual double ClpObjective::stepLength ( ClpSimplex * model, const  
double * solution, const double * change, double maximumTheta,  
double & currentObj, double & predictedObj, double & thetaObj )  
[pure virtual]
```

Returns step length which gives minimum of objective for solution + theta * change vector up to maximum theta.

arrays are numberColumns+numberRows Also sets current objective, predicted and at maximumTheta

Implemented in [ClpLinearObjective](#), and [ClpQuadraticObjective](#).

```
3.57.2.3 virtual int ClpObjective::markNonlinear ( char * which )  
[virtual]
```

Given a zeroed array sets nonlinear columns to 1.

Returns number of nonlinear columns

Reimplemented in [ClpQuadraticObjective](#).

```
3.57.2.4 virtual ClpObjective* ClpObjective::subsetClone ( int  
numberColumns, const int * whichColumns ) const [virtual]
```

Subset clone.

Duplicates are allowed and order is as given. Derived classes need not provide this as it may not always make sense

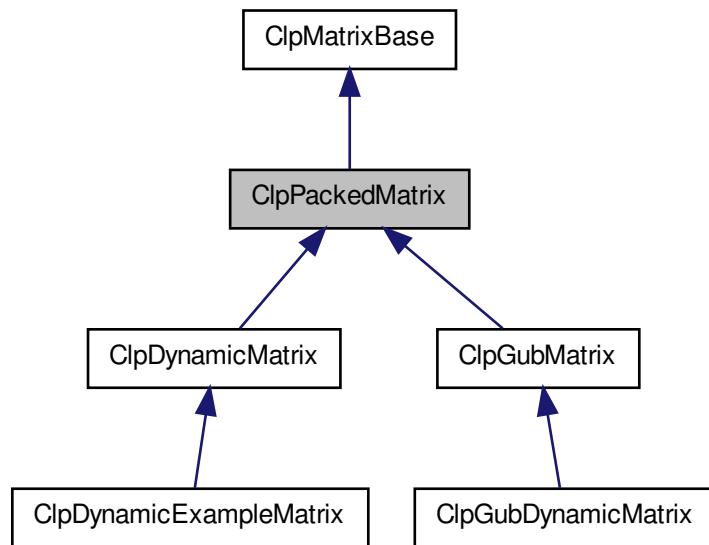
Reimplemented in [ClpLinearObjective](#), and [ClpQuadraticObjective](#).

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

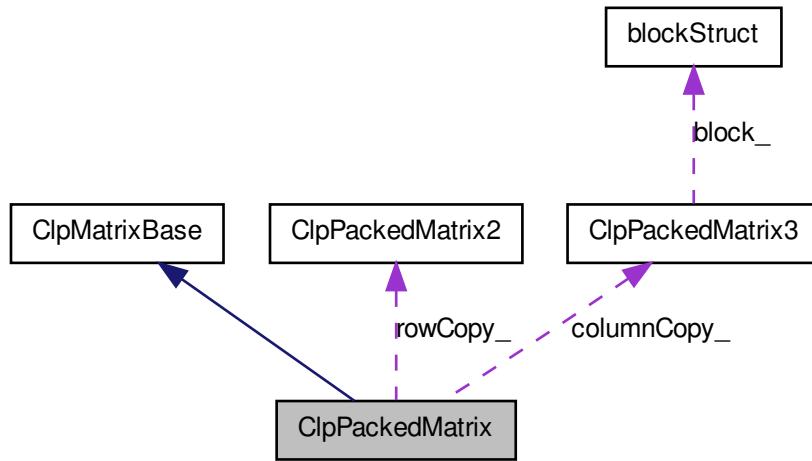
- ClpObjective.hpp

3.58 ClpPackedMatrix Class Reference

Inheritance diagram for ClpPackedMatrix:



Collaboration diagram for ClPackedMatrix:



Public Member Functions

Useful methods

- `virtual CoinPackedMatrix * getPackedMatrix () const`
Return a complete CoinPackedMatrix.
- `virtual bool isColOrdered () const`
Whether the packed matrix is column major ordered or not.
- `virtual CoinBigIndexgetNumElements () const`
Number of entries in the packed matrix.
- `virtual int getNumCols () const`
Number of columns.
- `virtual int getNumRows () const`
Number of rows.
- `virtual const double * getElements () const`
A vector containing the elements in the packed matrix.

- `double * getMutableElements () const`
Mutable elements.
- `virtual const int * getIndices () const`
A vector containing the minor indices of the elements in the packed matrix.
- `virtual const CoinBigIndex * getVectorStarts () const`
- `virtual const int * getVectorLengths () const`
The lengths of the major-dimension vectors.
- `virtual int getVectorLength (int index) const`
The length of a single major-dimension vector.
- `virtual void deleteCols (const int numDel, const int *indDel)`
Delete the columns whose indices are listed in `indDel`.
- `virtual void deleteRows (const int numDel, const int *indDel)`
Delete the rows whose indices are listed in `indDel`.
- `virtual void appendCols (int number, const CoinPackedVectorBase *const *columns)`
Append Columns.
- `virtual void appendRows (int number, const CoinPackedVectorBase *const *rows)`
Append Rows.
- `virtual int appendMatrix (int number, int type, const CoinBigIndex *starts, const int *index, const double *element, int numberOther=-1)`
Append a set of rows/columns to the end of the matrix.
- `virtual void replaceVector (const int index, const int numReplace, const double *newElements)`
Replace the elements of a vector.
- `virtual void modifyCoefficient (int row, int column, double newElement, bool keepZero=false)`
Modify one element of packed matrix.
- `virtual ClpMatrixBase * reverseOrderedCopy () const`
Returns a new matrix in reverse order without gaps.
- `virtual CoinBigIndex countBasis (const int *whichColumn, int &numberColumnBasic)`
Returns number of elements in column part of basis.

- virtual void `fillBasis` (`ClpSimplex` *model, const int *whichColumn, int &numberColumnBasic, int *row, int *start, int *rowCount, int *columnCount, `CoinFactorizationDouble` *element)
Fills in column part of basis.
- virtual int `scale` (`ClpModel` *model, const `ClpSimplex` *baseModel=NULL) const
Creates scales for column copy (rowCopy in model may be modified) returns non-zero if no scaling done.
- virtual void `scaleRowCopy` (`ClpModel` *model) const
Scales rowCopy if column copy scaled Only called if scales already exist.
- void `createScaledMatrix` (`ClpSimplex` *model) const
Creates scaled column copy if scales exist.
- virtual `ClpMatrixBase` * `scaledColumnCopy` (`ClpModel` *model) const
Really really scales column copy Only called if scales already exist.
- virtual bool `allElementsInRange` (`ClpModel` *model, double smallest, double largest, int check=15)
Checks if all elements are in valid range.
- virtual void `rangeOfElements` (double &smallestNegative, double &largestNegative, double &smallestPositive, double &largestPositive)
Returns largest and smallest elements of both signs.
- virtual void `unpack` (const `ClpSimplex` *model, `CoinIndexedVector` *rowArray, int column) const
Unpacks a column into an CoinIndexedvector.
- virtual void `unpackPacked` (`ClpSimplex` *model, `CoinIndexedVector` *rowArray, int column) const
Unpacks a column into an CoinIndexedvector in packed format Note that model is NOT const.
- virtual void `add` (const `ClpSimplex` *model, `CoinIndexedVector` *rowArray, int column, double multiplier) const
Adds multiple of a column into an CoinIndexedvector You can use quickAdd to add to vector.
- virtual void `add` (const `ClpSimplex` *model, double *array, int column, double multiplier) const
Adds multiple of a column into an array.

- virtual void `releasePackedMatrix () const`
Allow any parts of a created CoinPackedMatrix to be deleted.
- virtual `CoinBigIndex * dubiousWeights (const ClpSimplex *model, int *inputWeights) const`
Given positive integer weights for each row fills in sum of weights for each column (and slack).
- virtual bool `canDoPartialPricing () const`
Says whether it can do partial pricing.
- virtual void `partialPricing (ClpSimplex *model, double start, double end, int &bestSequence, int &numberWanted)`
Partial pricing.
- virtual int `refresh (ClpSimplex *model)`
makes sure active columns correct
- virtual void `reallyScale (const double *rowScale, const double *columnScale)`
- virtual void `setDimensions (int numrows, int numcols)`
Set the dimensions of the matrix.

Matrix times vector methods

- virtual void `times (double scalar, const double *x, double *y) const`
*Return $y + A * scalar * x$ in y .*
- virtual void `times (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale) const`
And for scaling.
- virtual void `transposeTimes (double scalar, const double *x, double *y) const`
*Return $y + x * scalar * A$ in y .*
- virtual void `transposeTimes (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale, double *spare=NULL) const`
And for scaling.
- void `transposeTimesSubset (int number, const int *which, const double *pi, double *y, const double *rowScale, const double *columnScale, double *spare=NULL) const`
*Return $y - pi * A$ in y .*

- virtual void `transposeTimes` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const

*Return $x * scalar * A + y$ in z.*
- void `transposeTimesByColumn` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const

*Return $x * scalar * A + y$ in z.*
- virtual void `transposeTimesByRow` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const

*Return $x * scalar * A + y$ in z.*
- virtual void `subsetTransposeTimes` (const `ClpSimplex` *model, const `CoinIndexedVector` *x, const `CoinIndexedVector` *y, `CoinIndexedVector` *z) const

*Return $x * A$ in z but just for indices in y.*
- virtual bool `canCombine` (const `ClpSimplex` *model, const `CoinIndexedVector` *pi) const

Returns true if can combine transposeTimes and subsetTransposeTimes and if it would be faster.
- virtual void `transposeTimes2` (const `ClpSimplex` *model, const `CoinIndexedVector` *pi1, `CoinIndexedVector` *dj1, const `CoinIndexedVector` *pi2, `CoinIndexedVector` *spare, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor)

Updates two arrays for steepest.
- virtual void `subsetTimes2` (const `ClpSimplex` *model, `CoinIndexedVector` *dj1, const `CoinIndexedVector` *pi2, `CoinIndexedVector` *dj2, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor)

Updates second array for steepest and does devex weights.
- void `useEffectiveRhs` (`ClpSimplex` *model)

Sets up an effective RHS.

Other

- `CoinPackedMatrix` * `matrix` () const

Returns CoinPackedMatrix (non const).

- void `setMatrixNull ()`
Just sets matrix_ to NULL so it can be used elsewhere.
- void `makeSpecialColumnCopy ()`
Say we want special column copy.
- void `releaseSpecialColumnCopy ()`
Say we don't want special column copy.
- bool `zeros () const`
Are there zeros?
- bool `wantsSpecialColumnCopy () const`
Do we want special column copy.
- int `flags () const`
Flags.
- void `checkGaps ()`
Sets flags_ correctly.
- int `numberActiveColumns () const`
number of active columns (normally same as number of columns)
- void `setNumberActiveColumns (int value)`
Set number of active columns (normally same as number of columns).

Constructors, destructor

- `ClPackedMatrix ()`
Default constructor.
- virtual `~ClPackedMatrix ()`
Destructor.

Copy method

- `ClPackedMatrix (const ClPackedMatrix &)`
The copy constructor.
- `ClPackedMatrix (const CoinPackedMatrix &)`
The copy constructor from an CoinPackedMatrix.

- `ClpPackedMatrix` (const `ClpPackedMatrix` &wholeModel, int numberRows, const int *whichRows, int numberColumns, const int *whichColumns)
Subset constructor (without gaps).
- `ClpPackedMatrix` (const `CoinPackedMatrix` &wholeModel, int numberRows, const int *whichRows, int numberColumns, const int *whichColumns)
- `ClpPackedMatrix` (`CoinPackedMatrix` *matrix)
This takes over ownership (for space reasons).
- `ClpPackedMatrix` & `operator=` (const `ClpPackedMatrix` &)
- virtual `ClpMatrixBase` * `clone` () const
Clone.
- virtual void `copy` (const `ClpPackedMatrix` *from)
Copy contents - resizing if necessary - otherwise re-use memory.
- virtual `ClpMatrixBase` * `subsetClone` (int numberRows, const int *whichRows, int numberColumns, const int *whichColumns) const
Subset clone (without gaps).
- void `specialRowCopy` (`ClpSimplex` *model, const `ClpMatrixBase` *rowCopy)
make special row copy
- void `specialColumnCopy` (`ClpSimplex` *model)
make special column copy
- virtual void `correctSequence` (const `ClpSimplex` *model, int &sequenceIn, int &sequenceOut)
Correct sequence in and out to give true value.

Protected Member Functions

- void `checkFlags` (int type) const
Check validity.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `CoinPackedMatrix` * `matrix_`

Data.

- int `numberActiveColumns_`
number of active columns (normally same as number of columns)
- int `flags_`
Flags - 1 - has zero elements 2 - has gaps 4 - has special row copy 8 - has special column copy 16 - wants special column copy.
- `ClpPackedMatrix2 * rowCopy_`
Special row copy.
- `ClpPackedMatrix3 * columnCopy_`
Special column copy.

3.58.1 Detailed Description

Definition at line 30 of file ClpPackedMatrix.hpp.

3.58.2 Constructor & Destructor Documentation

3.58.2.1 ClpPackedMatrix::ClpPackedMatrix ()

Default constructor.

3.58.2.2 ClpPackedMatrix::ClpPackedMatrix (const ClpPackedMatrix &)

The copy constructor.

3.58.2.3 ClpPackedMatrix::ClpPackedMatrix (const CoinPackedMatrix &)

The copy constructor from an CoinPackedMatrix.

3.58.2.4 ClpPackedMatrix::ClpPackedMatrix (const ClpPackedMatrix & wholeModel, int numberRows, const int * whichRows, int numberColumns, const int * whichColumns)

Subset constructor (without gaps).

Duplicates are allowed and order is as given

3.58.3 Member Function Documentation

3.58.3.1 `virtual bool ClpPackedMatrix::isColOrdered () const [inline, virtual]`

Whether the packed matrix is column major ordered or not.

Implements [ClpMatrixBase](#).

Definition at line 40 of file ClpPackedMatrix.hpp.

3.58.3.2 `virtual CoinBigIndex ClpPackedMatrix::getNumElements () const [inline, virtual]`

Number of entries in the packed matrix.

Implements [ClpMatrixBase](#).

Definition at line 44 of file ClpPackedMatrix.hpp.

3.58.3.3 `virtual int ClpPackedMatrix::getNumCols () const [inline, virtual]`

Number of columns.

Implements [ClpMatrixBase](#).

Definition at line 48 of file ClpPackedMatrix.hpp.

3.58.3.4 `virtual int ClpPackedMatrix::getNumRows () const [inline, virtual]`

Number of rows.

Implements [ClpMatrixBase](#).

Definition at line 52 of file ClpPackedMatrix.hpp.

**3.58.3.5 virtual const double* ClpPackedMatrix::getElements() const
[inline, virtual]**

A vector containing the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implements [ClpMatrixBase](#).

Definition at line 60 of file ClpPackedMatrix.hpp.

3.58.3.6 virtual const int* ClpPackedMatrix::getIndices() const [inline, virtual]

A vector containing the minor indices of the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implements [ClpMatrixBase](#).

Definition at line 72 of file ClpPackedMatrix.hpp.

**3.58.3.7 virtual const int* ClpPackedMatrix::getVectorLengths() const
[inline, virtual]**

The lengths of the major-dimension vectors.

Implements [ClpMatrixBase](#).

Definition at line 80 of file ClpPackedMatrix.hpp.

**3.58.3.8 virtual int ClpPackedMatrix::getVectorLength(int index) const
[inline, virtual]**

The length of a single major-dimension vector.

Reimplemented from [ClpMatrixBase](#).

Definition at line 84 of file ClpPackedMatrix.hpp.

3.58.3.9 virtual void ClPackedMatrix::deleteCols (const int numDel, const int * indDel) [virtual]

Delete the columns whose indices are listed in `indDel`.

Implements [ClpMatrixBase](#).

3.58.3.10 virtual void ClPackedMatrix::deleteRows (const int numDel, const int * indDel) [virtual]

Delete the rows whose indices are listed in `indDel`.

Implements [ClpMatrixBase](#).

3.58.3.11 virtual int ClPackedMatrix::appendMatrix (int number, int type, const CoinBigIndex * starts, const int * index, const double * element, int numberOther = -1) [virtual]

Append a set of rows/columns to the end of the matrix.

Returns number of errors i.e. if any of the new rows/columns contain an index that's larger than the number of columns-1/rows-1 (if `numberOther>0`) or duplicates If 0 then rows, 1 if columns

Reimplemented from [ClpMatrixBase](#).

3.58.3.12 virtual void ClPackedMatrix::replaceVector (const int index, const int numReplace, const double * newElements) [inline, virtual]

Replace the elements of a vector.

The indices remain the same. This is only needed if scaling and a row copy is used. At most the number specified will be replaced. The index is between 0 and major dimension of matrix

Definition at line 109 of file ClPackedMatrix.hpp.

```
3.58.3.13 virtual void ClpPackedMatrix::modifyCoefficient( int row, int
column, double newElement, bool keepZero = false ) [inline,
virtual]
```

Modify one element of packed matrix.

An element may be added. This works for either ordering If the new element is zero it will be deleted unless keepZero true

Reimplemented from [ClpMatrixBase](#).

Definition at line 116 of file ClpPackedMatrix.hpp.

```
3.58.3.14 virtual ClpMatrixBase* ClpPackedMatrix::scaledColumnCopy (
ClpModel * model ) const [virtual]
```

Really scales column copy Only called if scales already exist.

Up to user to delete

Reimplemented from [ClpMatrixBase](#).

```
3.58.3.15 virtual bool ClpPackedMatrix::allElementsInRange ( ClpModel
* model, double smallest, double largest, int check = 15 )
[virtual]
```

Checks if all elements are in valid range.

Can just return true if you are not paranoid. For Clp I will probably expect no zeros. Code can modify matrix to get rid of small elements. check bits (can be turned off to save time) : 1 - check if matrix has gaps 2 - check if zero elements 4 - check and compress duplicates 8 - report on large and small

Reimplemented from [ClpMatrixBase](#).

```
3.58.3.16 virtual void ClpPackedMatrix::rangeOfElements ( double
& smallestNegative, double & largestNegative, double &
smallestPositive, double & largestPositive ) [virtual]
```

Returns largest and smallest elements of both signs.

Largest refers to largest absolute value.

Reimplemented from [ClpMatrixBase](#).

**3.58.3.17 virtual void ClpPackedMatrix::unpackPacked (ClpSimplex * *model*,
CoinIndexedVector * *rowArray*, int *column*) const [virtual]**

Unpacks a column into an CoinIndexedvector in packed format. Note that *model* is NOT const.

Bounds and objective could be modified if doing column generation (just for this variable)

Implements [ClpMatrixBase](#).

Reimplemented in [ClpGubMatrix](#).

**3.58.3.18 virtual CoinBigIndex* ClpPackedMatrix::dubiousWeights (const
ClpSimplex * *model*, int * *inputWeights*) const [virtual]**

Given positive integer weights for each row fills in sum of weights for each column (and slack).

Returns weights vector

Reimplemented from [ClpMatrixBase](#).

**3.58.3.19 virtual void ClpPackedMatrix::setDimensions (int *numrows*, int
numcols) [virtual]**

Set the dimensions of the matrix.

In effect, append new empty columns/rows to the matrix. A negative number for either dimension means that that dimension doesn't change. Otherwise the new dimensions MUST be at least as large as the current ones otherwise an exception is thrown.

Reimplemented from [ClpMatrixBase](#).

**3.58.3.20 virtual void ClpPackedMatrix::times (double *scalar*, const double *
x, double * *y*) const [virtual]**

Return *y* + *A* * *scalar* **x* in *y*.

Precondition

x must be of size numColumns()
y must be of size numRows()

Implements [ClpMatrixBase](#).

Reimplemented in [ClpDynamicMatrix](#), and [ClpGubDynamicMatrix](#).

**3.58.3.21 virtual void ClpPackedMatrix::transposeTimes (double scalar,
const double * x, double * y) const [virtual]**

Return $y + x * \text{scalar} * A$ in y.

Precondition

x must be of size numRows()
y must be of size numColumns()

Implements [ClpMatrixBase](#).

**3.58.3.22 void ClpPackedMatrix::transposeTimesSubset (int number, const
int * which, const double * pi, double * y, const double * rowScale,
const double * columnScale, double * spare = NULL) const**

Return $y - pi * A$ in y.

Precondition

pi must be of size numRows()
y must be of size numColumns() This just does subset (but puts in correct place
in y)

**3.58.3.23 virtual void ClpPackedMatrix::transposeTimes (const
ClpSimplex * model, double scalar, const CoinIndexedVector
* x, CoinIndexedVector * y, CoinIndexedVector * z) const
[virtual]**

Return $x * \text{scalar} * A + y$ in z.

Can use y as temporary array (will be empty at end) Note - If x packed mode - then z packed mode Squashes small elements and knows about [ClpSimplex](#)

Implements [ClpMatrixBase](#).

Reimplemented in [ClpGubMatrix](#).

```
3.58.3.24 void ClpPackedMatrix::transposeTimesByColumn ( const  
                           ClpSimplex * model, double scalar, const CoinIndexedVector * x,  
                           CoinIndexedVector * y, CoinIndexedVector * z ) const
```

Return $x * scalar * A + y$ in z.

Note - If x packed mode - then z packed mode This does by column and knows no gaps
Squashes small elements and knows about [ClpSimplex](#)

```
3.58.3.25 virtual void ClpPackedMatrix::transposeTimesByRow ( const  
                           ClpSimplex * model, double scalar, const CoinIndexedVector  
                           * x, CoinIndexedVector * y, CoinIndexedVector * z ) const  
                           [virtual]
```

Return $x * scalar * A + y$ in z.

Can use y as temporary array (will be empty at end) Note - If x packed mode - then z packed mode Squashes small elements and knows about [ClpSimplex](#). This version uses row copy

Reimplemented in [ClpGubMatrix](#).

```
3.58.3.26 virtual void ClpPackedMatrix::subsetTransposeTimes ( const  
                           ClpSimplex * model, const CoinIndexedVector * x, const  
                           CoinIndexedVector * y, CoinIndexedVector * z ) const  
                           [virtual]
```

Return $x * A$ in z but just for indices in y.

Note - z always packed mode

Implements [ClpMatrixBase](#).

Reimplemented in [ClpGubMatrix](#).

3.58.3.27 void ClpPackedMatrix::setMatrixNull() [inline]

Just sets matrix_ to NULL so it can be used elsewhere.

used in GUB

Definition at line 311 of file ClpPackedMatrix.hpp.

**3.58.3.28 virtual ClpMatrixBase* ClpPackedMatrix::subsetClone(int
numberRows, const int * whichRows, int numberColumns, const int
* whichColumns) const [virtual]**

Subset clone (without gaps).

Duplicates are allowed and order is as given

Reimplemented from [ClpMatrixBase](#).

Reimplemented in [ClpGubMatrix](#).

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

- ClpPackedMatrix.hpp

3.59 ClpPackedMatrix2 Class Reference**Public Member Functions****Useful methods**

- void [transposeTimes](#) (const [ClpSimplex](#) *model, const CoinPackedMatrix *rowCopy, const CoinIndexedVector *x, CoinIndexedVector *spareArray, CoinIndexedVector *z) const

*Return $x * -1 * A$ in z .*
- bool [usefulInfo](#) () const

Returns true if copy has useful information.

Constructors, destructor

- [ClpPackedMatrix2\(\)](#)

Default constructor.

- `ClpPackedMatrix2 (ClpSimplex *model, const CoinPackedMatrix *rowCopy)`
Constructor from copy.
- `virtual ~ClpPackedMatrix2 ()`
Destructor.

Copy method

- `ClpPackedMatrix2 (const ClpPackedMatrix2 &)`
The copy constructor.
- `ClpPackedMatrix2 & operator= (const ClpPackedMatrix2 &)`

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `int numberBlocks_`
Number of blocks.
- `int numberRows_`
Number of rows.
- `int * offset_`
Column offset for each block (plus one at end).
- `unsigned short * count_`
Counts of elements in each part of row.
- `CoinBigIndex * rowStart_`
Row starts.
- `unsigned short * column_`
columns within block
- `double * work_`
work arrays

3.59.1 Detailed Description

Definition at line 509 of file ClpPackedMatrix.hpp.

3.59.2 Constructor & Destructor Documentation

3.59.2.1 ClpPackedMatrix2::ClpPackedMatrix2()

Default constructor.

3.59.2.2 ClpPackedMatrix2::ClpPackedMatrix2(ClpSimplex * *model*, const CoinPackedMatrix * *rowCopy*)

Constructor from copy.

3.59.2.3 ClpPackedMatrix2::ClpPackedMatrix2(const ClpPackedMatrix2 &)

The copy constructor.

3.59.3 Member Function Documentation

3.59.3.1 void ClpPackedMatrix2::transposeTimes(const ClpSimplex * *model*, const CoinPackedMatrix * *rowCopy*, const CoinIndexedVector * *x*, CoinIndexedVector * *spareArray*, CoinIndexedVector * *z*) const

Return $x * -1 * A$ in z .

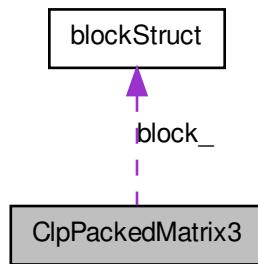
Note - x packed and z will be packed mode Squashes small elements and knows about [ClpSimplex](#)

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

- ClpPackedMatrix.hpp

3.60 ClpPackedMatrix3 Class Reference

Collaboration diagram for ClpPackedMatrix3:



Public Member Functions

Useful methods

- void `transposeTimes` (const `ClpSimplex` *model, const double *pi, CoinIndexedVector *output) const
*Return $x * -1 * A$ in z .*
- void `transposeTimes2` (const `ClpSimplex` *model, const double *pi, CoinIndexedVector *dj1, const double *piWeight, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor)
Updates two arrays for steepest.

Constructors, destructor

- `ClpPackedMatrix3 ()`
Default constructor.
- `ClpPackedMatrix3 (ClpSimplex *model, const CoinPackedMatrix *columnCopy)`
Constructor from copy.
- virtual `~ClpPackedMatrix3 ()`
Destructor.

Copy method

- `ClpPackedMatrix3 (const ClpPackedMatrix3 &)`
The copy constructor.
- `ClpPackedMatrix3 & operator= (const ClpPackedMatrix3 &)`

Sort methods

- `void sortBlocks (const ClpSimplex *model)`
Sort blocks.
- `void swapOne (const ClpSimplex *model, const ClpPackedMatrix *matrix, int iColumn)`
Swap one variable.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `int numberBlocks_`
Number of blocks.
- `int numberColumns_`
Number of columns.
- `int * column_`
Column indices and reverse lookup (within block).
- `CoinBigIndex * start_`
Starts for odd/long vectors.
- `int * row_`
Rows.
- `double * element_`
Elements.
- `blockStruct * block_`
Blocks (ordinary start at 0 and go to first block).

3.60.1 Detailed Description

Definition at line 578 of file ClpPackedMatrix.hpp.

3.60.2 Constructor & Destructor Documentation

3.60.2.1 ClpPackedMatrix3::ClpPackedMatrix3()

Default constructor.

3.60.2.2 ClpPackedMatrix3::ClpPackedMatrix3(ClpSimplex * *model*, const CoinPackedMatrix * *columnCopy*)

Constructor from copy.

3.60.2.3 ClpPackedMatrix3::ClpPackedMatrix3(const ClpPackedMatrix3 &)

The copy constructor.

3.60.3 Member Function Documentation

3.60.3.1 void ClpPackedMatrix3::transposeTimes(const ClpSimplex * *model*, const double * *pi*, CoinIndexedVector * *output*) const

Return $x * -1 * A$ in z .

Note - x packed and z will be packed mode Squashes small elements and knows about [ClpSimplex](#)

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

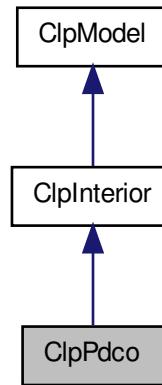
- ClpPackedMatrix.hpp

3.61 ClpPdco Class Reference

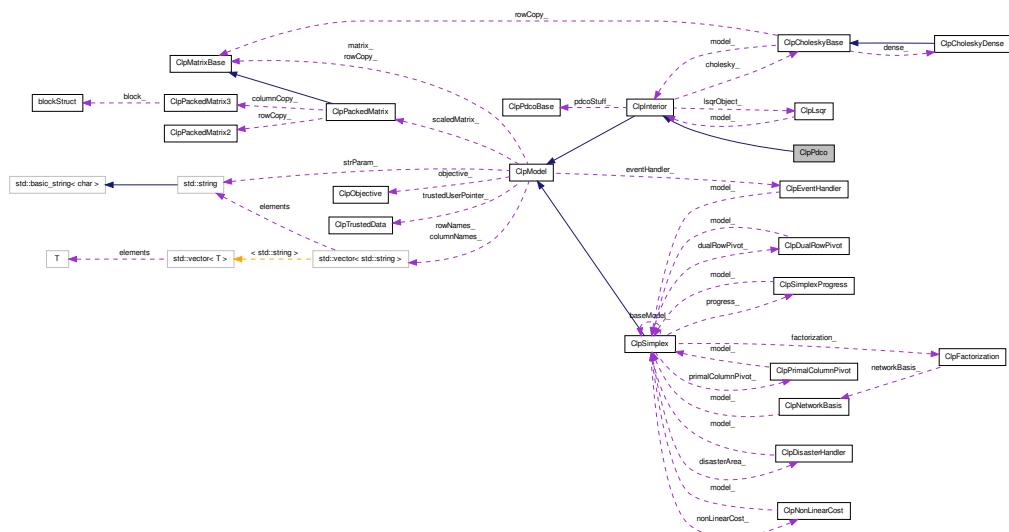
This solves problems in Primal Dual Convex Optimization.

```
#include <ClpPdco.hpp>
```

Inheritance diagram for ClpPdco:



Collaboration diagram for ClpPdco:



Public Member Functions

Description of algorithm

- int **pdco** ()

Pdco algorithm.
- int **pdco** ([ClpPdcoBase](#) *stuff, [Options](#) &options, [Info](#) &info, [Outfo](#) &outfo)

Functions used in pdco

- void **lsqr** ()

LSQR.
- void **matVecMult** (int, double *, double *)
 • void **matVecMult** (int, [CoinDenseVector< double >](#) &, double *)
 • void **matVecMult** (int, [CoinDenseVector< double >](#) &, [CoinDenseVector< double >](#) &)
 • void **matVecMult** (int, [CoinDenseVector< double >](#) *, [CoinDenseVector< double >](#) *)
 • void **getBoundTypes** (int *, int *, int *, int **)
 • void **getGrad** ([CoinDenseVector< double >](#) &x, [CoinDenseVector< double >](#) &grad)
 • void **getHessian** ([CoinDenseVector< double >](#) &x, [CoinDenseVector< double >](#) &H)
 • double **getObj** ([CoinDenseVector< double >](#) &x)
 • void **matPrecon** (double, double *, double *)
 • void **matPrecon** (double, [CoinDenseVector< double >](#) &, double *)
 • void **matPrecon** (double, [CoinDenseVector< double >](#) &, [CoinDenseVector< double >](#) &)
 • void **matPrecon** (double, [CoinDenseVector< double >](#) >, [CoinDenseVector< double >](#) *, [CoinDenseVector< double >](#) *)

3.61.1 Detailed Description

This solves problems in Primal Dual Convex Optimization. It inherits from [ClpInterior](#). It has no data of its own and is never created - only cast from a [ClpInterior](#) object at algorithm time.

Definition at line 22 of file ClpPdco.hpp.

3.61.2 Member Function Documentation

3.61.2.1 int ClpPdco::pdco ()

Pdco algorithm.

Method

Reimplemented from [ClpInterior](#).

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

- ClpPdco.hpp

3.62 ClpPdcoBase Class Reference

Abstract base class for tailoring everything for Pcd.

```
#include <ClpPdcoBase.hpp>
```

Public Member Functions

Virtual methods that the derived classes must provide

- virtual void **matVecMult** ([ClpInterior](#) *model, int mode, double *x, double *y) const =0
- virtual void **getGrad** ([ClpInterior](#) *model, CoinDenseVector< double > &x, CoinDenseVector< double > &grad) const =0
- virtual void **getHessian** ([ClpInterior](#) *model, CoinDenseVector< double > &x, CoinDenseVector< double > &H) const =0
- virtual double **getObj** ([ClpInterior](#) *model, CoinDenseVector< double > &x) const =0
- virtual void **matPrecon** ([ClpInterior](#) *model, double delta, double *x, double *y) const =0

Other

Clone

- virtual [ClpPdcoBase](#) * **clone** () const =0
- int **type** () const

Returns type.

- void **setType** (int type)

Sets type.

- int **sizeD1** () const

Returns size of d1.

- double **getD1** () const

Returns d1 as scalar.

- int [sizeD2 \(\) const](#)
Returns size of d2.
- double [getD2 \(\) const](#)
Returns d2 as scalar.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- double [d1_](#)
Should be dense vectors.
- double [d2_](#)
- int [type_](#)
type (may be useful)

Constructors, destructor

NOTE: All constructors are protected.

There's no need to expose them, after all, this is an abstract class.

- virtual [~ClpPdcoBase \(\)](#)
Destructor (has to be public).
- [ClpPdcoBase \(\)](#)
Default constructor.
- [ClpPdcoBase \(const ClpPdcoBase &\)](#)
- [ClpPdcoBase & operator= \(const ClpPdcoBase &\)](#)

3.62.1 Detailed Description

Abstract base class for tailoring everything for Poco. Since this class is abstract, no object of this type can be created.

If a derived class provides all methods then all ClpPoco algorithms should work.

Eventually we should be able to use [ClpObjective](#) and [ClpMatrixBase](#).

Definition at line 25 of file ClpPdcoBase.hpp.

3.62.2 Constructor & Destructor Documentation

3.62.2.1 ClpPdcoBase::ClpPdcoBase() [protected]

Default constructor.

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

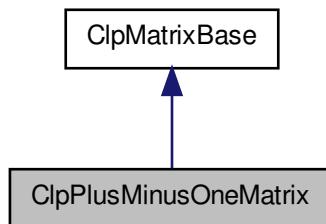
- ClpPdcoBase.hpp

3.63 ClpPlusMinusOneMatrix Class Reference

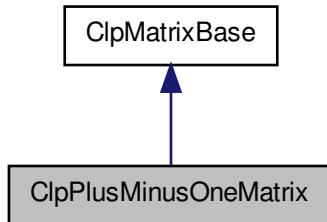
This implements a simple +- one matrix as derived from [ClpMatrixBase](#).

```
#include <ClpPlusMinusOneMatrix.hpp>
```

Inheritance diagram for ClpPlusMinusOneMatrix:



Collaboration diagram for ClpPlusMinusOneMatrix:



Public Member Functions

Useful methods

- virtual `CoinPackedMatrix * getPackedMatrix () const`
Return a complete CoinPackedMatrix.
- virtual `bool isColOrdered () const`
Whether the packed matrix is column major ordered or not.
- virtual `CoinBigIndex getNumElements () const`
Number of entries in the packed matrix.
- virtual `int getNumCols () const`
Number of columns.
- virtual `int getNumRows () const`
Number of rows.
- virtual `const double * getElements () const`
A vector containing the elements in the packed matrix.
- virtual `const int * getIndices () const`
A vector containing the minor indices of the elements in the packed matrix.
- `int * getMutableIndices () const`
- virtual `const CoinBigIndex * getVectorStarts () const`
- virtual `const int * getVectorLengths () const`

The lengths of the major-dimension vectors.

- virtual void `deleteCols` (const int numDel, const int *indDel)
Delete the columns whose indices are listed in indDel.
- virtual void `deleteRows` (const int numDel, const int *indDel)
Delete the rows whose indices are listed in indDel.
- virtual void `appendCols` (int number, const CoinPackedVectorBase *const *columns)
Append Columns.
- virtual void `appendRows` (int number, const CoinPackedVectorBase *const *rows)
Append Rows.
- virtual int `appendMatrix` (int number, int type, const CoinBigIndex *starts, const int *index, const double *element, int numberOther=-1)
Append a set of rows/columns to the end of the matrix.
- virtual `ClpMatrixBase * reverseOrderedCopy` () const
Returns a new matrix in reverse order without gaps.
- virtual CoinBigIndex `countBasis` (const int *whichColumn, int &numberColumnBasic)
Returns number of elements in column part of basis.
- virtual void `fillBasis` (`ClpSimplex` *model, const int *whichColumn, int &numberColumnBasic, int *row, int *start, int *rowCount, int *columnCount, CoinFactorizationDouble *element)
Fills in column part of basis.
- virtual CoinBigIndex * `dubiousWeights` (const `ClpSimplex` *model, int *inputWeights) const
Given positive integer weights for each row fills in sum of weights for each column (and slack).
- virtual void `rangeOfElements` (double &smallestNegative, double &largestNegative, double &smallestPositive, double &largestPositive)
Returns largest and smallest elements of both signs.
- virtual void `unpack` (const `ClpSimplex` *model, CoinIndexedVector *rowArray, int column) const
Unpacks a column into an CoinIndexedvector.
- virtual void `unpackPacked` (`ClpSimplex` *model, CoinIndexedVector *rowArray, int column) const

Unpacks a column into an CoinIndexedvector in packed format. Note that model is NOT const.

- virtual void `add` (const `ClpSimplex` *model, `CoinIndexedVector` *rowArray, int column, double multiplier) const
Adds multiple of a column into an CoinIndexedvector. You can use quickAdd to add to vector.
- virtual void `add` (const `ClpSimplex` *model, double *array, int column, double multiplier) const
Adds multiple of a column into an array.
- virtual void `releasePackedMatrix` () const
Allow any parts of a created CoinMatrix to be deleted.
- virtual void `setDimensions` (int numrows, int numcols)
Set the dimensions of the matrix.
- void `checkValid` (bool detail) const
Just checks matrix valid - will say if dimensions not quite right if detail.

Matrix times vector methods

- virtual void `times` (double scalar, const double *x, double *y) const
*Return y + A * scalar * x in y.*
- virtual void `times` (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale) const
And for scaling.
- virtual void `transposeTimes` (double scalar, const double *x, double *y) const
*Return y + x * scalar * A in y.*
- virtual void `transposeTimes` (double scalar, const double *x, double *y, const double *rowScale, const double *columnScale, double *spare=NULL) const
And for scaling.
- virtual void `transposeTimes` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
*Return x * scalar * A + y in z.*

- virtual void `transposeTimesByRow` (const `ClpSimplex` *model, double scalar, const `CoinIndexedVector` *x, `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
*Return $x * scalar * A + y$ in z.*
- virtual void `subsetTransposeTimes` (const `ClpSimplex` *model, const `CoinIndexedVector` *x, const `CoinIndexedVector` *y, `CoinIndexedVector` *z) const
*Return $x * A$ in z but just for indices in y.*
- virtual bool `canCombine` (const `ClpSimplex` *model, const `CoinIndexedVector` *pi) const
Returns true if can combine transposeTimes and subsetTransposeTimes and if it would be faster.
- virtual void `transposeTimes2` (const `ClpSimplex` *model, const `CoinIndexedVector` *pi1, `CoinIndexedVector` *dj1, const `CoinIndexedVector` *pi2, `CoinIndexedVector` *spare, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor)
Updates two arrays for steepest.
- virtual void `subsetTimes2` (const `ClpSimplex` *model, `CoinIndexedVector` *dj1, const `CoinIndexedVector` *pi2, `CoinIndexedVector` *dj2, double referenceIn, double devex, unsigned int *reference, double *weights, double scaleFactor)
Updates second array for steepest and does devex weights.

Other

- `CoinBigIndex` * `startPositive` () const
Return starts of +Is.
- `CoinBigIndex` * `startNegative` () const
Return starts of -Is.

Constructors, destructor

- `ClpPlusMinusOneMatrix` ()
Default constructor.
- virtual `~ClpPlusMinusOneMatrix` ()
Destructor.

Copy method

- `ClpPlusMinusOneMatrix (const ClpPlusMinusOneMatrix &)`
The copy constructor.
- `ClpPlusMinusOneMatrix (const CoinPackedMatrix &)`
The copy constructor from an CoinPlusMinusOneMatrix.
- `ClpPlusMinusOneMatrix (int numberOfRows, int numberOfColumns, bool columnOrdered, const int *indices, const CoinBigIndex *startPositive, const CoinBigIndex *startNegative)`
Constructor from arrays.
- `ClpPlusMinusOneMatrix (const ClpPlusMinusOneMatrix &wholeModel, int numberOfRows, const int *whichRows, int numberOfColumns, const int *whichColumns)`
Subset constructor (without gaps).
- `ClpPlusMinusOneMatrix & operator= (const ClpPlusMinusOneMatrix &)`
- `virtual ClpMatrixBase * clone () const`
Clone.
- `virtual ClpMatrixBase * subsetClone (int numberOfRows, const int *whichRows, int numberOfColumns, const int *whichColumns) const`
Subset clone (without gaps).
- `void passInCopy (int numberOfRows, int numberOfColumns, bool columnOrdered, int *indices, CoinBigIndex *startPositive, CoinBigIndex *startNegative)`
pass in copy (object takes ownership)
- `virtual bool canDoPartialPricing () const`
Says whether it can do partial pricing.
- `virtual void partialPricing (ClpSimplex *model, double start, double end, int &bestSequence, int &numberWanted)`
Partial pricing.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `CoinPackedMatrix * matrix_`
For fake CoinPackedMatrix.

- int * **lengths_**
- CoinBigIndex * **startPositive_**

Start of +1's for each.
- CoinBigIndex * **startNegative_**

Start of -1's for each.
- int * **indices_**

Data -1, then +1 rows in pairs (row== -1 if one entry).
- int **numberRows_**

Number of rows.
- int **numberColumns_**

Number of columns.
- bool **columnOrdered_**

True if column ordered.

3.63.1 Detailed Description

This implements a simple +- one matrix as derived from [ClpMatrixBase](#).

Definition at line 18 of file ClpPlusMinusOneMatrix.hpp.

3.63.2 Constructor & Destructor Documentation

3.63.2.1 ClpPlusMinusOneMatrix::ClpPlusMinusOneMatrix ()

Default constructor.

3.63.2.2 ClpPlusMinusOneMatrix::ClpPlusMinusOneMatrix (const ClpPlusMinusOneMatrix &)

The copy constructor.

3.63.2.3 ClpPlusMinusOneMatrix::ClpPlusMinusOneMatrix (const CoinPackedMatrix &)

The copy constructor from an CoinPlusMinusOneMatrix.

If not a valid matrix then getIndices will be NULL and startPositive[0] will have number of +1, startPositive[1] will have number of -1, startPositive[2] will have number of others,

**3.63.2.4 ClpPlusMinusOneMatrix::ClpPlusMinusOneMatrix (const
ClpPlusMinusOneMatrix & *wholeModel*, int *numberRows*, const int
* *whichRows*, int *numberColumns*, const int * *whichColumns*)**

Subset constructor (without gaps).

Duplicates are allowed and order is as given

3.63.3 Member Function Documentation

**3.63.3.1 virtual bool ClpPlusMinusOneMatrix::isColOrdered () const
[virtual]**

Whether the packed matrix is column major ordered or not.

Implements [ClpMatrixBase](#).

**3.63.3.2 virtual CoinBigIndex ClpPlusMinusOneMatrix::getNumElements ()
const [virtual]**

Number of entries in the packed matrix.

Implements [ClpMatrixBase](#).

**3.63.3.3 virtual int ClpPlusMinusOneMatrix::getNumCols () const
[inline, virtual]**

Number of columns.

Implements [ClpMatrixBase](#).

Definition at line 30 of file ClpPlusMinusOneMatrix.hpp.

**3.63.3.4 virtual int ClpPlusMinusOneMatrix::getNumRows () const
[inline, virtual]**

Number of rows.

Implements [ClpMatrixBase](#).

Definition at line 34 of file ClpPlusMinusOneMatrix.hpp.

**3.63.3.5 virtual const double* ClpPlusMinusOneMatrix::getElements () const
[virtual]**

A vector containing the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implements [ClpMatrixBase](#).

**3.63.3.6 virtual const int* ClpPlusMinusOneMatrix::getIndices () const
[inline, virtual]**

A vector containing the minor indices of the elements in the packed matrix.

Note that there might be gaps in this list, entries that do not belong to any major-dimension vector. To get the actual elements one should look at this vector together with vectorStarts and vectorLengths.

Implements [ClpMatrixBase](#).

Definition at line 48 of file ClpPlusMinusOneMatrix.hpp.

**3.63.3.7 virtual const int* ClpPlusMinusOneMatrix::getVectorLengths () const
[virtual]**

The lengths of the major-dimension vectors.

Implements [ClpMatrixBase](#).

**3.63.3.8 virtual void ClpPlusMinusOneMatrix::deleteCols (const int numDel,
const int * indDel) [virtual]**

Delete the columns whose indices are listed in `indDel`.

Implements [ClpMatrixBase](#).

**3.63.3.9 virtual void ClpPlusMinusOneMatrix::deleteRows (const int
numDel, const int * indDel) [virtual]**

Delete the rows whose indices are listed in `indDel`.

Implements [ClpMatrixBase](#).

**3.63.3.10 virtual int ClpPlusMinusOneMatrix::appendMatrix (int number,
int type, const CoinBigIndex * starts, const int * index, const
double * element, int numberOther = -1) [virtual]**

Append a set of rows/columns to the end of the matrix.

Returns number of errors i.e. if any of the new rows/columns contain an index that's larger than the number of columns-1/rows-1 (if `numberOther>0`) or duplicates If 0 then rows, 1 if columns

Reimplemented from [ClpMatrixBase](#).

**3.63.3.11 virtual CoinBigIndex* ClpPlusMinusOneMatrix::dubiousWeights (const
ClpSimplex * model, int * inputWeights) const [virtual]**

Given positive integer weights for each row fills in sum of weights for each column (and slack).

Returns weights vector

Reimplemented from [ClpMatrixBase](#).

3.63.3.12 virtual void ClpPlusMinusOneMatrix::rangeOfElements (double & *smallestNegative*, double & *largestNegative*, double & *smallestPositive*, double & *largestPositive*) [virtual]

Returns largest and smallest elements of both signs.

Largest refers to largest absolute value.

Reimplemented from [ClpMatrixBase](#).

3.63.3.13 virtual void ClpPlusMinusOneMatrix::unpackPacked (ClpSimplex * *model*, CoinIndexedVector * *rowArray*, int *column*) const [virtual]

Unpacks a column into an CoinIndexedvector in packed format. Note that model is NOT const.

Bounds and objective could be modified if doing column generation (just for this variable)

Implements [ClpMatrixBase](#).

3.63.3.14 virtual void ClpPlusMinusOneMatrix::setDimensions (int *numrows*, int *numcols*) [virtual]

Set the dimensions of the matrix.

In effect, append new empty columns/rows to the matrix. A negative number for either dimension means that that dimension doesn't change. Otherwise the new dimensions MUST be at least as large as the current ones otherwise an exception is thrown.

Reimplemented from [ClpMatrixBase](#).

3.63.3.15 virtual void ClpPlusMinusOneMatrix::times (double *scalar*, const double * *x*, double * *y*) const [virtual]

Return *y* + *A* * *scalar* **x* in *y*.

Precondition

x must be of size numColumns()

y must be of size numRows ()

Implements [ClpMatrixBase](#).

3.63.3.16 virtual void ClpPlusMinusOneMatrix::transposeTimes (double scalar, const double * x, double * y) const [virtual]

Return $y + x * \text{scalar} * A$ in y.

Precondition

x must be of size numRows ()

y must be of size numColumns ()

Implements [ClpMatrixBase](#).

3.63.3.17 virtual void ClpPlusMinusOneMatrix::transposeTimes (const ClpSimplex * model, double scalar, const CoinIndexedVector * x, CoinIndexedVector * y, CoinIndexedVector * z) const [virtual]

Return $x * \text{scalar} * A + y$ in z.

Can use y as temporary array (will be empty at end) Note - If x packed mode - then z packed mode Squashes small elements and knows about [ClpSimplex](#)

Implements [ClpMatrixBase](#).

3.63.3.18 virtual void ClpPlusMinusOneMatrix::transposeTimesByRow (const ClpSimplex * model, double scalar, const CoinIndexedVector * x, CoinIndexedVector * y, CoinIndexedVector * z) const [virtual]

Return $x * \text{scalar} * A + y$ in z.

Can use y as temporary array (will be empty at end) Note - If x packed mode - then z packed mode Squashes small elements and knows about [ClpSimplex](#). This version uses row copy

```
3.63.3.19 virtual void ClpPlusMinusOneMatrix::subsetTransposeTimes  
( const ClpSimplex * model, const CoinIndexedVector * x,  
const CoinIndexedVector * y, CoinIndexedVector * z ) const  
[virtual]
```

Return $x \cdot A$ in *z* but just for indices in *y*.

Note - *z* always packed mode

Implements [ClpMatrixBase](#).

```
3.63.3.20 virtual ClpMatrixBase* ClpPlusMinusOneMatrix::subsetClone ( int  
numberRows, const int * whichRows, int numberColumns, const int  
* whichColumns ) const [virtual]
```

Subset clone (without gaps).

Duplicates are allowed and order is as given

Reimplemented from [ClpMatrixBase](#).

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

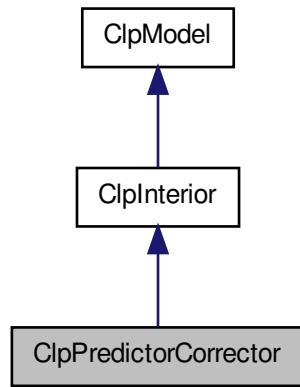
- ClpPlusMinusOneMatrix.hpp

3.64 ClpPredictorCorrector Class Reference

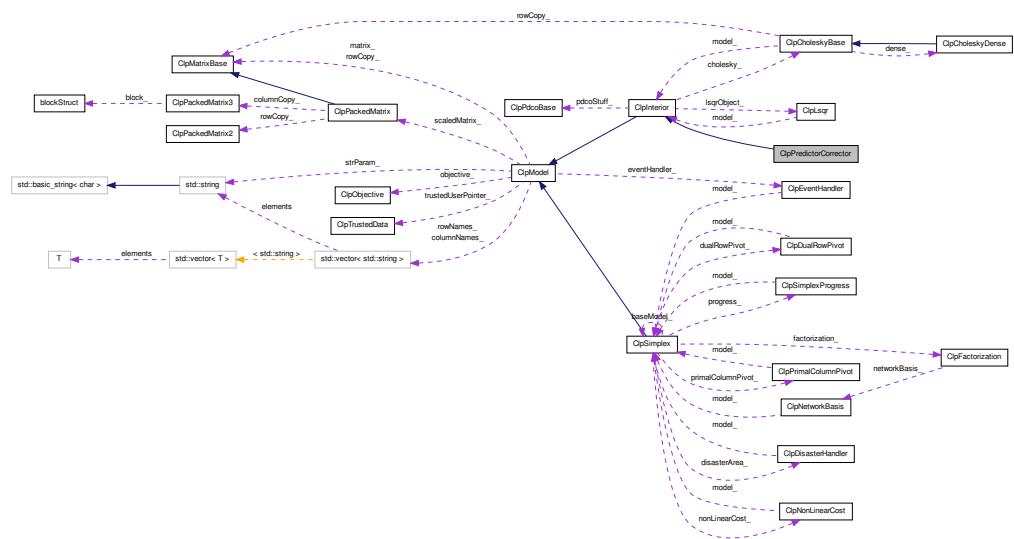
This solves LPs using the predictor-corrector method due to Mehrotra.

```
#include <ClpPredictorCorrector.hpp>
```

Inheritance diagram for ClpPredictorCorrector:



Collaboration diagram for ClpPredictorCorrector:



Public Member Functions

Description of algorithm

- int **solve ()**
Primal Dual Predictor Corrector algorithm.

Functions used in algorithm

- CoinWorkDouble **findStepLength** (int phase)
findStepLength.
- CoinWorkDouble **findDirectionVector** (const int phase)
findDirectionVector.
- int **createSolution ()**
createSolution. Creates solution from scratch (- code if no memory)
- CoinWorkDouble **complementarityGap** (int &numberComplementarityPairs,
int &numberComplementarityItems, const int phase)
complementarityGap. Computes gap
- void **setupForSolve** (const int phase)
setupForSolve.
- void **solveSystem** (CoinWorkDouble *region1, CoinWorkDouble
*region2, const CoinWorkDouble *region1In, const CoinWorkDouble
*region2In, const CoinWorkDouble *saveRegion1, const CoinWorkDouble
*saveRegion2, bool gentleRefine)
Does solve.
- bool **checkGoodMove** (const bool doCorrector, CoinWorkDouble &best-
NextGap, bool allowIncreasingGap)
sees if looks plausible change in complementarity
- bool **checkGoodMove2** (CoinWorkDouble move, CoinWorkDouble &best-
NextGap, bool allowIncreasingGap)
: checks for one step size
- int **updateSolution** (CoinWorkDouble nextGap)
updateSolution. Updates solution at end of iteration
- CoinWorkDouble **affineProduct ()**
*Save info on products of affine deltaT*deltaW and deltaS*deltaZ.*

- void [debugMove](#) (int phase, CoinWorkDouble primalStep, CoinWorkDouble dualStep)

See exactly what would happen given current deltas.

3.64.1 Detailed Description

This solves LPs using the predictor-corrector method due to Mehrotra. It also uses multiple centrality corrections as in Gondzio.

See; S. Mehrotra, "On the implementation of a primal-dual interior point method", SIAM Journal on optimization, 2 (1992) J. Gondzio, "Multiple centrality corrections in a primal-dual method for linear programming", Computational Optimization and Applications",6 (1996)

It is rather basic as Interior point is not my speciality

It inherits from [ClpInterior](#). It has no data of its own and is never created - only cast from a [ClpInterior](#) object at algorithm time.

It can also solve QPs

Definition at line 37 of file ClpPredictorCorrector.hpp.

3.64.2 Member Function Documentation

3.64.2.1 int ClpPredictorCorrector::solve ()

Primal Dual Predictor Corrector algorithm.

Method

Big TODO

3.64.2.2 void ClpPredictorCorrector::solveSystem (CoinWorkDouble * region1, CoinWorkDouble * region2, const CoinWorkDouble * region1In, const CoinWorkDouble * region2In, const CoinWorkDouble * saveRegion1, const CoinWorkDouble * saveRegion2, bool gentleRefine)

Does solve.

region1 is for deltaX (columns+rows), region2 for deltaPi (rows)

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

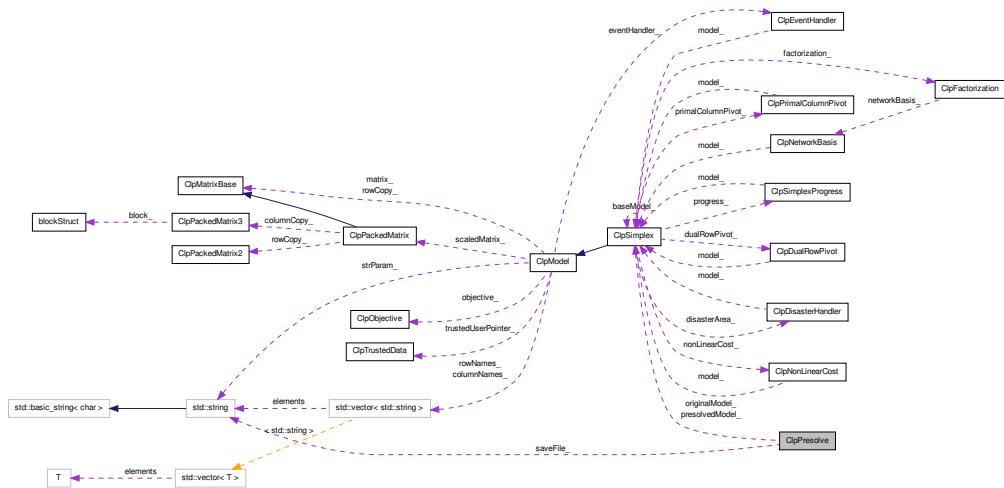
- ClpPredictorCorrector.hpp

3.65 ClpPresolver Class Reference

This is the Clp interface to CoinPresolve.

```
#include <ClpPresolve.hpp>
```

Collaboration diagram for ClpPresolver:



Public Member Functions

Main Constructor, destructor

- **ClpPresolve ()**
Default constructor.
 - virtual ~ClpPresolve ()
Virtual destructor.

presolve - presolves a model, transforming the model

and saving information in the `ClpPresolve` object needed for postsolving.

This underlying (protected) method is virtual; the idea is that in the future, one could override this method to customize how the various presolve techniques are applied.

This version of presolve returns a pointer to a new presolved model. NULL if infeasible or unbounded. This should be paired with postsolve below. The advantage of going back to original model is that it will be exactly as it was i.e. 0.0 will not become 1.0e-19. If keepIntegers is true then bounds may be tightened in original. Bounds will be moved by up to feasibilityTolerance to try and stay feasible. Names will be dropped in presolved model if asked

- **ClpSimplex * presolvedModel (ClpSimplex &si, double feasibilityTolerance=0.0, bool keepIntegers=true, int numberPasses=5, bool dropNames=false, bool doRowObjective=false, const char *prohibitedRows=NULL, const char *prohibitedColumns=NULL)**
- int **presolvedModelToFile (ClpSimplex &si, std::string fileName, double feasibilityTolerance=0.0, bool keepIntegers=true, int numberPasses=5, bool dropNames=false, bool doRowObjective=false)**

This version saves data in a file.

- **ClpSimplex * model () const**

Return pointer to presolved model, Up to user to destroy.

- **ClpSimplex * originalModel () const**

Return pointer to original model.

- void **setOriginalModel (ClpSimplex *model)**

Set pointer to original model.

- const int * **originalColumns () const**

return pointer to original columns

- const int * **originalRows () const**

return pointer to original rows

- void **setNonLinearValue (double value)**

"Magic" number.

- double **nonLinearValue () const**

- bool **doDual () const**

Whether we want to do dual part of presolve.

- void **setDoDual (bool doDual)**

- bool **doSingleton () const**

Whether we want to do singleton part of presolve.

- void **setDoSingleton (bool doSingleton)**

- bool **doDoubleton () const**

Whether we want to do doubleton part of presolve.

- void **setDoDoubleton** (bool doDoubleton)
- bool **doTripleton** () const

Whether we want to do tripleton part of presolve.

- void **setDoTripleton** (bool doTripleton)
- bool **doTighten** () const

Whether we want to do tighten part of presolve.

- void **setDoTighten** (bool doTighten)
- bool **doForcing** () const

Whether we want to do forcing part of presolve.

- void **setDoForcing** (bool doForcing)
- bool **doImpliedFree** () const

Whether we want to do impliedfree part of presolve.

- void **setDoImpliedFree** (bool doImpliedfree)
- bool **doDupcol** () const

Whether we want to do dupcol part of presolve.

- void **setDoDupcol** (bool doDupcol)
- bool **doDuprow** () const

Whether we want to do duprow part of presolve.

- void **setDoDuprow** (bool doDuprow)
- bool **doSingletonColumn** () const

Whether we want to do singleton column part of presolve.

- void **setDoSingletonColumn** (bool doSingleton)
- bool **doGubrow** () const

Whether we want to do gubrow part of presolve.

- void **setDoGubrow** (bool doGubrow)
- bool **doTwoxTwo** () const

Whether we want to do twoxtwo part of presolve.

- void **setDoTwoxTwo** (bool doTwoxTwo)
- int **presolveActions** () const

Set whole group.

- void **setPresolveActions** (int action)
- void **setSubstitution** (int value)

Substitution level.

- void **statistics** ()

Asks for statistics.

- int **presolveStatus** () const
Return presolve status (0,1,2).

postsolve - postsolve the problem. If the problem

has not been solved to optimality, there are no guarantees.

If you are using an algorithm like simplex that has a concept of "basic" rows/cols, then set updateStatus

Note that if you modified the original problem after presolving, then you must "undo" these modifications before calling postsolve. This version updates original

- virtual void **postsolve** (bool updateStatus=true)
- void **destroyPresolve** ()
Gets rid of presolve actions (e.g.when infeasible).

private or protected data

- virtual const CoinPresolveAction * **presolve** (CoinPresolveMatrix *prob)
If you want to apply the individual presolve routines differently, or perhaps add your own to the mix, define a derived class and override this method.
- virtual void **postsolve** (CoinPostsolveMatrix &prob)
Postsolving is pretty generic; just apply the transformations in reverse order.
- virtual **ClpSimplex** * **gutsOfPresolvedModel** (**ClpSimplex** *originalModel, double feasibilityTolerance, bool keepIntegers, int numberPasses, bool dropNames, bool doRowObjective, const char *prohibitedRows=NULL, const char *prohibitedColumns=NULL)
This is main part of Presolve.

3.65.1 Detailed Description

This is the Clp interface to CoinPresolve.

Definition at line 15 of file ClpPresolve.hpp.

3.65.2 Member Function Documentation

3.65.2.1 int ClpPresolve::presolvedModelToFile (ClpSimplex & *si*, std::string *fileName*, double *feasibilityTolerance* = 0.0, bool *keepIntegers* = true, int *numberPasses* = 5, bool *dropNames* = false, bool *doRowObjective* = false)

This version saves data in a file.

The passed in model is updated to be presolved model. Returns non-zero if infeasible

3.65.2.2 void ClpPresolve::setNonLinearValue (double *value*) [inline]

"Magic" number.

If this is non-zero then any elements with this value may change and so presolve is very limited in what can be done to the row and column. This is for non-linear problems.

Definition at line 76 of file ClpPresolve.hpp.

3.65.2.3 virtual void ClpPresolve::postsolve (CoinPostSolveMatrix & *prob*) [protected, virtual]

Postsolving is pretty generic; just apply the transformations in reverse order.

You will probably only be interested in overriding this method if you want to add code to test for consistency while debugging new presolve techniques.

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

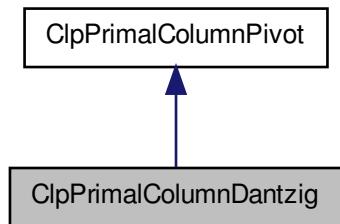
- ClpPresolve.hpp

3.66 ClpPrimalColumnDantzig Class Reference

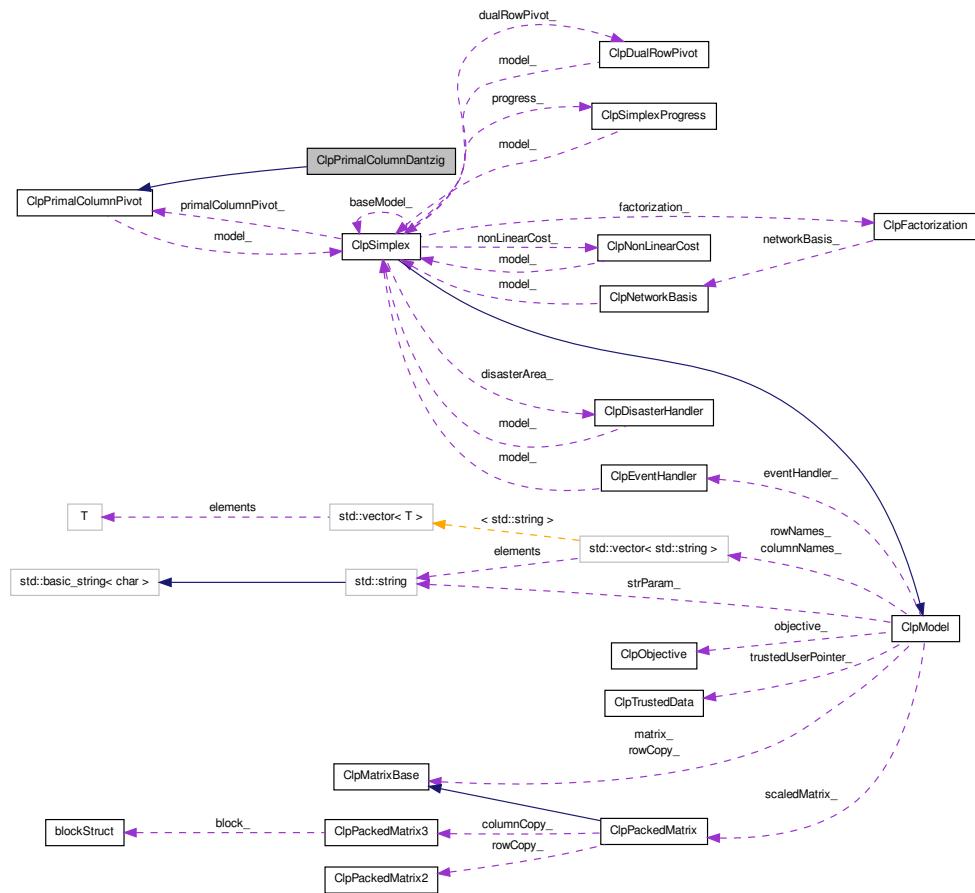
Primal Column Pivot Dantzig Algorithm Class.

```
#include <ClpPrimalColumnDantzig.hpp>
```

Inheritance diagram for ClpPrimalColumnDantzig:



Collaboration diagram for ClpPrimalColumnDantzig:



Public Member Functions

Algorithmic methods

- virtual int **pivotColumn** (CoinIndexedVector *updates, CoinIndexedVector *sparseRow1, CoinIndexedVector *sparseRow2, CoinIndexedVector *sparseColumn1, CoinIndexedVector *sparseColumn2)
Returns pivot column, -1 if none.
- virtual void **saveWeights** (ClpSimplex *model, int)
Just sets model.

Constructors and destructors

- [ClpPrimalColumnDantzig \(\)](#)
Default Constructor.
- [ClpPrimalColumnDantzig \(const ClpPrimalColumnDantzig &\)](#)
Copy constructor.
- [ClpPrimalColumnDantzig & operator= \(const ClpPrimalColumnDantzig &rhs\)](#)
Assignment operator.
- [virtual ~ClpPrimalColumnDantzig \(\)](#)
Destructor.
- [virtual ClpPrimalColumnPivot * clone \(bool copyData=true\) const](#)
Clone.

3.66.1 Detailed Description

Primal Column Pivot Dantzig Algorithm Class. This is simplest choice - choose largest infeasibility

Definition at line 19 of file ClpPrimalColumnDantzig.hpp.

3.66.2 Member Function Documentation

3.66.2.1 virtual int ClpPrimalColumnDantzig::pivotColumn (
 *CoinIndexedVector * updates, CoinIndexedVector * spareRow1,*
 *CoinIndexedVector * spareRow2, CoinIndexedVector * spareColumn1, CoinIndexedVector * spareColumn2) [virtual]*

Returns pivot column, -1 if none.

Lumbers over all columns - slow The Packed CoinIndexedVector updates has cost updates - for normal LP that is just +weight where a feasibility changed. It also has reduced cost from last iteration in pivot row Can just do full price if you really want to be slow

Implements [ClpPrimalColumnPivot](#).

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

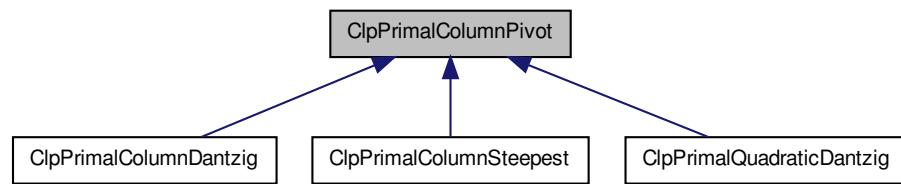
- ClpPrimalColumnDantzig.hpp

3.67 ClpPrimalColumnPivot Class Reference

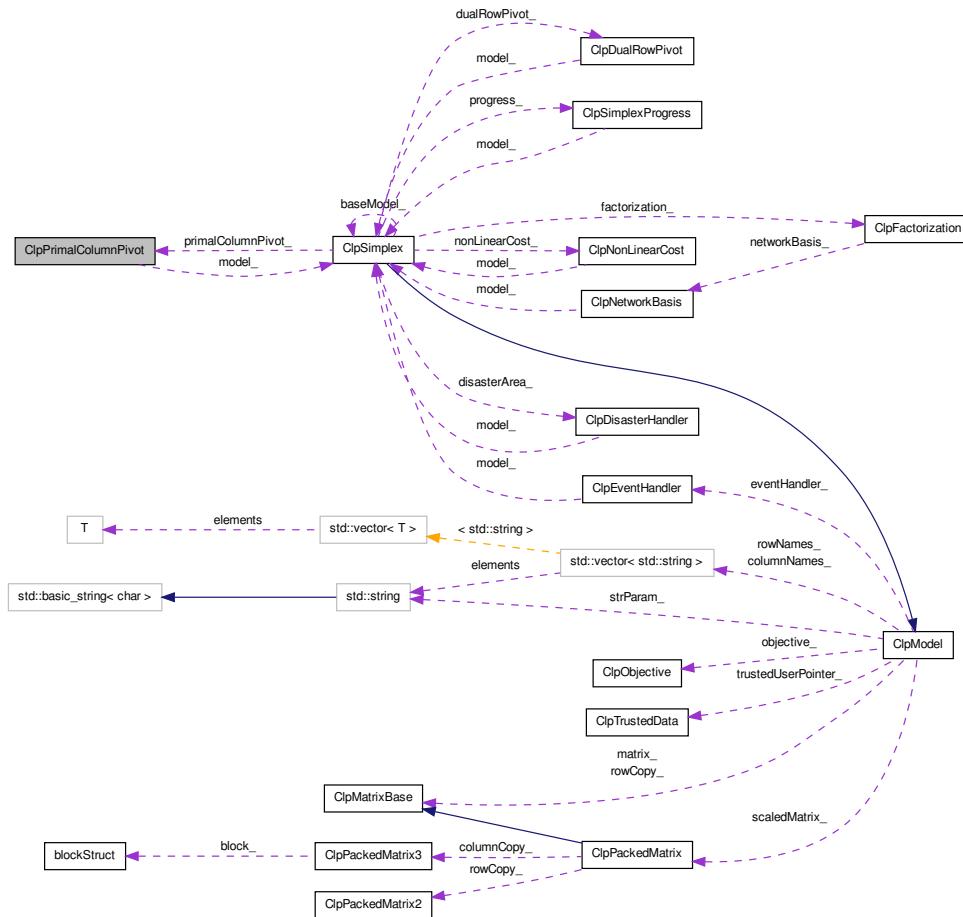
Primal Column Pivot Abstract Base Class.

```
#include <ClpPrimalColumnPivot.hpp>
```

Inheritance diagram for ClpPrimalColumnPivot:



Collaboration diagram for ClpPrimalColumnPivot:



Public Member Functions

Algorithmic methods

- virtual int `pivotColumn` (CoinIndexedVector *updates, CoinIndexedVector *spareRow1, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)=0
Returns pivot column, -1 if none.
- virtual void `updateWeights` (CoinIndexedVector *input)

Updates weights - part 1 (may be empty).

- virtual void `saveWeights (ClpSimplex *model, int mode)=0`
Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.
- virtual int `pivotRow (double &way)`
Signals pivot row choice: -2 (default) - use normal pivot row choice -1 to numRows-1 - use this (will be checked) way should be -1 to go to lower bound, +1 to upper bound.
- virtual void `clearArrays ()`
Gets rid of all arrays (may be empty).
- virtual bool `looksOptimal () const`
Returns true if would not find any column.
- virtual void `setLooksOptimal (bool flag)`
Sets optimality flag (for advanced use).

Constructors and destructors

- `ClpPrimalColumnPivot ()`
Default Constructor.
- `ClpPrimalColumnPivot (const ClpPrimalColumnPivot &)`
Copy constructor.
- `ClpPrimalColumnPivot & operator= (const ClpPrimalColumnPivot &rhs)`
Assignment operator.
- virtual `~ClpPrimalColumnPivot ()`
Destructor.
- virtual `ClpPrimalColumnPivot * clone (bool copyData=true) const =0`
Clone.

Other

- `ClpSimplex * model ()`
Returns model.

- void [setModel \(ClpSimplex *newmodel\)](#)
Sets model.
- int [type \(\)](#)
Returns type (above 63 is extra information).
- virtual int [numberSprintColumns \(int &numberIterations\) const](#)
Returns number of extra columns for sprint algorithm - 0 means off.
- virtual void [switchOffSprint \(\)](#)
Switch off sprint idea.
- virtual void [maximumPivotsChanged \(\)](#)
Called when maximum pivots changes.

Protected Attributes

Protected member data

- [ClpSimplex * model_](#)
Pointer to model.
- int [type_](#)
Type of column pivot algorithm.
- bool [looksOptimal_](#)
Says if looks optimal (normally computed).

3.67.1 Detailed Description

Primal Column Pivot Abstract Base Class. Abstract Base Class for describing an interface to an algorithm to choose column pivot in primal simplex algorithm. For some algorithms e.g. Dantzig choice then some functions may be null. For Dantzig the only one of any importance is pivotColumn.

If you wish to inherit from this look at ClpPrimalColumnDantzig.cpp as that is simplest version.

Definition at line 25 of file ClpPrimalColumnPivot.hpp.

3.67.2 Member Function Documentation

3.67.2.1 virtual int ClpPrimalColumnPivot::pivotColumn (CoinIndexedVector * *updates*, CoinIndexedVector * *spareRow1*, CoinIndexedVector * *spareRow2*, CoinIndexedVector * *spareColumn1*, CoinIndexedVector * *spareColumn2*) [pure virtual]

Returns pivot column, -1 if none.

Normally updates reduced costs using result of last iteration before selecting incoming column.

The Packed CoinIndexedVector updates has cost updates - for normal LP that is just +-weight where a feasibility changed. It also has reduced cost from last iteration in pivot row

Inside pivotColumn the pivotRow_ and reduced cost from last iteration are also used.

So in the simplest case i.e. feasible we compute the row of the tableau corresponding to last pivot and add a multiple of this to current reduced costs.

We can use other arrays to help updates

Implemented in [ClpPrimalColumnDantzig](#), [ClpPrimalColumnSteepest](#), and [ClpPrimalQuadraticDantzig](#).

3.67.2.2 virtual void ClpPrimalColumnPivot::saveWeights (ClpSimplex * *model*, int *mode*) [pure virtual]

Saves any weights round factorization as pivot rows may change Will be empty unless steepest edge (will save model) May also recompute infeasibility stuff 1) before factorization 2) after good factorization (if weights empty may initialize) 3) after something happened but no factorization (e.g.

check for infeasible) 4) as 2 but restore weights from previous snapshot 5) forces some initialization e.g. weights Also sets model

Implemented in [ClpPrimalColumnDantzig](#), [ClpPrimalColumnSteepest](#), and [ClpPrimalQuadraticDantzig](#).

3.67.2.3 virtual int ClpPrimalColumnPivot::numberSprintColumns (int & *numberIterations*) const [virtual]

Returns number of extra columns for sprint algorithm - 0 means off.

Also number of iterations before recompute

Reimplemented in [ClpPrimalColumnSteepest](#).

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

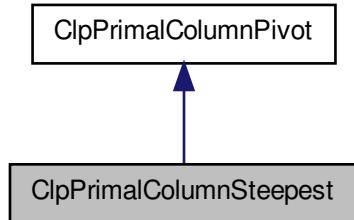
- ClpPrimalColumnPivot.hpp

3.68 ClpPrimalColumnSteepest Class Reference

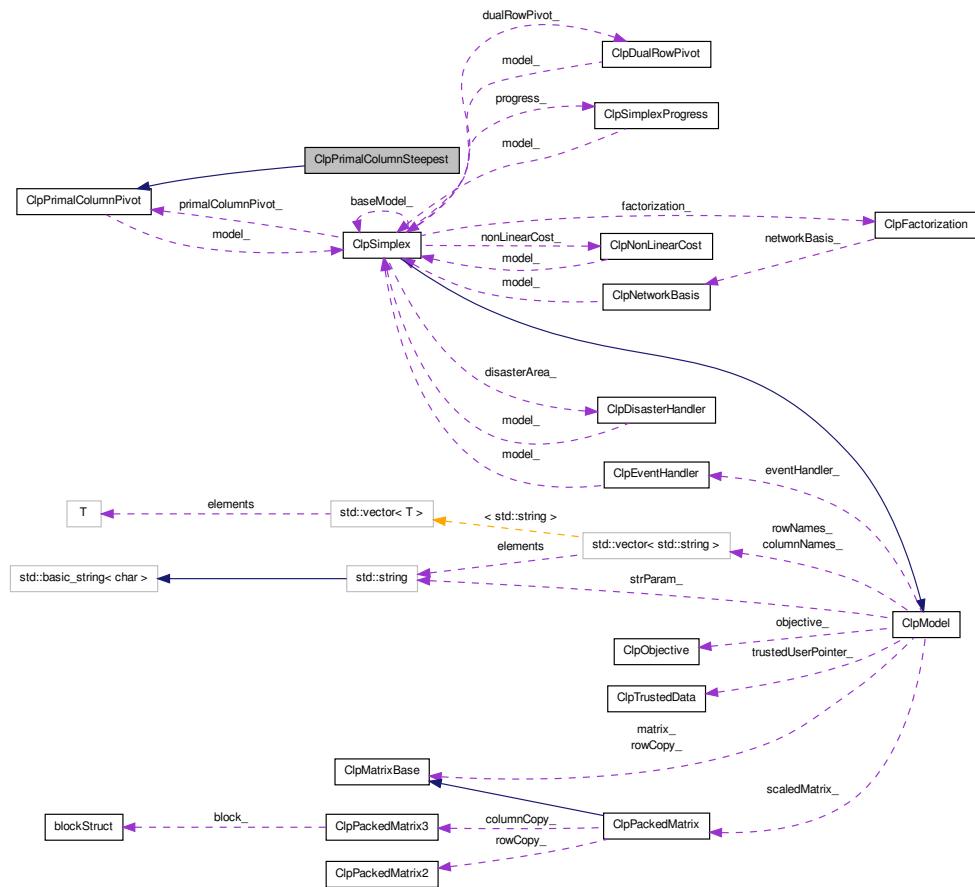
Primal Column Pivot Steepest Edge Algorithm Class.

```
#include <ClpPrimalColumnSteepest.hpp>
```

Inheritance diagram for ClpPrimalColumnSteepest:



Collaboration diagram for ClpPrimalColumnSteepest:



Public Types

- enum Persistence
enums for persistence

Public Member Functions

Algorithmic methods

- virtual int `pivotColumn` (CoinIndexedVector *updates, CoinIndexedVector *spareRow1, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
Returns pivot column, -1 if none.
- int `pivotColumnOldMethod` (CoinIndexedVector *updates, CoinIndexedVector *spareRow1, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
For quadratic or funny nonlinearities.
- void `justDjs` (CoinIndexedVector *updates, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
Just update djs.
- int `partialPricing` (CoinIndexedVector *updates, CoinIndexedVector *spareRow2, int numberWanted, int numberLook)
Update djs doing partial pricing (dantzig).
- void `djsAndDevex` (CoinIndexedVector *updates, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
Update djs, weights for Devex using djs.
- void `djsAndSteepest` (CoinIndexedVector *updates, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
Update djs, weights for Steepest using djs.
- void `djsAndDevex2` (CoinIndexedVector *updates, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
Update djs, weights for Devex using pivot row.
- void `djsAndSteepest2` (CoinIndexedVector *updates, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
Update djs, weights for Steepest using pivot row.
- void `justDevex` (CoinIndexedVector *updates, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
Update weights for Devex.
- void `justSteepest` (CoinIndexedVector *updates, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)

Update weights for Steepest.

- void `transposeTimes2` (const CoinIndexedVector *pi1, CoinIndexedVector *dj1, const CoinIndexedVector *pi2, CoinIndexedVector *dj2, CoinIndexedVector *spare, double scaleFactor)

Updates two arrays for steepest.

- virtual void `updateWeights` (CoinIndexedVector *input)

Updates weights - part 1 - also checks accuracy.

- void `checkAccuracy` (int sequence, double relativeTolerance, CoinIndexedVector *rowArray1, CoinIndexedVector *rowArray2)

Checks accuracy - just for debug.

- void `initializeWeights` ()

Initialize weights.

- virtual void `saveWeights` (ClpSimplex *model, int mode)

Save weights - this may initialize weights as well mode is - 1) before factorization 2) after factorization 3) just redo infeasibilities 4) restore weights 5) at end of values pass (so need initialization).

- virtual void `unrollWeights` ()

Gets rid of last update.

- virtual void `clearArrays` ()

Gets rid of all arrays.

- virtual bool `looksOptimal` () const

Returns true if would not find any column.

- virtual void `maximumPivotsChanged` ()

Called when maximum pivots changes.

gets and sets

- int `mode` () const

Mode.

- virtual int `numberSprintColumns` (int &numberIterations) const

Returns number of extra columns for sprint algorithm - 0 means off.

- virtual void `switchOffSprint` ()

Switch off sprint idea.

Constructors and destructors

- `ClpPrimalColumnSteepest (int mode=3)`
Default Constructor 0 is exact devex, 1 full steepest, 2 is partial exact devex 3 switches between 0 and 2 depending on factorization 4 starts as partial dantzig/devex but then may switch between 0 and 2.
- `ClpPrimalColumnSteepest (const ClpPrimalColumnSteepest &rhs)`
Copy constructor.
- `ClpPrimalColumnSteepest & operator= (const ClpPrimalColumnSteepest &rhs)`
Assignment operator.
- `virtual ~ClpPrimalColumnSteepest ()`
Destructor.
- `virtual ClpPrimalColumnPivot * clone (bool copyData=true) const`
Clone.

Private functions to deal with devex

- `bool reference (int i) const`
reference would be faster using ClpSimplex's status_, but I prefer to keep modularity.
- `void setReference (int i, bool trueFalse)`
- `void setPersistence (Persistence life)`
Set/ get persistence.
- `Persistence persistence () const`

3.68.1 Detailed Description

Primal Column Pivot Steepest Edge Algorithm Class. See Forrest-Goldfarb paper for algorithm

Definition at line 23 of file ClpPrimalColumnSteepest.hpp.

3.68.2 Constructor & Destructor Documentation

3.68.2.1 ClpPrimalColumnSteepest::ClpPrimalColumnSteepest (int mode = 3)

Default Constructor 0 is exact devex, 1 full steepest, 2 is partial exact devex 3 switches between 0 and 2 depending on factorization 4 starts as partial dantzig/devex but then may switch between 0 and 2.

By partial exact devex is meant that the weights are updated as normal but only part of the nonbasic variables are scanned. This can be faster on very easy problems.

3.68.3 Member Function Documentation

3.68.3.1 virtual int ClpPrimalColumnSteepest::pivotColumn (
 *CoinIndexedVector * updates, CoinIndexedVector * spareRow1,*
 *CoinIndexedVector * spareRow2, CoinIndexedVector **
 *spareColumn1, CoinIndexedVector * spareColumn2) [virtual]*

Returns pivot column, -1 if none.

The Packed CoinIndexedVector updates has cost updates - for normal LP that is just +-weight where a feasibility changed. It also has reduced cost from last iteration in pivot row Parts of operation split out into separate functions for profiling and speed

Implements [ClpPrimalColumnPivot](#).

3.68.3.2 virtual int ClpPrimalColumnSteepest::numberSprintColumns (int &
 numberIterations) const [virtual]

Returns number of extra columns for sprint algorithm - 0 means off.

Also number of iterations before recompute

Reimplemented from [ClpPrimalColumnPivot](#).

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

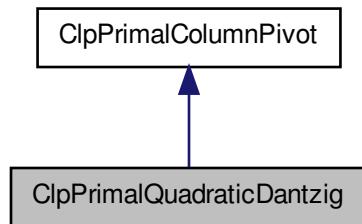
- ClpPrimalColumnSteepest.hpp

3.69 ClpPrimalQuadraticDantzig Class Reference

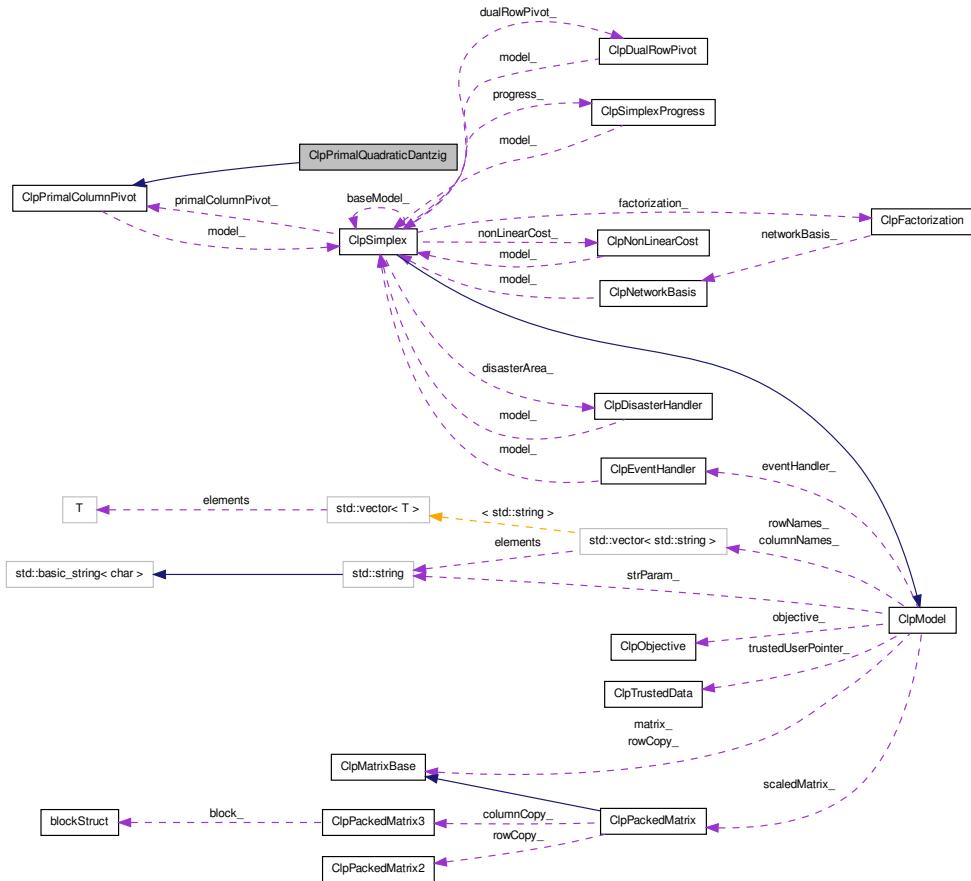
Primal Column Pivot Dantzig Algorithm Class.

```
#include <ClpPrimalQuadraticDantzig.hpp>
```

Inheritance diagram for ClpPrimalQuadraticDantzig:



Collaboration diagram for ClpPrimalQuadraticDantzig:



Public Member Functions

Algorithmic methods

- virtual int `pivotColumn` (CoinIndexedVector *updates, CoinIndexedVector *spareRow1, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
Returns pivot column, -1 if none.
- virtual void `saveWeights` (ClpSimplex *model, int mode)
Just sets model.

Constructors and destructors

- `ClpPrimalQuadraticDantzig ()`
Default Constructor.
- `ClpPrimalQuadraticDantzig (const ClpPrimalQuadraticDantzig &)`
Copy constructor.
- `ClpPrimalQuadraticDantzig (ClpSimplexPrimalQuadratic *model,
ClpQuadraticInfo *info)`
Constructor from model.
- `ClpPrimalQuadraticDantzig & operator= (const ClpPrimalQuadraticDantzig &rhs)`
Assignment operator.
- `virtual ~ClpPrimalQuadraticDantzig ()`
Destructor.
- `virtual ClpPrimalColumnPivot * clone (bool copyData=true) const`
Clone.

3.69.1 Detailed Description

Primal Column Pivot Dantzig Algorithm Class. This is simplest choice - choose largest infeasibility

Definition at line 20 of file ClpPrimalQuadraticDantzig.hpp.

3.69.2 Member Function Documentation

3.69.2.1 `virtual int ClpPrimalQuadraticDantzig::pivotColumn (CoinIndexedVector * updates, CoinIndexedVector * spareRow1, CoinIndexedVector * spareRow2, CoinIndexedVector * spareColumn1, CoinIndexedVector * spareColumn2) [virtual]`

Returns pivot column, -1 if none.

Lumbers over all columns - slow updateArray has cost updates (also use pivotRow_ from last iteration) Can just do full price if you really want to be slow

Implements [ClpPrimalColumnPivot](#).

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

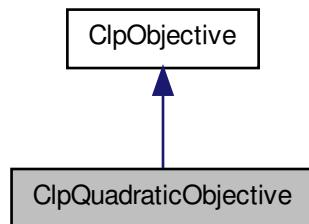
- ClpPrimalQuadraticDantzig.hpp

3.70 ClpQuadraticObjective Class Reference

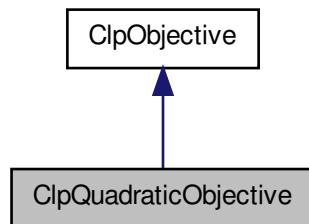
Quadratic Objective Class.

```
#include <ClpQuadraticObjective.hpp>
```

Inheritance diagram for ClpQuadraticObjective:



Collaboration diagram for ClpQuadraticObjective:



Public Member Functions

Stuff

- virtual double * **gradient** (const **ClpSimplex** *model, const double *solution, double &offset, bool refresh, int includeLinear=2)
Returns gradient.
- virtual double **reducedGradient** (**ClpSimplex** *model, double *region, bool useFeasibleCosts)
Resize objective.
- virtual double **stepLength** (**ClpSimplex** *model, const double *solution, const double *change, double maximumTheta, double ¤tObj, double &predictedObj, double &thetaObj)
*Returns step length which gives minimum of objective for solution + theta * change vector up to maximum theta.*
- virtual double **objectiveValue** (const **ClpSimplex** *model, const double *solution) const
*Return objective value (without any **ClpModel** offset) (model may be NULL).*
- virtual void **resize** (int newNumberColumns)
Resize objective.
- virtual void **deleteSome** (int numberToDelete, const int *which)
Delete columns in objective.
- virtual void **reallyScale** (const double *columnScale)
Scale objective.
- virtual int **markNonlinear** (char *which)
Given a zeroed array sets nonlinear columns to 1.

Constructors and destructors

- **ClpQuadraticObjective** ()
Default Constructor.
- **ClpQuadraticObjective** (const double *linearObjective, int numberColumns, const CoinBigIndex *start, const int *column, const double *element, int numberExtendedColumns_=-1)
Constructor from objective.
- **ClpQuadraticObjective** (const **ClpQuadraticObjective** &rhs, int type=0)

Copy constructor.

- `ClpQuadraticObjective (const ClpQuadraticObjective &rhs, int numberColumns, const int *whichColumns)`

Subset constructor.

- `ClpQuadraticObjective & operator= (const ClpQuadraticObjective &rhs)`

Assignment operator.

- `virtual ~ClpQuadraticObjective ()`

Destructor.

- `virtual ClpObjective * clone () const`

Clone.

- `virtual ClpObjective * subsetClone (int numberColumns, const int *whichColumns) const`

Subset clone.

- `void loadQuadraticObjective (const int numberColumns, const CoinBigIndex *start, const int *column, const double *element, int numberExtendedColumns=-1)`

Load up quadratic objective.

- `void loadQuadraticObjective (const CoinPackedMatrix &matrix)`

- `void deleteQuadraticObjective ()`

Get rid of quadratic objective.

Gets and sets

- `CoinPackedMatrix * quadraticObjective () const`

Quadratic objective.

- `double * linearObjective () const`

Linear objective.

- `int numberExtendedColumns () const`

Length of linear objective which could be bigger.

- `int numberColumns () const`

Number of columns in quadratic objective.

- `bool fullMatrix () const`

If a full or half matrix.

3.70.1 Detailed Description

Quadratic Objective Class.

Definition at line 18 of file ClpQuadraticObjective.hpp.

3.70.2 Constructor & Destructor Documentation

3.70.2.1 ClpQuadraticObjective::ClpQuadraticObjective (const ClpQuadraticObjective & rhs, int type = 0)

Copy constructor .

If type is -1 then make sure half symmetric, if +1 then make sure full

3.70.2.2 ClpQuadraticObjective::ClpQuadraticObjective (const ClpQuadraticObjective & rhs, int numberColumns, const int * whichColumns)

Subset constructor.

Duplicates are allowed and order is as given.

3.70.3 Member Function Documentation

3.70.3.1 virtual double* ClpQuadraticObjective::gradient (const ClpSimplex * model, const double * solution, double & offset, bool refresh, int includeLinear = 2) [virtual]

Returns gradient.

If Quadratic then solution may be NULL, also returns an offset (to be added to current one) If refresh is false then uses last solution Uses model for scaling includeLinear 0 - no, 1 as is, 2 as feasible

Implements [ClpObjective](#).

3.70.3.2 virtual double ClpQuadraticObjective::reducedGradient (ClpSimplex * model, double * region, bool useFeasibleCosts) [virtual]

Resize objective.

Returns reduced gradient.Returns an offset (to be added to current one).

Implements [ClpObjective](#).

3.70.3.3 virtual double ClpQuadraticObjective::stepLength (ClpSimplex * *model*, const double * *solution*, const double * *change*, double *maximumTheta*, double & *currentObj*, double & *predictedObj*, double & *thetaObj*) [virtual]

Returns step length which gives minimum of objective for solution + theta * change vector up to maximum theta.

arrays are numberColumns+numberRows Also sets current objective, predicted and at maximumTheta

Implements [ClpObjective](#).

3.70.3.4 virtual int ClpQuadraticObjective::markNonlinear (char * *which*) [virtual]

Given a zeroed array sets nonlinear columns to 1.

Returns number of nonlinear columns

Reimplemented from [ClpObjective](#).

3.70.3.5 virtual ClpObjective* ClpQuadraticObjective::subsetClone (int *numberColumns*, const int * *whichColumns*) const [virtual]

Subset clone.

Duplicates are allowed and order is as given.

Reimplemented from [ClpObjective](#).

3.70.3.6 void ClpQuadraticObjective::loadQuadraticObjective (const int *numberColumns*, const CoinBigIndex * *start*, const int * *column*, const double * *element*, int *numberExtendedColumns* = -1)

Load up quadratic objective.

This is stored as a CoinPackedMatrix

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

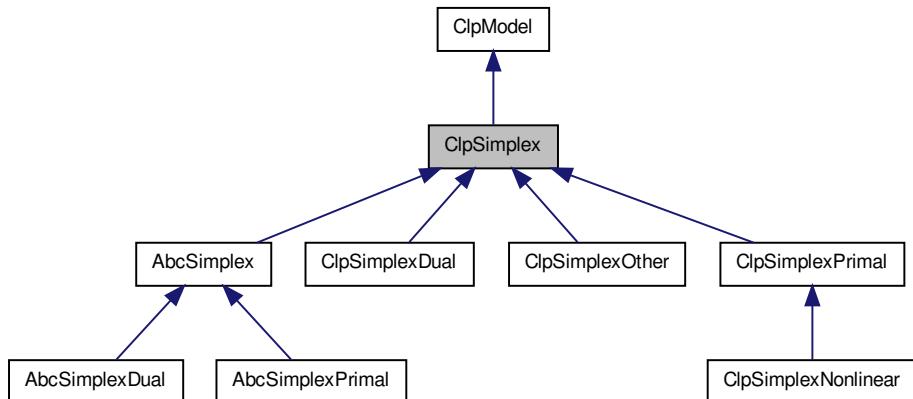
- ClpQuadraticObjective.hpp

3.71 ClpSimplex Class Reference

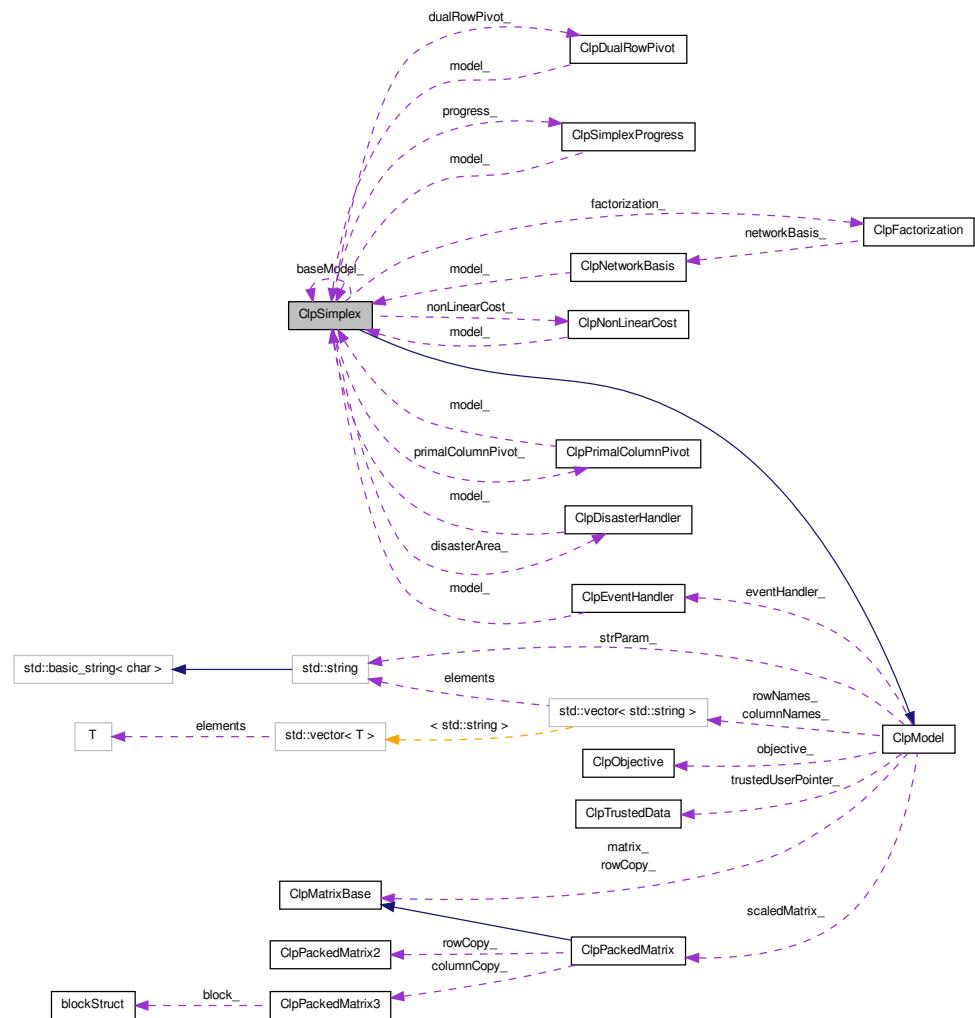
This solves LPs using the simplex method.

```
#include <ClpSimplex.hpp>
```

Inheritance diagram for ClpSimplex:



Collaboration diagram for ClpSimplex:



Public Types

- enum `Status`

enums for status of various sorts.

Public Member Functions

Constructors and destructor and copy

- **ClpSimplex** (bool emptyMessages=false)
Default constructor.
- **ClpSimplex** (const **ClpSimplex** &rhs, int scalingMode=-1)
Copy constructor.
- **ClpSimplex** (const **ClpModel** &rhs, int scalingMode=-1)
Copy constructor from model.
- **ClpSimplex** (const **ClpModel** *wholeModel, int numberOfRows, const int *whichRows, int numberColumns, const int *whichColumns, bool dropNames=true, bool dropIntegers=true, bool fixOthers=false)
Subproblem constructor.
- **ClpSimplex** (const **ClpSimplex** *wholeModel, int numberOfRows, const int *whichRows, int numberColumns, const int *whichColumns, bool dropNames=true, bool dropIntegers=true, bool fixOthers=false)
Subproblem constructor.
- **ClpSimplex** (**ClpSimplex** *wholeModel, int numberColumns, const int *whichColumns)
*This constructor modifies original **ClpSimplex** and stores original stuff in created **ClpSimplex**.*
- void **originalModel** (**ClpSimplex** *miniModel)
This copies back stuff from miniModel and then deletes miniModel.
- int **abcState** () const
- void **setAbcState** (int state)
- void **setPersistenceFlag** (int value)
Array persistence flag If 0 then as now (delete/new) 1 then only do arrays if bigger needed 2 as 1 but give a bit extra if bigger needed.
- void **makeBaseModel** ()
Save a copy of model with certain state - normally without cuts.
- void **deleteBaseModel** ()
Switch off base model.
- **ClpSimplex** * **baseModel** () const
See if we have base model.
- void **setToBaseModel** (**ClpSimplex** *model=NULL)

Reset to base model (just size and arrays needed) If model NULL use internal copy.

- **ClpSimplex & operator= (const ClpSimplex &rhs)**
Assignment operator. This copies the data.
- **~ClpSimplex ()**
Destructor.
- **void loadProblem (const ClpMatrixBase &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)**
Loads a problem (the constraints on the rows are given by lower and upper bounds).
- **void loadProblem (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)**
- **void loadProblem (const int numcols, const int numrows, const CoinBigIndex *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)**
Just like the other `loadProblem()` method except that the matrix is given in a standard column major ordered format (without gaps).
- **void loadProblem (const int numcols, const int numrows, const CoinBigIndex *start, const int *index, const double *value, const int *length, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub, const double *rowObjective=NULL)**
This one is for after presolve to save memory.
- **int loadProblem (CoinModel &modelObject, bool keepSolution=false)**
This loads a model from a coinModel object - returns number of errors.
- **int readMps (const char *filename, bool keepNames=false, bool ignoreErrors=false)**
Read an mps file from the given filename.
- **int readGMPL (const char *filename, const char *dataName, bool keepNames=false)**
Read GMPL files from the given filenames.
- **int readLp (const char *filename, const double epsilon=1e-5)**
Read file in LP format from file with name filename.
- **void borrowModel (ClpModel &otherModel)**
Borrow model.

- void **borrowModel** (ClpSimplex &otherModel)
- void **passInEventHandler** (const ClpEventHandler *eventHandler)

Pass in Event handler (cloned and deleted at end).
- void **getbackSolution** (const ClpSimplex &smallModel, const int *whichRow, const int *whichColumn)

Puts solution back into small model.
- int **loadNonLinear** (void *info, int &numberConstraints, ClpConstraint **&constraints)

Load nonlinear part of problem from AMPL info Returns 0 if linear 1 if quadratic objective 2 if quadratic constraints 3 if nonlinear objective 4 if nonlinear constraints -1 on failure.

Functions most useful to user

- int **initialSolve** (ClpSolve &options)

General solve algorithm which can do presolve.
- int **initialSolve** ()

Default initial solve.
- int **initialDualSolve** ()

Dual initial solve.
- int **initialPrimalSolve** ()

Primal initial solve.
- int **initialBarrierSolve** ()

Barrier initial solve.
- int **initialBarrierNoCrossSolve** ()

Barrier initial solve, not to be followed by crossover.
- int **dual** (int ifValuesPass=0, int startFinishOptions=0)

Dual algorithm - see [ClpSimplexDual.hpp](#) for method.
- int **dualDebug** (int ifValuesPass=0, int startFinishOptions=0)
 • int **primal** (int ifValuesPass=0, int startFinishOptions=0)

Primal algorithm - see [ClpSimplexPrimal.hpp](#) for method.
- int **nonlinearSLP** (int numberPasses, double deltaTolerance)

Solves nonlinear problem using SLP - may be used as crash for other algorithms when number of iterations small.

- int `nonlinearSLP` (int numberConstraints, `ClpConstraint` **constraints, int numberPasses, double deltaTolerance)

Solves problem with nonlinear constraints using SLP - may be used as crash for other algorithms when number of iterations small.
- int `barrier` (bool crossover=true)

Solves using barrier (assumes you have good cholesky factor code).
- int `reducedGradient` (int phase=0)

Solves non-linear using reduced gradient.
- int `solve` (CoinStructuredModel *model)

Solve using structure of model and maybe in parallel.
- int `loadProblem` (CoinStructuredModel &modelObject, bool originalOrder=true, bool keepSolution=false)

This loads a model from a CoinStructuredModel object - returns number of errors.
- int `cleanup` (int cleanupScaling)

When scaling is on it is possible that the scaled problem is feasible but the unscaled is not.
- int `dualRanging` (int numberCheck, const int *which, double *costIncrease, int *sequenceIncrease, double *costDecrease, int *sequenceDecrease, double *valueIncrease=NULL, double *valueDecrease=NULL)

Dual ranging.
- int `primalRanging` (int numberCheck, const int *which, double *valueIncrease, int *sequenceIncrease, double *valueDecrease, int *sequenceDecrease)

Primal ranging.
- int `modifyCoefficientsAndPivot` (int number, const int *which, const CoinBigIndex *start, const int *row, const double *newCoefficient, const unsigned char *newStatus=NULL, const double *newLower=NULL, const double *newUpper=NULL, const double *newObjective=NULL)

Modifies coefficients etc and if necessary pivots in and out.
- int `outDuplicateRows` (int numberLook, int *whichRows, bool noOverlaps=false, double tolerance=-1.0, double cleanUp=0.0)

Take out duplicate rows (includes scaled rows and intersections).
- double `moveTowardsPrimalFeasible` ()

Try simple crash like techniques to get closer to primal feasibility returns final sum of infeasibilities.

- void [removeSuperBasicSlacks](#) (int threshold=0)
Try simple crash like techniques to remove super basic slacks but only if > threshold.
- [ClpSimplex * miniPresolve](#) (char *rowType, char *columnType, void **info)
Mini presolve (faster) Char arrays must be numberOfRows and numberColumns long on entry second part must be filled in as follows - 0 - possible >0 - take out and do something (depending on value - TBD) -1 row/column can't vanish but can have entries removed/changed -2 don't touch at all on exit <=0 ones will be in presolved problem struct will be created and will be long enough (information on length etc in first entry) user must delete struct.
- void [miniPostsolve](#) (const [ClpSimplex](#) *presolvedModel, void *info)
After mini presolve.
- int [writeBasis](#) (const char *filename, bool writeValues=false, int formatType=0) const
Write the basis in MPS format to the specified file.
- int [readBasis](#) (const char *filename)
Read a basis from the given filename, returns -1 on file error, 0 if no values, 1 if values.
- [CoinWarmStartBasis * getBasis](#) () const
Returns a basis (to be deleted by user).
- void [setFactorization](#) ([ClpFactorization](#) &factorization)
Passes in factorization.
- [ClpFactorization * swapFactorization](#) ([ClpFactorization](#) *factorization)
- void [copyFactorization](#) ([ClpFactorization](#) &factorization)
Copies in factorization to existing one.
- int [tightenPrimalBounds](#) (double factor=0.0, int doTight=0, bool tightIntegers=false)
Tightens primal bounds to make dual faster.
- int [crash](#) (double gap, int pivot)
Crash - at present just aimed at dual, returns -2 if dual preferred and crash basis created -1 if dual preferred and all slack basis preferred 0 if basis going in was not all slack 1 if primal preferred and all slack basis preferred 2 if primal preferred and crash basis created.
- void [setDualRowPivotAlgorithm](#) ([ClpDualRowPivot](#) &choice)
Sets row pivot choice algorithm in dual.

- void **setPrimalColumnPivotAlgorithm** (**ClpPrimalColumnPivot** &choice)
Sets column pivot choice algorithm in primal.
- int **strongBranching** (int numberVariables, const int *variables, double *newLower, double *newUpper, double **outputSolution, int *outputStatus, int *outputIterations, bool stopOnFirstInfeasible=true, bool alwaysFinish=false, int startFinishOptions=0)
For strong branching.
- int **fathom** (void *stuff)
Fathom - 1 if solution.
- int **fathomMany** (void *stuff)
*Do up to N deep - returns -1 - no solution nNodes_ valid nodes >= if solution and that node gives solution **ClpNode** array is 2**N long.*
- double **doubleCheck** ()
Double checks OK.
- int **startFastDual2** (**ClpNodeStuff** *stuff)
Starts Fast dual2.
- int **fastDual2** (**ClpNodeStuff** *stuff)
Like Fast dual.
- void **stopFastDual2** (**ClpNodeStuff** *stuff)
Stops Fast dual2.
- **ClpSimplex** * **fastCrunch** (**ClpNodeStuff** *stuff, int mode)
Deals with crunch aspects mode 0 - in 1 - out with solution 2 - out without solution returns small model or NULL.

Needed for functionality of OsiSimplexInterface

- int **pivot** ()
Pivot in a variable and out a variable.
- int **primalPivotResult** ()
Pivot in a variable and choose an outgoing one.
- int **dualPivotResultPart1** ()
Pivot out a variable and choose an incoming one.
- int **pivotResultPart2** (int algorithm, int state)
Do actual pivot state is 0 if need tableau column, 1 if in rowArray_[1].

- int **startup** (int ifValuesPass, int startFinishOptions=0)
Common bits of coding for dual and primal.
- void **finish** (int startFinishOptions=0)
- bool **statusOfProblem** (bool initial=false)
Factorizes and returns true if optimal.
- void **defaultFactorizationFrequency** ()
If user left factorization frequency then compute.
- void **copyEnabledStuff** (const ClpSimplex *rhs)
Copy across enabled stuff from one solver to another.

most useful gets and sets

- bool **primalFeasible** () const
If problem is primal feasible.
- bool **dualFeasible** () const
If problem is dual feasible.
- ClpFactorization * **factorization** () const
factorization
- bool **sparseFactorization** () const
Sparsity on or off.
- void **setSparseFactorization** (bool value)
- int **factorizationFrequency** () const
Factorization frequency.
- void **setFactorizationFrequency** (int value)
- double **dualBound** () const
Dual bound.
- void **setDualBound** (double value)
- double **infeasibilityCost** () const
Infeasibility cost.
- void **setInfeasibilityCost** (double value)
- int **perturbation** () const
Amount of print out: 0 - none 1 - just final 2 - just factorizations 3 - as 2 plus a bit more 4 - verbose above that 8,16,32 etc just for selective debug.

- void **setPerturbation** (int value)
- int **algorithm** () const

Current (or last) algorithm.
- void **setAlgorithm** (int value)

Set algorithm.
- bool **isObjectiveLimitTestValid** () const

Return true if the objective limit test can be relied upon.
- double **sumDualInfeasibilities** () const

Sum of dual infeasibilities.
- void **setSumDualInfeasibilities** (double value)
- double **sumOfRelaxedDualInfeasibilities** () const

Sum of relaxed dual infeasibilities.
- void **setSumOfRelaxedDualInfeasibilities** (double value)
- int **numberDualInfeasibilities** () const

Number of dual infeasibilities.
- void **setNumberDualInfeasibilities** (int value)
- int **numberDualInfeasibilitiesWithoutFree** () const

Number of dual infeasibilities (without free).
- double **sumPrimalInfeasibilities** () const

Sum of primal infeasibilities.
- void **setSumPrimalInfeasibilities** (double value)
- double **sumOfRelaxedPrimalInfeasibilities** () const

Sum of relaxed primal infeasibilities.
- void **setSumOfRelaxedPrimalInfeasibilities** (double value)
- int **numberPrimalInfeasibilities** () const

Number of primal infeasibilities.
- void **setNumberPrimalInfeasibilities** (int value)
- int **saveModel** (const char *fileName)

Save model to file, returns 0 if success.
- int **restoreModel** (const char *fileName)

Restore model from file, returns 0 if success, deletes current model.
- void **checkSolution** (int setToBounds=0)

Just check solution (for external use) - sets sum of infeasibilities etc.

- void **checkSolutionInternal** ()
Just check solution (for internal use) - sets sum of infeasibilities etc.
- void **checkUnscaledSolution** ()
Check unscaled primal solution but allow for rounding error.
- CoinIndexedVector * **rowArray** (int index) const
Useful row length arrays (0,1,2,3,4,5).
- CoinIndexedVector * **columnArray** (int index) const
Useful column length arrays (0,1,2,3,4,5).
- double **alphaAccuracy** () const
Initial value for alpha accuracy calculation (-1.0 off).
- void **setAlphaAccuracy** (double value)
- void **setDisasterHandler** (ClpDisasterHandler *handler)
Objective value.
- ClpDisasterHandler * **disasterHandler** () const
Get disaster handler.
- double **largeValue** () const
Large bound value (for complementarity etc).
- void **setLargeValue** (double value)
- double **largestPrimalError** () const
Largest error on Ax-b.
- double **largestDualError** () const
Largest error on basic duals.
- void **setLargestPrimalError** (double value)
Largest error on Ax-b.
- void **setLargestDualError** (double value)
Largest error on basic duals.
- double **zeroTolerance** () const
Get zero tolerance.
- void **setZeroTolerance** (double value)
Set zero tolerance.
- int * **pivotVariable** () const

Basic variables pivoting on which rows.

- bool **automaticScaling** () const
If automatic scaling on.
- void **setAutomaticScaling** (bool onOff)
- double **currentDualTolerance** () const
Current dual tolerance.
- void **setCurrentDualTolerance** (double value)
- double **currentPrimalTolerance** () const
Current primal tolerance.
- void **setCurrentPrimalTolerance** (double value)
- int **numberRefinements** () const
How many iterative refinements to do.
- void **setNumberRefinements** (int value)
- double **alpha** () const
Alpha (pivot element) for use by classes e.g. steepestedge.
- void **setAlpha** (double value)
- double **dualIn** () const
Reduced cost of last incoming for use by classes e.g. steepestedge.
- void **setDualIn** (double value)
Set reduced cost of last incoming to force error.
- int **pivotRow** () const
Pivot Row for use by classes e.g. steepestedge.
- void **setPivotRow** (int value)
- double **valueIncomingDual** () const
value of incoming variable (in Dual)

public methods

- double * **solutionRegion** (int section) const
Return row or column sections - not as much needed as it once was.
- double * **djRegion** (int section) const
- double * **lowerRegion** (int section) const
- double * **upperRegion** (int section) const
- double * **costRegion** (int section) const
- double * **solutionRegion** () const

Return region as single array.

- double * **djRegion** () const
- double * **lowerRegion** () const
- double * **upperRegion** () const
- double * **costRegion** () const
- Status **getStatus** (int sequence) const
- void **setStatus** (int sequence, Status newstatus)
- bool **startPermanentArrays** ()

Start or reset using maximumRows_ and Columns_ - true if change.

- void **setInitialDenseFactorization** (bool onOff)

Normally the first factorization does sparse coding because the factorization could be singular.

- bool **initialDenseFactorization** () const
- int **sequenceIn** () const

Return sequence In or Out.

- int **sequenceOut** () const
- void **setSequenceIn** (int sequence)

Set sequenceIn or Out.

- void **setSequenceOut** (int sequence)
- int **directionIn** () const

Return direction In or Out.

- int **directionOut** () const
- void **setDirectionIn** (int direction)

Set directionIn or Out.

- void **setDirectionOut** (int direction)
- double **valueOut** () const

Value of Out variable.

- void **setValueOut** (double value)

Set value of out variable.

- double **dualOut** () const

Dual value of Out variable.

- void **setDualOut** (double value)

Set dual value of out variable.

- void **setLowerOut** (double value)

Set lower of out variable.

- void **setUpperOut** (double value)
Set upper of out variable.
- void **setTheta** (double value)
Set theta of out variable.
- int **isColumn** (int sequence) const
Returns 1 if sequence indicates column.
- int **sequenceWithin** (int sequence) const
Returns sequence number within section.
- double **solution** (int sequence)
Return row or column values.
- double & **solutionAddress** (int sequence)
Return address of row or column values.
- double **reducedCost** (int sequence)
- double & **reducedCostAddress** (int sequence)
- double **lower** (int sequence)
- double & **lowerAddress** (int sequence)
Return address of row or column lower bound.
- double **upper** (int sequence)
- double & **upperAddress** (int sequence)
Return address of row or column upper bound.
- double **cost** (int sequence)
- double & **costAddress** (int sequence)
Return address of row or column cost.
- double **originalLower** (int iSequence) const
Return original lower bound.
- double **originalUpper** (int iSequence) const
Return original upper bound.
- double **theta** () const
Theta (pivot change).
- double **bestPossibleImprovement** () const
Best possible improvement using djs (primal) or obj change by flipping bounds to make dual feasible (dual).
- **ClpNonLinearCost** * **nonLinearCost** () const

Return pointer to details of costs.

- int **moreSpecialOptions** () const

*Return more special options 1 bit - if presolve says infeasible in [ClpSolve](#) return 2 bit - if presolved problem infeasible return 4 bit - keep arrays like upper_ around 8 bit - if factorization kept can still declare optimal at once 16 bit - if checking replaceColumn accuracy before updating 32 bit - say optimal if primal feasible! 64 bit - give up easily in dual (and say infeasible) 128 bit - no objective, 0-1 and in B&B 256 bit - in primal from dual or vice versa 512 bit - alternative use of solveType_ 1024 bit - don't do row copy of factorization 2048 bit - perturb in complete fathoming 4096 bit - try more for complete fathoming 8192 bit - don't even think of using primal if user asks for dual (and vv) 16384 bit - in initialSolve so be more flexible debug 32768 bit - do dual in netlibd 65536 (*3) initial stateDualColumn.*

- void **setMoreSpecialOptions** (int value)

Set more special options 1 bit - if presolve says infeasible in [ClpSolve](#) return 2 bit - if presolved problem infeasible return 4 bit - keep arrays like upper_ around 8 bit - no free or superBasic variables 16 bit - if checking replaceColumn accuracy before updating 32 bit - say optimal if primal feasible! 64 bit - give up easily in dual (and say infeasible) 128 bit - no objective, 0-1 and in B&B 256 bit - in primal from dual or vice versa 512 bit - alternative use of solveType_ 1024 bit - don't do row copy of factorization 2048 bit - perturb in complete fathoming 4096 bit - try more for complete fathoming 8192 bit - don't even think of using primal if user asks for dual (and vv) 16384 bit - in initialSolve so be more flexible 32768 bit - don't swap algorithms from dual if small infeasibility 65536 bit - perturb in postsolve cleanup (even if < 10000 rows).

status methods

- void **setFakeBound** (int sequence, [FakeBound](#) fakeBound)
- [FakeBound](#) **getFakeBound** (int sequence) const
- void **setRowStatus** (int sequence, [Status](#) newstatus)
- [Status](#) **getRowStatus** (int sequence) const
- void **setColumnStatus** (int sequence, [Status](#) newstatus)
- [Status](#) **getColumnStatus** (int sequence) const
- void **setPivoted** (int sequence)
- void **clearPivoted** (int sequence)
- bool **pivoted** (int sequence) const
- void **setFlagged** (int sequence)

To flag a variable (not inline to allow for column generation).

- void **clearFlagged** (int sequence)
- bool **flagged** (int sequence) const
- void **setActive** (int iRow)

To say row active in primal pivot row choice.

- void **clearActive** (int iRow)
• bool **active** (int iRow) const
• void **createStatus** ()
Set up status array (can be used by OsiClp).
- void **allSlackBasis** (bool resetSolution=false)
Sets up all slack basis and resets solution to as it was after initial load or readMps.
- int **lastBadIteration** () const
So we know when to be cautious.
- void **setLastBadIteration** (int value)
Set so we know when to be cautious.
- int **progressFlag** () const
Progress flag - at present 0 bit says artificial out.
- ClpSimplexProgress * **progress** ()
For dealing with all issues of cycling etc.
- int **forceFactorization** () const
Force re-factorization early value.
- void **forceFactorization** (int value)
Force re-factorization early.
- double **rawObjectiveValue** () const
Raw objective value (so always minimize in primal).
- void **computeObjectiveValue** (bool useWorkingSolution=false)
Compute objective value from solution and put in objectiveValue_.
- double **computeInternalObjectiveValue** ()
Compute minimization objective value from internal solution without perturbation.
- double * **infeasibilityRay** (bool fullRay=false) const
Infeasibility/unbounded ray (NULL returned if none/wrong) Up to user to use delete [] on these arrays.
- int **numberExtraRows** () const
Number of extra rows.
- int **maximumBasic** () const
Maximum number of basic variables - can be more than number of rows if GUB.
- int **baseIteration** () const

Iteration when we entered dual or primal.

- void [generateCpp](#) (FILE *fp, bool defaultFactor=false)
Create C++ lines to get to current state.
- [ClpFactorization * getEmptyFactorization \(\)](#)
Gets clean and emptyish factorization.
- void [setEmptyFactorization \(\)](#)
May delete or may make clean and emptyish factorization.
- void [moveInfo](#) (const [ClpSimplex](#) &rhs, bool justStatus=false)
Move status and solution across.

Basis handling

- void [getBInvARow](#) (int row, double *z, double *slack=NULL)
Get a row of the tableau (slack part in slack if not NULL).
- void [getBInvRow](#) (int row, double *z)
Get a row of the basis inverse.
- void [getBInvACol](#) (int col, double *vec)
Get a column of the tableau.
- void [getBInvCol](#) (int col, double *vec)
Get a column of the basis inverse.
- void [getBasics](#) (int *index)
Get basic indices (order of indices corresponds to the order of elements in a vector returned by [getBInvACol\(\)](#) and [getBInvCol\(\)](#)).

Changing bounds on variables and constraints

- void [setObjectiveCoefficient](#) (int elementIndex, double elementValue)
Set an objective function coefficient.
- void [setObjCoeff](#) (int elementIndex, double elementValue)
Set an objective function coefficient.
- void [setColumnLower](#) (int elementIndex, double elementValue)
*Set a single column lower bound
Use -DBL_MAX for -infinity.*

- void `setColumnUpper` (int elementIndex, double elementValue)
Set a single column upper bound
Use DBL_MAX for infinity.
- void `setColumnBounds` (int elementIndex, double lower, double upper)
Set a single column lower and upper bound.
- void `setColumnSetBounds` (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of columns simultaneously
The default implementation just invokes `setColLower()` and `setColUpper()` over and over again.
- void `setColLower` (int elementIndex, double elementValue)
Set a single column lower bound
Use -DBL_MAX for -infinity.
- void `setColUpper` (int elementIndex, double elementValue)
Set a single column upper bound
Use DBL_MAX for infinity.
- void `setColBounds` (int elementIndex, double newlower, double newupper)
Set a single column lower and upper bound.
- void `setColSetBounds` (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of columns simultaneously
- void `setRowLower` (int elementIndex, double elementValue)
Set a single row lower bound
Use -DBL_MAX for -infinity.
- void `setRowUpper` (int elementIndex, double elementValue)
Set a single row upper bound
Use DBL_MAX for infinity.
- void `setRowBounds` (int elementIndex, double lower, double upper)
Set a single row lower and upper bound.
- void `setRowSetBounds` (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of rows simultaneously
- void `resize` (int newNumberRows, int newNumberColumns)
Resizes rim part of model.

Protected Member Functions

protected methods

- int [gutsOfSolution](#) (double *givenDuals, const double *givenPrimals, bool valuesPass=false)
May change basis and then returns number changed.
- void [gutsOfDelete](#) (int type)
Does most of deletion (0 = all, 1 = most, 2 most + factorization).
- void [gutsOfCopy](#) (const [ClpSimplex](#) &rhs)
Does most of copying.
- bool [createRim](#) (int what, bool makeRowCopy=false, int startFinishOptions=0)
puts in format I like (rowLower, rowUpper) also see StandardMatrix 1 bit does rows (now and columns), (2 bit does column bounds), 4 bit does objective(s).
- void [createRim1](#) (bool initial)
Does rows and columns.
- void [createRim4](#) (bool initial)
Does objective.
- void [createRim5](#) (bool initial)
Does rows and columns and objective.
- void [deleteRim](#) (int getRidOfFactorizationData=2)
releases above arrays and does solution scaling out.
- bool [sanityCheck](#) ()
Sanity check on input rim data (after scaling) - returns true if okay.

Friends

- void [ClpSimplexUnitTest](#) (const std::string &mpsDir)
A function that tests the methods in the [ClpSimplex](#) class.

data. Many arrays have a row part and a column part.

There is a single array with both - columns then rows and then normally two arrays pointing to rows and columns.

The single array is the owner of memory

- double [bestPossibleImprovement_](#)

Best possible improvement using djs (primal) or obj change by flipping bounds to make dual feasible (dual).

- double [zeroTolerance_](#)

Zero tolerance.

- int [columnPrimalSequence_](#)

Sequence of worst (-1 if feasible).

- int [rowPrimalSequence_](#)

Sequence of worst (-1 if feasible).

- double [bestObjectiveValue_](#)

"Best" objective value

- int [moreSpecialOptions_](#)

More special options - see set for details.

- int [baseIteration_](#)

Iteration when we entered dual or primal.

- double [primalToleranceToGetOptimal_](#)

Primal tolerance needed to make dual feasible (<largeTolerance).

- double [largeValue_](#)

Large bound value (for complementarity etc).

- double [largestPrimalError_](#)

Largest error on Ax-b.

- double [largestDualError_](#)

Largest error on basic duals.

- double [alphaAccuracy_](#)

For computing whether to re-factorize.

- double [dualBound_](#)

Dual bound.

- double [alpha_](#)

Alpha (pivot element).

- double `theta_`
Theta (pivot change).
- double `lowerIn_`
Lower Bound on In variable.
- double `valueIn_`
Value of In variable.
- double `upperIn_`
Upper Bound on In variable.
- double `dualIn_`
Reduced cost of In variable.
- double `lowerOut_`
Lower Bound on Out variable.
- double `valueOut_`
Value of Out variable.
- double `upperOut_`
Upper Bound on Out variable.
- double `dualOut_`
Infeasibility (dual) or ? (primal) of Out variable.
- double `dualTolerance_`
Current dual tolerance for algorithm.
- double `primalTolerance_`
Current primal tolerance for algorithm.
- double `sumDualInfeasibilities_`
Sum of dual infeasibilities.
- double `sumPrimalInfeasibilities_`
Sum of primal infeasibilities.
- double `infeasibilityCost_`
Weight assigned to being infeasible in primal.

- double `sumOfRelaxedDualInfeasibilities_`
Sum of Dual infeasibilities using tolerance based on error in duals.
- double `sumOfRelaxedPrimalInfeasibilities_`
Sum of Primal infeasibilities using tolerance based on error in primals.
- double `acceptablePivot_`
Acceptable pivot value just after factorization.
- double * `lower_`
Working copy of lower bounds (Owner of arrays below).
- double * `rowLowerWork_`
Row lower bounds - working copy.
- double * `columnLowerWork_`
Column lower bounds - working copy.
- double * `upper_`
Working copy of upper bounds (Owner of arrays below).
- double * `rowUpperWork_`
Row upper bounds - working copy.
- double * `columnUpperWork_`
Column upper bounds - working copy.
- double * `cost_`
Working copy of objective (Owner of arrays below).
- double * `rowObjectiveWork_`
Row objective - working copy.
- double * `objectiveWork_`
Column objective - working copy.
- CoinIndexedVector * `rowArray_` [6]
Useful row length arrays.
- CoinIndexedVector * `columnArray_` [6]
Useful column length arrays.

- int **sequenceIn_**
Sequence of In variable.
- int **directionIn_**
Direction of In, 1 going up, -1 going down, 0 not a clude.
- int **sequenceOut_**
Sequence of Out variable.
- int **directionOut_**
Direction of Out, 1 to upper bound, -1 to lower bound, 0 - superbasic.
- int **pivotRow_**
Pivot Row.
- int **lastGoodIteration_**
Last good iteration (immediately after a re-factorization).
- double * **dj_**
Working copy of reduced costs (Owner of arrays below).
- double * **rowReducedCost_**
Reduced costs of slacks not same as duals (or - duals).
- double * **reducedCostWork_**
Possible scaled reduced costs.
- double * **solution_**
Working copy of primal solution (Owner of arrays below).
- double * **rowActivityWork_**
Row activities - working copy.
- double * **columnActivityWork_**
Column activities - working copy.
- int **numberDualInfeasibilities_**
Number of dual infeasibilities.
- int **numberDualInfeasibilitiesWithoutFree_**
Number of dual infeasibilities (without free).

- int **numberPrimalInfeasibilities_**
Number of primal infeasibilities.
- int **numberRefinements_**
How many iterative refinements to do.
- **ClpDualRowPivot * dualRowPivot_**
dual row pivot choice
- **ClpPrimalColumnPivot * primalColumnPivot_**
primal column pivot choice
- int * **pivotVariable_**
Basic variables pivoting on which rows.
- **ClpFactorization * factorization_**
factorization
- double * **savedSolution_**
Saved version of solution.
- int **numberTimesOptimal_**
Number of times code has tentatively thought optimal.
- **ClpDisasterHandler * disasterArea_**
Disaster handler.
- int **changeMade_**
If change has been made (first attempt at stopping looping).
- int **algorithm_**
Algorithm >0 == Primal, <0 == Dual.
- int **forceFactorization_**
Now for some reliability aids This forces re-factorization early.
- int **perturbation_**
Perturbation: -50 to +50 - perturb by this power of ten (-6 sounds good) 100 - auto perturb if takes too long (1.0e-6 largest nonzero) 101 - we are perturbed 102 - don't try perturbing again default is 100.
- unsigned char * **saveStatus_**
Saved status regions.

- `ClpNonLinearCost * nonLinearCost_`
Very wasteful way of dealing with infeasibilities in primal.
- `int lastBadIteration_`
So we know when to be cautious.
- `int lastFlaggedIteration_`
So we know when to open up again.
- `int numberFake_`
Can be used for count of fake bounds (dual) or fake costs (primal).
- `int numberChanged_`
Can be used for count of changed costs (dual) or changed bounds (primal).
- `int progressFlag_`
Progress flag - at present 0 bit says artificials out, 1 free in.
- `int firstFree_`
First free/super-basic variable (-1 if none).
- `int numberExtraRows_`
Number of extra rows.
- `int maximumBasic_`
Maximum number of basic variables - can be more than number of rows if GUB.
- `int dontFactorizePivots_`
If may skip final factorize then allow up to this pivots (default 20).
- `double incomingInfeasibility_`
For advanced use.
- `double allowedInfeasibility_`
- `int automaticScale_`
Automatic scaling of objective and rhs and bounds.
- `int maximumPerturbationSize_`
Maximum perturbation array size (take out when code rewritten).
- `double * perturbationArray_`

Perturbation array (maximumPerturbationSize_).

- [ClpSimplex * baseModel_](#)

A copy of model with certain state - normally without cuts.

- [ClpSimplexProgress progress_](#)

For dealing with all issues of cycling etc.

- int [abcState_](#)

- int [spareIntArray_](#) [4]

Spare int array for passing information [0]! = 0 switches on.

- double [spareDoubleArray_](#) [4]

Spare double array for passing information [0]! = 0 switches on.

- class [OsiClpSolverInterface](#)

Allow OsiClp certain perks.

Functions less likely to be useful to casual user

- int [getSolution](#) (const double *rowActivities, const double *columnActivities)

Given an existing factorization computes and checks primal and dual solutions.

- int [getSolution](#) ()

Given an existing factorization computes and checks primal and dual solutions.

- int [createPiecewiseLinearCosts](#) (const int *starts, const double *lower, const double *gradient)

Constructs a non linear cost from list of non-linearities (columns only) First lower of each column is taken as real lower Last lower is taken as real upper and cost ignored.

- [ClpDualRowPivot * dualRowPivot](#) () const

dual row pivot choice

- [ClpPrimalColumnPivot * primalColumnPivot](#) () const

primal column pivot choice

- bool [goodAccuracy](#) () const

Returns true if model looks OK.

- void [returnModel](#) ([ClpSimplex](#) &otherModel)

Return model - updates any scalars.

- int **internalFactorize** (int solveType)
Factorizes using current basis.
- **ClpDataSave saveData ()**
Save data.
- void **restoreData** (**ClpDataSave** saved)
Restore data.
- void **cleanStatus ()**
Clean up status.
- int **factorize ()**
Factorizes using current basis. For external use.
- void **computeDuals** (double *givenDjs)
Computes duals from scratch.
- void **computePrimals** (const double *rowActivities, const double *columnActivities)
Computes primals from scratch.
- void **add** (double *array, int column, double multiplier) const
Adds multiple of a column into an array.
- void **unpack** (CoinIndexedVector *rowArray) const
Unpacks one column of the matrix into indexed array Uses sequenceIn_ Also applies scaling if needed.
- void **unpack** (CoinIndexedVector *rowArray, int sequence) const
Unpacks one column of the matrix into indexed array Slack if sequence>= numberColumns Also applies scaling if needed.
- void **unpackPacked** (CoinIndexedVector *rowArray)
Unpacks one column of the matrix into indexed array as packed vector Uses sequenceIn_ Also applies scaling if needed.
- void **unpackPacked** (CoinIndexedVector *rowArray, int sequence)
Unpacks one column of the matrix into indexed array as packed vector Slack if sequence>= numberColumns Also applies scaling if needed.

- void [setValuesPassAction](#) (double incomingInfeasibility, double allowedInfeasibility)
For advanced use.
- int [cleanFactorization](#) (int ifValuesPass)
Get a clean factorization - i.e.
- int [housekeeping](#) (double objectiveChange)
This does basis housekeeping and does values for in/out variables.
- void [checkPrimalSolution](#) (const double *rowActivities=NULL, const double *columnActivities=NULL)
This sets largest infeasibility and most infeasible and sum and number of infeasibilities (Primal).
- void [checkDualSolution](#) ()
This sets largest infeasibility and most infeasible and sum and number of infeasibilities (Dual).
- void [checkBothSolutions](#) ()
This sets sum and number of infeasibilities (Dual and Primal).
- double [scaleObjective](#) (double value)
If input negative scales objective so maximum <= -value and returns scale factor used.
- int [solveDW](#) (CoinStructuredModel *model)
Solve using Dantzig-Wolfe decomposition and maybe in parallel.
- int [solveBenders](#) (CoinStructuredModel *model)
Solve using Benders decomposition and maybe in parallel.

3.71.1 Detailed Description

This solves LPs using the simplex method. It inherits from [ClpModel](#) and all its arrays are created at algorithm time. Originally I tried to work with model arrays but for simplicity of coding I changed to single arrays with structural variables then row variables. Some coding is still based on old style and needs cleaning up.

For a description of algorithms:

for dual see [ClpSimplexDual.hpp](#) and at top of ClpSimplexDual.cpp for primal see [ClpSimplexPrimal.hpp](#) and at top of ClpSimplexPrimal.cpp

There is an algorithm data member. + for primal variations and - for dual variations
Definition at line 55 of file ClpSimplex.hpp.

3.71.2 Member Enumeration Documentation

3.71.2.1 enum ClpSimplex::Status

enums for status of various sorts.

First 4 match CoinWarmStartBasis, isFixed means fixed at lower bound and out of basis

Reimplemented in [AbcSimplex](#).

Definition at line 63 of file ClpSimplex.hpp.

3.71.3 Constructor & Destructor Documentation

3.71.3.1 ClpSimplex::ClpSimplex (const ClpSimplex & rhs, int scalingMode = -1)

Copy constructor.

May scale depending on mode -1 leave mode as is 0 -off, 1 equilibrium, 2 geometric, 3, auto, 4 dynamic(later)

3.71.3.2 ClpSimplex::ClpSimplex (const ClpModel & rhs, int scalingMode = -1)

Copy constructor from model.

May scale depending on mode -1 leave mode as is 0 -off, 1 equilibrium, 2 geometric, 3, auto, 4 dynamic(later)

3.71.3.3 ClpSimplex::ClpSimplex (const ClpModel * wholeModel, int numberOfRows, const int * whichRows, int numberColumns, const int * whichColumns, bool dropNames = true, bool dropIntegers = true, bool fixOthers = false)

Subproblem constructor.

A subset of whole model is created from the row and column lists given. The new order is given by list order and duplicates are allowed. Name and integer information can be dropped Can optionally modify rhs to take into account variables NOT in list in this case duplicates are not allowed (also see getbackSolution)

3.71.3.4 ClpSimplex::ClpSimplex (const ClpSimplex * *wholeModel*, int *numberRows*, const int * *whichRows*, int *numberColumns*, const int * *whichColumns*, bool *dropNames* = **true, bool *dropIntegers* = **true**, bool *fixOthers* = **false**)**

Subproblem constructor.

A subset of whole model is created from the row and column lists given. The new order is given by list order and duplicates are allowed. Name and integer information can be dropped Can optionally modify rhs to take into account variables NOT in list in this case duplicates are not allowed (also see getbackSolution)

3.71.3.5 ClpSimplex::ClpSimplex (ClpSimplex * *wholeModel*, int *numberColumns*, const int * *whichColumns*)

This constructor modifies original [ClpSimplex](#) and stores original stuff in created [ClpSimplex](#).

It is only to be used in conjunction with originalModel

3.71.4 Member Function Documentation

3.71.4.1 void ClpSimplex::originalModel (ClpSimplex * *miniModel*)

This copies back stuff from miniModel and then deletes miniModel.

Only to be used with mini constructor

3.71.4.2 void ClpSimplex::loadProblem (const ClpMatrixBase & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*, const double * *rowObjective* = **NULL)**

Loads a problem (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Reimplemented from [ClpModel](#).

3.71.4.3 void ClpSimplex::loadProblem (const int *numcols*, const int *numrows*, const CoinBigIndex * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*, const double * *rowObjective* = **NULL)**

Just like the other [loadProblem\(\)](#) method except that the matrix is given in a standard column major ordered format (without gaps).

Reimplemented from [ClpModel](#).

3.71.4.4 int ClpSimplex::loadProblem (CoinModel & *modelObject*, bool *keepSolution* = **false)**

This loads a model from a coinModel object - returns number of errors.

If *keepSolution* true and size is same as current then keeps current status and solution

Reimplemented from [ClpModel](#).

3.71.4.5 int ClpSimplex::readLp (const char * *filename*, const double *epsilon* = **1e-5)**

Read file in LP format from file with name *filename*.

See class [CoinLpIO](#) for description of this format.

3.71.4.6 void ClpSimplex::borrowModel (ClpModel & *otherModel*)

Borrow model.

This is so we dont have to copy large amounts of data around. It assumes a derived class wants to overwrite an empty model with a real one - while it does an algorithm. This is same as [ClpModel](#) one, but sets scaling on etc.

Reimplemented from [ClpModel](#).

3.71.4.7 int ClpSimplex::initialSolve (ClpSolve & *options*)

General solve algorithm which can do presolve.

See [ClpSolve.hpp](#) for options

3.71.4.8 int ClpSimplex::dual (int *ifValuesPass* = 0, int *startFinishOptions* = 0)

Dual algorithm - see [ClpSimplexDual.hpp](#) for method.

ifValuesPass==2 just does values pass and then stops.

startFinishOptions - bits 1 - do not delete work areas and factorization at end 2 - use old factorization if same number of rows 4 - skip as much initialization of work areas as possible (based on whatsChanged in clpmodel.hpp) ** work in progress maybe other bits later

Reimplemented in [ClpSimplexDual](#).

3.71.4.9 int ClpSimplex::primal (int *ifValuesPass* = 0, int *startFinishOptions* = 0)

Primal algorithm - see [ClpSimplexPrimal.hpp](#) for method.

ifValuesPass==2 just does values pass and then stops.

startFinishOptions - bits 1 - do not delete work areas and factorization at end 2 - use old factorization if same number of rows 4 - skip as much initialization of work areas as possible (based on whatsChanged in clpmodel.hpp) ** work in progress maybe other bits later

Reimplemented in [AbcSimplexPrimal](#), and [ClpSimplexPrimal](#).

3.71.4.10 int ClpSimplex::nonlinearSLP (int *numberPasses*, double *deltaTolerance*)

Solves nonlinear problem using SLP - may be used as crash for other algorithms when number of iterations small.

Also exits if all problematical variables are changing less than deltaTolerance

**3.71.4.11 int ClpSimplex::nonlinearSLP (int *numberConstraints*,
ClpConstraint ** *constraints*, int *numberPasses*, double
deltaTolerance)**

Solves problem with nonlinear constraints using SLP - may be used as crash for other algorithms when number of iterations small.

Also exits if all problematical variables are changing less than deltaTolerance

3.71.4.12 int ClpSimplex::barrier (bool *crossover = true*)

Solves using barrier (assumes you have good cholesky factor code).

Does crossover to simplex if asked

3.71.4.13 int ClpSimplex::reducedGradient (int *phase = 0*)

Solves non-linear using reduced gradient.

Phase = 0 get feasible, =1 use solution

**3.71.4.14 int ClpSimplex::loadProblem (CoinStructuredModel &
modelObject, bool *originalOrder = true*, bool *keepSolution = false*)**

This loads a model from a CoinStructuredModel object - returns number of errors.

If originalOrder then keep to order stored in blocks, otherwise first column/rows correspond to first block - etc. If keepSolution true and size is same as current then keeps current status and solution

3.71.4.15 int ClpSimplex::cleanup (int *cleanupScaling*)

When scaling is on it is possible that the scaled problem is feasible but the unscaled is not.

Clp returns a secondary status code to that effect. This option allows for a cleanup. If you use it I would suggest 1. This only affects actions when scaled optimal 0 - no action 1 - clean up using dual if primal infeasibility 2 - clean up using dual if dual infeasibility 3 - clean up using dual if primal or dual infeasibility 11,12,13 - as 1,2,3 but use primal

return code as dual/primal

3.71.4.16 int ClpSimplex::dualRanging (int *numberCheck*, const int * *which*, double * *costIncrease*, int * *sequenceIncrease*, double * *costDecrease*, int * *sequenceDecrease*, double * *valueIncrease* = *NULL*, double * *valueDecrease* = *NULL*)

Dual ranging.

This computes increase/decrease in cost for each given variable and corresponding sequence numbers which would change basis. Sequence numbers are 0..numberColumns and numberColumns.. for artificials/slacks. For non-basic variables the information is trivial to compute and the change in cost is just minus the reduced cost and the sequence number will be that of the non-basic variables. For basic variables a ratio test is between the reduced costs for non-basic variables and the row of the tableau corresponding to the basic variable. The increase/decrease value is always ≥ 0.0

Up to user to provide correct length arrays where each array is of length numberCheck. which contains list of variables for which information is desired. All other arrays will be filled in by function. If fifth entry in which is variable 7 then fifth entry in output arrays will be information for variable 7.

If valueIncrease/Decrease not NULL (both must be NULL or both non NULL) then these are filled with the value of variable if such a change in cost were made (the existing bounds are ignored)

Returns non-zero if infeasible unbounded etc

Reimplemented in [ClpSimplexOther](#).

**3.71.4.17 int ClpSimplex::primalRanging (int *numberCheck*, const int *
which, double * *valueIncrease*, int * *sequenceIncrease*, double *
valueDecrease, int * *sequenceDecrease*)**

Primal ranging.

This computes increase/decrease in value for each given variable and corresponding sequence numbers which would change basis. Sequence numbers are 0..numberColumns and numberColumns.. for artificials/slacks. This should only be used for non-basic variabl as otherwise information is pretty useless For basic variables the sequence number will be that of the basic variables.

Up to user to provide correct length arrays where each array is of length numberCheck. which contains list of variables for which information is desired. All other arrays will be filled in by function. If fifth entry in which is variable 7 then fifth entry in output arrays will be information for variable 7.

Returns non-zero if infeasible unbounded etc

Reimplemented in [ClpSimplexOther](#).

**3.71.4.18 int ClpSimplex::modifyCoefficientsAndPivot (int *number*, const int
* *which*, const CoinBigIndex * *start*, const int * *row*, const double *
newCoefficient, const unsigned char * *newStatus* = *NULL*, const
double * *newLower* = *NULL*, const double * *newUpper* = *NULL*, const
double * *newObjective* = *NULL*)**

Modifies coefficients etc and if necessary pivots in and out.

All at same status will be done (basis may go singular). User can tell which others have been done (i.e. if status matches). If called from outside will change status and return 0. If called from event handler returns non-zero if user has to take action. indices>=numberColumns are slacks (obviously no coefficients) status array is (char) Status enum

**3.71.4.19 int ClpSimplex::outDuplicateRows (int *numberLook*, int *
whichRows, bool *noOverlaps* = *false*, double *tolerance* = -1.0,
double *cleanUp* = 0.0)**

Take out duplicate rows (includes scaled rows and intersections).

On exit whichRows has rows to delete - return code is number can be deleted or -1 if would be infeasible. If tolerance is -1.0 use primalTolerance for equality rows and

infeasibility If cleanUp not zero then spend more time trying to leave more stable row and make row bounds exact multiple of cleanUp if close enough

3.71.4.20 int ClpSimplex::writeBasis (const char * *filename*, bool *writeValues* = **false, int *formatType* = 0) const**

Write the basis in MPS format to the specified file.

If writeValues true writes values of structurals (and adds VALUES to end of NAME card)

Row and column names may be null. formatType is

- 0 - normal
- 1 - extra accuracy
- 2 - IEEE hex (later)

Returns non-zero on I/O error

Reimplemented in [ClpSimplexOther](#).

3.71.4.21 int ClpSimplex::tightenPrimalBounds (double *factor* = 0.0, int *doTight* = 0, bool *tightIntegers* = **false)**

Tightens primal bounds to make dual faster.

Unless fixed or doTight>10, bounds are slightly looser than they could be. This is to make dual go faster and is probably not needed with a presolve. Returns non-zero if problem infeasible.

Fudge for branch and bound - put bounds on columns of factor * largest value (at continuous) - should improve stability in branch and bound on infeasible branches (0.0 is off)

3.71.4.22 int ClpSimplex::crash (double *gap*, int *pivot*)

Crash - at present just aimed at dual, returns -2 if dual preferred and crash basis created -1 if dual preferred and all slack basis preferred 0 if basis going in was not all slack 1 if primal preferred and all slack basis preferred 2 if primal preferred and crash basis created.

if gap between bounds <="gap" variables can be flipped (If pivot -1 then can be made super basic!)

If "pivot" is -1 No pivoting - always primal 0 No pivoting (so will just be choice of algorithm) 1 Simple pivoting e.g. gub 2 Mini iterations

3.71.4.23 int ClpSimplex::strongBranching (int *numberVariables*, const int * *variables*, double * *newLower*, double * *newUpper*, double ** *outputSolution*, int * *outputStatus*, int * *outputIterations*, bool *stopOnFirstInfeasible* = *true*, bool *alwaysFinish* = *false*, int *startFinishOptions* = 0)

For strong branching.

On input lower and upper are new bounds while on output they are change in objective function values (>1.0e50 infeasible). Return code is 0 if nothing interesting, -1 if infeasible both ways and +1 if infeasible one way (check values to see which one(s)) Solutions are filled in as well - even down, odd up - also status and number of iterations

Reimplemented in [AbcSimplexDual](#), and [ClpSimplexDual](#).

3.71.4.24 int ClpSimplex::fathomMany (void * *stuff*)

Do up to N deep - returns -1 - no solution nNodes_ valid nodes >= if solution and that node gives solution [ClpNode](#) array is 2**N long.

Values for N and array are in stuff (nNodes_ also in stuff)

3.71.4.25 int ClpSimplex::pivot ()

Pivot in a variable and out a variable.

Returns 0 if okay, 1 if inaccuracy forced re-factorization, -1 if would be singular. Also updates primal/dual infeasibilities. Assumes sequenceIn_ and pivotRow_ set and also directionIn and Out.

3.71.4.26 int ClpSimplex::primalPivotResult ()

Pivot in a variable and choose an outgoing one.

Assumes primal feasible - will not go through a bound. Returns step length in theta
Returns ray in ray_ (or NULL if no pivot) Return codes as before but -1 means no acceptable pivot

3.71.4.27 int ClpSimplex::dualPivotResultPart1()

Pivot out a variable and choose an incoing one.

Assumes dual feasible - will not go through a reduced cost. Returns step length in theta
Return codes as before but -1 means no acceptable pivot

3.71.4.28 int ClpSimplex::startup(int *ifValuesPass*, int *startFinishOptions* = 0)

Common bits of coding for dual and primal.

Return 0 if okay, 1 if bad matrix, 2 if very bad factorization

startFinishOptions - bits 1 - do not delete work areas and factorization at end 2 - use old factorization if same number of rows 4 - skip as much initialization of work areas as possible (based on whatsChanged in clpmodel.hpp) ** work in progress maybe other bits later

3.71.4.29 bool ClpSimplex::statusOfProblem(bool *initial* = **false**)

Factorizes and returns true if optimal.

Used by user

3.71.4.30 int ClpSimplex::perturbation() const [inline]

Amount of print out: 0 - none 1 - just final 2 - just factorizations 3 - as 2 plus a bit more 4 - verbose above that 8,16,32 etc just for selective debug.

Perturbation: 50 - switch on perturbation 100 - auto perturb if takes too long (1.0e-6 largest nonzero) 101 - we are perturbed 102 - don't try perturbing again default is 100 others are for playing

Definition at line 617 of file ClpSimplex.hpp.

3.71.4.31 int ClpSimplex::saveModel (const char * *fileName*)

Save model to file, returns 0 if success.

This is designed for use outside algorithms so does not save iterating arrays etc. It does not save any messaging information. Does not save scaling values. It does not know about all types of virtual functions.

3.71.4.32 void ClpSimplex::checkSolution (int *setToBounds* = 0)

Just check solution (for external use) - sets sum of infeasibilities etc.

If *setToBounds* 0 then primal column values not changed and used to compute primal row activity values. If 1 or 2 then status used - so all nonbasic variables set to indicated bound and if any values changed (or ==2) basic values re-computed.

3.71.4.33 void ClpSimplex::checkSolutionInternal ()

Just check solution (for internal use) - sets sum of infeasibilities etc.

3.71.4.34 int ClpSimplex::getSolution (const double * *rowActivities*, const double * *columnActivities*)

Given an existing factorization computes and checks primal and dual solutions.

Uses input arrays for variables at bounds. Returns feasibility states

3.71.4.35 int ClpSimplex::getSolution ()

Given an existing factorization computes and checks primal and dual solutions.

Uses current problem arrays for bounds. Returns feasibility states

Reimplemented in [AbcSimplex](#).

**3.71.4.36 int ClpSimplex::createPiecewiseLinearCosts (const int * *starts*,
const double * *lower*, const double * *gradient*)**

Constructs a non linear cost from list of non-linearities (columns only) First lower of each column is taken as real lower Last lower is taken as real upper and cost ignored.

Returns nonzero if bad data e.g. lowers not monotonic

3.71.4.37 int ClpSimplex::internalFactorize (int *solveType*)

Factorizes using current basis.

solveType - 1 iterating, 0 initial, -1 external If 10 added then in primal values pass Return codes are as from [ClpFactorization](#) unless initial factorization when total number of singularities is returned. Special case is *numberRows_*+1 -> all slack basis.

Reimplemented in [AbcSimplex](#).

3.71.4.38 void ClpSimplex::computeDuals (double * *givenDjs*)

Computes duals from scratch.

If *givenDjs* then allows for nonzero basic djs

**3.71.4.39 int ClpSimplex::housekeeping (double *objectiveChange*)
[protected]**

This does basis housekeeping and does values for in/out variables.

Can also decide to re-factorize

3.71.4.40 double ClpSimplex::scaleObjective (double *value*) [protected]

If input negative scales objective so maximum \leq -value and returns scale factor used.

If positive unscales and also redo dual stuff

**3.71.4.41 void ClpSimplex::setValuesPassAction (double *incomingInfeasibility*,
double *allowedInfeasibility*)**

For advanced use.

When doing iterative solves things can get nasty so on values pass if incoming solution has largest infeasibility < incomingInfeasibility throw out variables from basis until largest infeasibility < allowedInfeasibility or incoming largest infeasibility. If allowedInfeasibility>= incomingInfeasibility this is always possible although you may end up with an all slack basis.

Defaults are 1.0,10.0

Reimplemented in [AbcSimplex](#).

3.71.4.42 int ClpSimplex::cleanFactorization (int *ifValuesPass*)

Get a clean factorization - i.e.

throw out singularities may do more later

Reimplemented in [AbcSimplex](#).

**3.71.4.43 void ClpSimplex::setDisasterHandler (ClpDisasterHandler *
handler) [inline]**

Objective value.

Set disaster handler

Definition at line 855 of file ClpSimplex.hpp.

**3.71.4.44 int ClpSimplex::gutsOfSolution (double * *givenDuals*, const double
* *givenPrimals*, bool *valuesPass* = **false**) [protected]**

May change basis and then returns number changed.

Computation of solutions may be overridden by given pi and solution

Reimplemented in [AbcSimplex](#).

3.71.4.45 bool ClpSimplex::createRim (int *what*, bool *makeRowCopy* = **false, int *startFinishOptions* = 0) [protected]**

puts in format I like (rowLower, rowUpper) also see StandardMatrix 1 bit does rows (now and columns), (2 bit does column bounds), 4 bit does objective(s).

8 bit does solution scaling in 16 bit does rowArray and columnArray indexed vectors and makes row copy if wanted, also sets columnStart_ etc Also creates scaling arrays if needed. It does scaling if needed. 16 also moves solutions etc in to work arrays On 16 returns false if problem "bad" i.e. matrix or bounds bad If startFinishOptions is -1 then called by user in getSolution so do arrays but keep pivotVariable_

3.71.4.46 void ClpSimplex::deleteRim (int *getRidOfFactorizationData* = 2) [protected]

releases above arrays and does solution scaling out.

May also get rid of factorization data - 0 get rid of nothing, 1 get rid of arrays, 2 also factorization

3.71.4.47 double* ClpSimplex::solutionRegion (int *section*) const [inline]

Return row or column sections - not as much needed as it once was.

These just map into single arrays

Reimplemented in [AbcSimplex](#).

Definition at line 993 of file ClpSimplex.hpp.

3.71.4.48 void ClpSimplex::setInitialDenseFactorization (bool *onOff*)

Normally the first factorization does sparse coding because the factorization could be singular.

This allows initial dense factorization when it is known to be safe

Reimplemented in [AbcSimplex](#).

3.71.4.49 void ClpSimplex::createStatus()

Set up status array (can be used by OsiClp).

Also can be used to set up all slack basis

Reimplemented in [AbcSimplex](#).

3.71.4.50 double* ClpSimplex::infeasibilityRay(bool fullRay = **false) const**

Infeasibility/unbounded ray (NULL returned if none/wrong) Up to user to use delete [] on these arrays.

Reimplemented from [ClpModel](#).

3.71.4.51 int ClpSimplex::numberExtraRows() const [inline]

Number of extra rows.

These are ones which will be dynamically created each iteration. This is for GUB but may have other uses.

Definition at line 1312 of file ClpSimplex.hpp.

3.71.4.52 void ClpSimplex::setColumnLower(int elementIndex, double elementValue)

Set a single column lower bound

Use -DBL_MAX for -infinity.

Reimplemented from [ClpModel](#).

Reimplemented in [AbcSimplex](#).

3.71.4.53 void ClpSimplex::setColumnUpper(int elementIndex, double elementValue)

Set a single column upper bound

Use DBL_MAX for infinity.

Reimplemented from [ClpModel](#).

Reimplemented in [AbcSimplex](#).

3.71.4.54 void ClpSimplex::setColumnSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*)

Set the bounds on a number of columns simultaneously

The default implementation just invokes [setColLower\(\)](#) and [setColUpper\(\)](#) over and over again.

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes
boundList the new lower/upper bound pairs for the variables

Reimplemented from [ClpModel](#).

Reimplemented in [AbcSimplex](#).

3.71.4.55 void ClpSimplex::setColLower (int *elementIndex*, double *elementValue*) [inline]

Set a single column lower bound

Use -DBL_MAX for -infinity.

Reimplemented from [ClpModel](#).

Reimplemented in [AbcSimplex](#).

Definition at line 1393 of file ClpSimplex.hpp.

3.71.4.56 void ClpSimplex::setColUpper (int *elementIndex*, double *elementValue*) [inline]

Set a single column upper bound

Use DBL_MAX for infinity.

Reimplemented from [ClpModel](#).

Reimplemented in [AbcSimplex](#).

Definition at line 1398 of file ClpSimplex.hpp.

3.71.4.57 void ClpSimplex::setColSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [inline]

Set the bounds on a number of columns simultaneously

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes

boundList the new lower/upper bound pairs for the variables

Reimplemented from [ClpModel](#).

Reimplemented in [AbcSimplex](#).

Definition at line 1414 of file ClpSimplex.hpp.

3.71.4.58 void ClpSimplex::setRowLower (int *elementIndex*, double *elementValue*)

Set a single row lower bound

Use -DBL_MAX for -infinity.

Reimplemented from [ClpModel](#).

Reimplemented in [AbcSimplex](#).

3.71.4.59 void ClpSimplex::setRowUpper (int *elementIndex*, double *elementValue*)

Set a single row upper bound

Use DBL_MAX for infinity.

Reimplemented from [ClpModel](#).

Reimplemented in [AbcSimplex](#).

3.71.4.60 void ClpSimplex::setRowSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*)

Set the bounds on a number of rows simultaneously

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the constraints whose *either* bound changes
boundList the new lower/upper bound pairs for the constraints

Reimplemented from [ClpModel](#).

Reimplemented in [AbcSimplex](#).

3.71.5 Friends And Related Function Documentation

3.71.5.1 void ClpSimplexUnitTest (const std::string & *mpsDir*) [friend]

A function that tests the methods in the [ClpSimplex](#) class.

The only reason for it not to be a member method is that this way it doesn't have to be compiled into the library. And that's a gain, because the library should be compiled with optimization on, but this method should be compiled with debugging.

It also does some testing of [ClpFactorization](#) class

3.71.6 Member Data Documentation

3.71.6.1 ClpNonLinearCost* ClpSimplex::nonLinearCost_ [protected]

Very wasteful way of dealing with infeasibilities in primal.

However it will allow non-linearities and use of dual analysis. If it doesn't work it can easily be replaced.

Definition at line 1607 of file ClpSimplex.hpp.

3.71.6.2 int ClpSimplex::numberExtraRows_ [protected]

Number of extra rows.

These are ones which will be dynamically created each iteration. This is for GUB but may have other uses.

Definition at line 1623 of file ClpSimplex.hpp.

3.71.6.3 double ClpSimplex::incomingInfeasibility_ [protected]

For advanced use.

When doing iterative solves things can get nasty so on values pass if incoming solution has largest infeasibility < incomingInfeasibility throw out variables from basis until largest infeasibility < allowedInfeasibility. if allowedInfeasibility \geq incomingInfeasibility this is always possible although you may end up with an all slack basis.

Defaults are 1.0,10.0

Definition at line 1638 of file ClpSimplex.hpp.

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

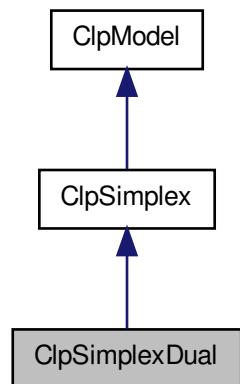
- ClpSimplex.hpp

3.72 ClpSimplexDual Class Reference

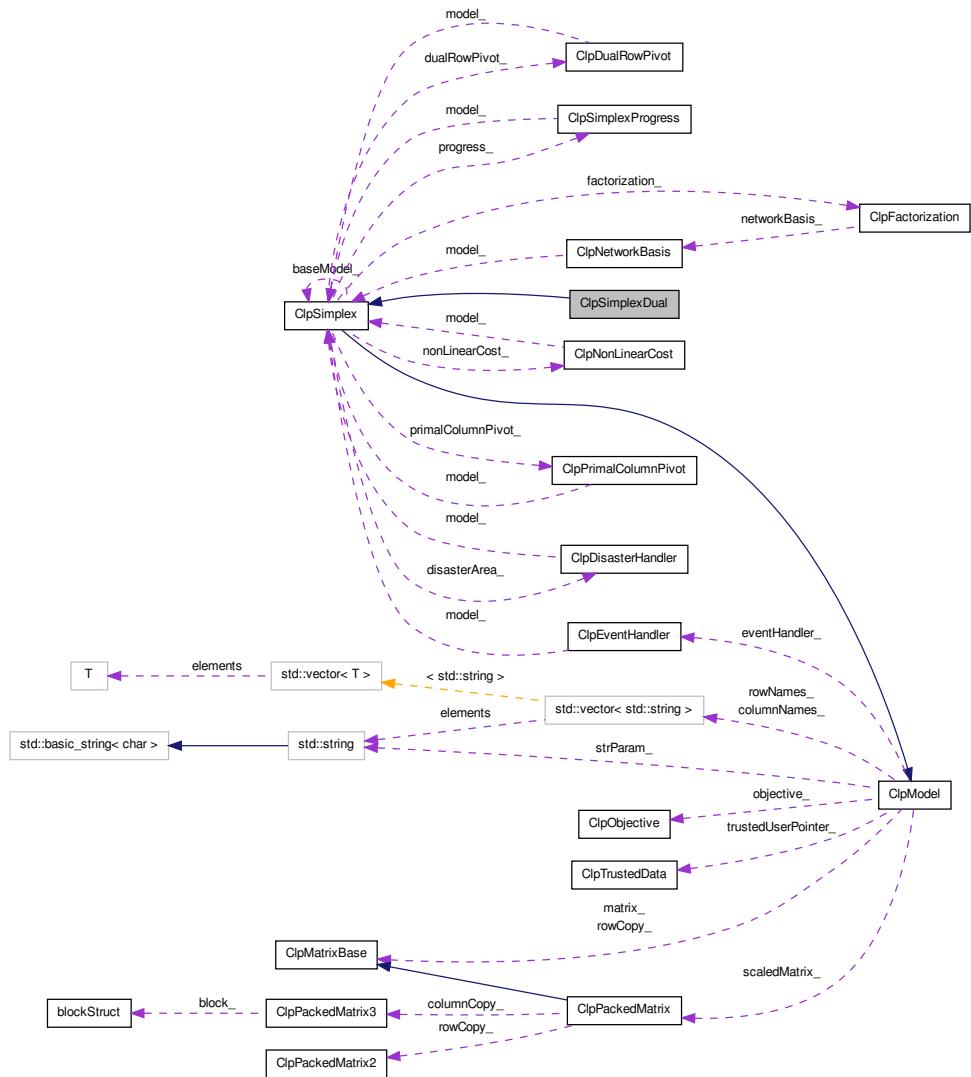
This solves LPs using the dual simplex method.

```
#include <ClpSimplexDual.hpp>
```

Inheritance diagram for ClpSimplexDual:



Collaboration diagram for ClpSimplexDual:



Public Member Functions

Description of algorithm

- int `dual` (int ifValuesPass, int startFinishOptions=0)

Dual algorithm.

- int `strongBranching` (int numberVariables, const int *variables, double *newLower, double *newUpper, double **outputSolution, int *outputStatus, int *outputIterations, bool stopOnFirstInfeasible=true, bool alwaysFinish=false, int startFinishOptions=0)

For strong branching.

- `ClpFactorization * setupForStrongBranching` (char *arrays, int numberOfRows, int numberOfColumns, bool solveLp=false)

This does first part of StrongBranching.

- void `cleanupAfterStrongBranching` (`ClpFactorization *factorization`)

This cleans up after strong branching.

Functions used in dual

- int `whileIterating` (double *&givenPi, int ifValuesPass)

This has the flow between re-factorizations Broken out for clarity and will be used by strong branching.

- int `updateDualsInDual` (CoinIndexedVector *rowArray, CoinIndexedVector *columnArray, CoinIndexedVector *outputArray, double theta, double &objectiveChange, bool fullRecompute)

The duals are updated by the given arrays.

- void `updateDualsInValuesPass` (CoinIndexedVector *rowArray, CoinIndexedVector *columnArray, double theta)

The duals are updated by the given arrays.

- void `flipBounds` (CoinIndexedVector *rowArray, CoinIndexedVector *columnArray)

While updateDualsInDual sees what effect is of flip this does actual flipping.

- double `dualColumn` (CoinIndexedVector *rowArray, CoinIndexedVector *columnArray, CoinIndexedVector *spareArray, CoinIndexedVector *spareArray2, double acceptablePivot, CoinBigIndex *dubiousWeights)

Row array has row part of pivot row Column array has column part.

- int `dualColumn0` (const CoinIndexedVector *rowArray, const CoinIndexedVector *columnArray, CoinIndexedVector *spareArray, double acceptablePivot, double &upperReturn, double &bestReturn, double &badFree)

Does first bit of dualColumn.

- void `checkPossibleValuesMove` (CoinIndexedVector *rowArray, CoinIndexedVector *columnArray, double acceptablePivot)

Row array has row part of pivot row Column array has column part.

- void [checkPossibleCleanup](#) (CoinIndexedVector *rowArray, CoinIndexedVector *columnArray, double acceptablePivot)

Row array has row part of pivot row Column array has column part.

- void [doEasyOnesInValuesPass](#) (double *givenReducedCosts)

This sees if we can move duals in dual values pass.

- void [dualRow](#) (int alreadyChosen)

Chooses dual pivot row Would be faster with separate region to scan and will have this (with square of infeasibility) when steepest For easy problems we can just choose one of the first rows we look at.

- int [changeBounds](#) (int initialize, CoinIndexedVector *outputArray, double &changeCost)

Checks if any fake bounds active - if so returns number and modifies updatedDualBound_ and everything.

- bool [changeBound](#) (int iSequence)

As changeBounds but just changes new bounds for a single variable.

- void [originalBound](#) (int iSequence)

Restores bound to original bound.

- int [checkUnbounded](#) (CoinIndexedVector *ray, CoinIndexedVector *spare, double changeCost)

Checks if tentative optimal actually means unbounded in dual Returns -3 if not, 2 if is unbounded.

- void [statusOfProblemInDual](#) (int &lastCleaned, int type, double *givenDjs, [ClpDataSave](#) &saveData, int ifValuesPass)

Refactorizes if necessary Checks if finished.

- int [perturb](#) ()

Perturbs problem (method depends on [perturbation\(\)](#)) returns nonzero if should go to dual.

- int [fastDual](#) (bool alwaysFinish=false)

Fast iterations.

- int [numberAtFakeBound](#) ()

Checks number of variables at fake bounds.

- int [pivotResultPart1](#) ()

Pivot in a variable and choose an outgoing one.

- int **nextSuperBasic** ()

Get next free , -1 if none.
- int **startupSolve** (int ifValuesPass, double *saveDuals, int startFinishOptions)

Startup part of dual (may be extended to other algorithms) returns 0 if good, 1 if bad.
- void **finishSolve** (int startFinishOptions)
- void **gutsOfDual** (int ifValuesPass, double *&saveDuals, int initialStatus, **ClpDataSave** &saveData)
- void **resetFakeBounds** (int type)

3.72.1 Detailed Description

This solves LPs using the dual simplex method. It inherits from [ClpSimplex](#). It has no data of its own and is never created - only cast from a [ClpSimplex](#) object at algorithm time.

Definition at line 23 of file ClpSimplexDual.hpp.

3.72.2 Member Function Documentation

3.72.2.1 int ClpSimplexDual::dual (int *ifValuesPass*, int *startFinishOptions* = 0)

Dual algorithm.

Method

It tries to be a single phase approach with a weight of 1.0 being given to getting optimal and a weight of updatedDualBound_ being given to getting dual feasible. In this version I have used the idea that this weight can be thought of as a fake bound. If the distance between the lower and upper bounds on a variable is less than the feasibility weight then we are always better off flipping to other bound to make dual feasible. If the distance is greater then we make up a fake bound updatedDualBound_ away from one bound. If we end up optimal or primal infeasible, we check to see if bounds okay. If so we have finished, if not we increase updatedDualBound_ and continue (after checking if unbounded). I am undecided about free variables - there is coding but I am not sure about it. At present I put them in basis anyway.

The code is designed to take advantage of sparsity so arrays are seldom zeroed out from scratch or gone over in their entirety. The only exception is a full scan to find outgoing variable for Dantzig row choice. For steepest edge we keep an updated list of infeasibilities (actually squares). On easy problems we don't need full scan - just pick first reasonable.

One problem is how to tackle degeneracy and accuracy. At present I am using the modification of costs which I put in OSL and some of what I think is the dual analog of Gill et al. I am still not sure of the exact details.

The flow of dual is three while loops as follows:

```
while (not finished) {
    while (not clean solution) {
```

Factorize and/or clean up solution by flipping variables so dual feasible. If looks finished check fake dual bounds. Repeat until status is iterating (-1) or finished (0,1,2)

```
}
```

```
while (status===-1) {
```

Iterate until no pivot in or out or time to re-factorize.

Flow is:

choose pivot row (outgoing variable). if none then we are primal feasible so looks as if done but we need to break and check bounds etc.

Get pivot row in tableau

Choose incoming column. If we don't find one then we look primal infeasible so break and check bounds etc. (Also the pivot tolerance is larger after any iterations so that may be reason)

If we do find incoming column, we may have to adjust costs to keep going forwards (anti-degeneracy). Check pivot will be stable and if unstable throw away iteration and break to re-factorize. If minor error re-factorize after iteration.

Update everything (this may involve flipping variables to stay dual feasible.

```
}
```

```
}
```

TODO's (or maybe not)

At present we never check we are going forwards. I overdid that in OSL so will try and make a last resort.

Needs partial scan pivot out option.

May need other anti-degeneracy measures, especially if we try and use loose tolerances as a way to solve in fewer iterations.

I like idea of dynamic scaling. This gives opportunity to decouple different implications of scaling for accuracy, iteration count and feasibility tolerance.

for use of exotic parameter startFinishoptions see Clpsimplex.hpp

Reimplemented from [ClpSimplex](#).

```
3.72.2.2 int ClpSimplexDual::strongBranching ( int numberVariables, const
int * variables, double * newLower, double * newUpper, double
** outputSolution, int * outputStatus, int * outputIterations, bool
stopOnFirstInfeasible = true, bool alwaysFinish = false, int
startFinishOptions = 0 )
```

For strong branching.

On input lower and upper are new bounds while on output they are change in objective function values ($> 1.0e50$ infeasible). Return code is 0 if nothing interesting, -1 if infeasible both ways and +1 if infeasible one way (check values to see which one(s)) Solutions are filled in as well - even down, odd up - also status and number of iterations

Reimplemented from [ClpSimplex](#).

```
3.72.2.3 int ClpSimplexDual::whileIterating ( double *& givenPi, int
ifValuesPass )
```

This has the flow between re-factorizations Broken out for clarity and will be used by strong branching.

Reasons to come out: -1 iterations etc -2 inaccuracy -3 slight inaccuracy (and done iterations) +0 looks optimal (might be unbounded - but we will investigate) +1 looks infeasible +3 max iterations

If givenPi not NULL then in values pass

```
3.72.2.4 int ClpSimplexDual::updateDualsInDual ( CoinIndexedVector *
rowArray, CoinIndexedVector * columnArray, CoinIndexedVector
* outputArray, double theta, double & objectiveChange, bool
fullRecompute )
```

The duals are updated by the given arrays.

Returns number of infeasibilities. After rowArray and columnArray will just have those which have been flipped. Variables may be flipped between bounds to stay dual feasible. The output vector has movement of primal solution (row length array)

```
3.72.2.5 void ClpSimplexDual::updateDualsInValuesPass ( CoinIndexedVector
* rowArray, CoinIndexedVector * columnArray, double theta )
```

The duals are updated by the given arrays.

This is in values pass - so no changes to primal is made

```
3.72.2.6 double ClpSimplexDual::dualColumn ( CoinIndexedVector *
    rowArray, CoinIndexedVector * columnArray, CoinIndexedVector
    * spareArray, CoinIndexedVector * spareArray2, double
    acceptablePivot, CoinBigIndex * dubiousWeights )
```

Row array has row part of pivot row Column array has column part.

This chooses pivot column. Spare arrays are used to save pivots which will go infeasible We will check for basic so spare array will never overflow. If necessary will modify costs For speed, we may need to go to a bucket approach when many variables are being flipped. Returns best possible pivot value

```
3.72.2.7 void ClpSimplexDual::checkPossibleValuesMove ( CoinIndexedVector
    * rowArray, CoinIndexedVector * columnArray, double
    acceptablePivot )
```

Row array has row part of pivot row Column array has column part.

This sees what is best thing to do in dual values pass if sequenceIn==sequenceOut can change dual on chosen row and leave variable in basis

```
3.72.2.8 void ClpSimplexDual::checkPossibleCleanup ( CoinIndexedVector *
    rowArray, CoinIndexedVector * columnArray, double acceptablePivot
    )
```

Row array has row part of pivot row Column array has column part.

This sees what is best thing to do in branch and bound cleanup If sequenceIn_ < 0 then can't do anything

```
3.72.2.9 void ClpSimplexDual::doEasyOnesInValuesPass ( double *
    givenReducedCosts )
```

This sees if we can move duals in dual values pass.

This is done before any pivoting

3.72.2.10 void ClpSimplexDual::dualRow (int *alreadyChosen*)

Chooses dual pivot row Would be faster with separate region to scan and will have this (with square of infeasibility) when steepest For easy problems we can just choose one of the first rows we look at.

If alreadyChosen ≥ 0 then in values pass and that row has been selected

**3.72.2.11 int ClpSimplexDual::changeBounds (int *initialize*,
 CoinIndexedVector * *outputArray*, double & *changeCost*)**

Checks if any fake bounds active - if so returns number and modifies updatedDualBound_ and everything.

Free variables will be left as free Returns number of bounds changed if ≥ 0 Returns -1 if not initialize and no effect Fills in changeVector which can be used to see if unbounded and cost of change vector If 2 sets to original (just changed)

3.72.2.12 bool ClpSimplexDual::changeBound (int *iSequence*)

As changeBounds but just changes new bounds for a single variable.

Returns true if change

**3.72.2.13 void ClpSimplexDual::statusOfProblemInDual (int & *lastCleaned*,
 int *type*, double * *givenDjs*, ClpDataSave & *saveData*, int
 ifValuesPass)**

Refactorizes if necessary Checks if finished.

Updates status. lastCleaned refers to iteration at which some objective/feasibility cleaning took place.

type - 0 initial so set up save arrays etc

- 1 normal -if good update save

2 restoring from saved

3.72.2.14 int ClpSimplexDual::fastDual (bool *alwaysFinish* = **false)**

Fast iterations.

Misses out a lot of initialization. Normally stops on maximum iterations, first re-factorization or tentative optimum. If looks interesting then continues as normal. Returns 0 if finished properly, 1 otherwise.

3.72.2.15 int ClpSimplexDual::numberAtFakeBound ()

Checks number of variables at fake bounds.

This is used by fastDual so can exit gracefully before end

3.72.2.16 int ClpSimplexDual::pivotResultPart1 ()

Pivot in a variable and choose an outgoing one.

Assumes dual feasible - will not go through a reduced cost. Returns step length in theta
Return codes as before but -1 means no acceptable pivot

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

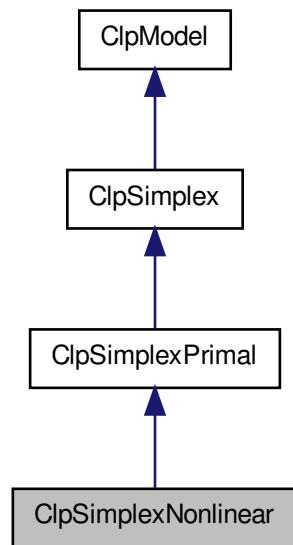
- ClpSimplexDual.hpp

3.73 ClpSimplexNonlinear Class Reference

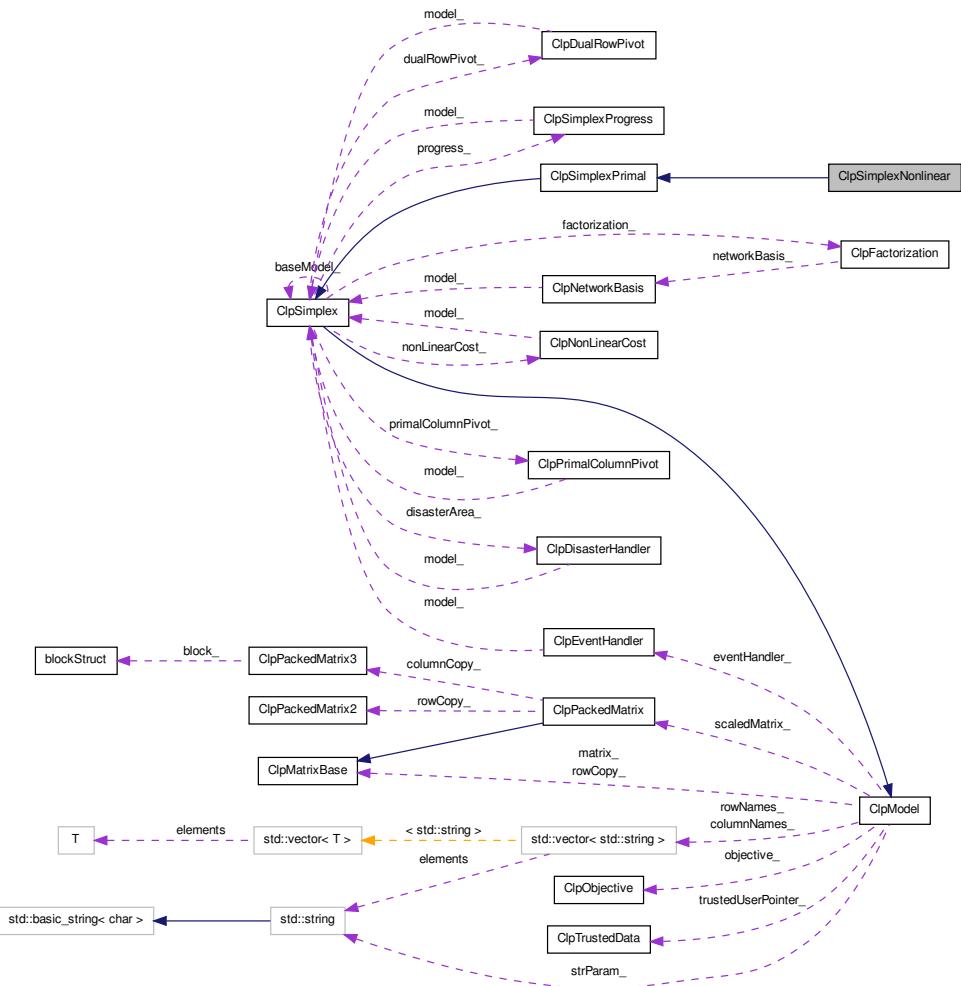
This solves non-linear LPs using the primal simplex method.

```
#include <ClpSimplexNonlinear.hpp>
```

Inheritance diagram for ClpSimplexNonlinear:



Collaboration diagram for ClpSimplexNonlinear:



Public Member Functions

Description of algorithm

- int **primal()**

Primal algorithms for reduced gradient At present we have two algorithms:

- int [primalSLP](#) (int numberPasses, double deltaTolerance)
Primal algorithm for quadratic Using a semi-trust region approach as for pooling problem This is in because I have it lying around.
- int [primalSLP](#) (int numberConstraints, [ClpConstraint](#) **constraints, int numberPasses, double deltaTolerance)
Primal algorithm for nonlinear constraints Using a semi-trust region approach as for pooling problem This is in because I have it lying around.
- void [directionVector](#) (CoinIndexedVector *longArray, CoinIndexedVector *spare1, CoinIndexedVector *spare2, int mode, double &normFlagged, double &normUnflagged, int &numberNonBasic)
Creates direction vector.
- int [whileIterating](#) (int &pivotMode)
Main part.
- int [pivotColumn](#) (CoinIndexedVector *longArray, CoinIndexedVector *rowArray, CoinIndexedVector *columnArray, CoinIndexedVector *spare, int &pivotMode, double &solutionError, double *array1)
longArray has direction pivotMode - 0 - use all dual infeasible variables 1 - largest dj while >= 10 trying startup phase Returns 0 - can do normal iteration (basis change) 1 - no basis change 2 - if wants singleton 3 - if time to re-factorize If sequenceIn_ >=0 then that will be incoming variable
- void [statusOfProblemInPrimal](#) (int &lastCleaned, int type, [ClpSimplexProgress](#) *progress, bool doFactorization, double &bestObjectiveWhenFlagged)
Refactorizes if necessary Checks if finished.
- int [pivotNonlinearResult](#) ()
Do last half of an iteration.

3.73.1 Detailed Description

This solves non-linear LPs using the primal simplex method. It inherits from [ClpSimplexPrimal](#). It has no data of its own and is never created - only cast from a [ClpSimplexPrimal](#) object at algorithm time. If needed create new class and pass around

Definition at line 28 of file ClpSimplexNonlinear.hpp.

3.73.2 Member Function Documentation

3.73.2.1 int ClpSimplexNonlinear::primal ()

Primal algorithms for reduced gradient At present we have two algorithms:

A reduced gradient method.

3.73.2.2 int ClpSimplexNonlinear::primalSLP (int *numberPasses*, double *deltaTolerance*)

Primal algorithm for quadratic Using a semi-trust region approach as for pooling problem This is in because I have it lying around.

3.73.2.3 int ClpSimplexNonlinear::primalSLP (int *numberConstraints*, ClpConstraint ** *constraints*, int *numberPasses*, double *deltaTolerance*)

Primal algorithm for nonlinear constraints Using a semi-trust region approach as for pooling problem This is in because I have it lying around.

3.73.2.4 void ClpSimplexNonlinear::directionVector (CoinIndexedVector * *longArray*, CoinIndexedVector * *spare1*, CoinIndexedVector * *spare2*, int *mode*, double & *normFlagged*, double & *normUnflagged*, int & *numberNonBasic*)

Creates direction vector.

note longArray is long enough for rows and columns. If numberNonBasic 0 then is updated otherwise mode is ignored and those are used. Norms are only for those > 1.0e3*dualTolerance If mode is nonzero then just largest dj

3.73.2.5 void ClpSimplexNonlinear::statusOfProblemInPrimal (int & *lastCleaned*, int *type*, ClpSimplexProgress * *progress*, bool *doFactorization*, double & *bestObjectiveWhenFlagged*)

Refactorizes if necessary Checks if finished.

Updates status. lastCleaned refers to iteration at which some objective/feasibility cleaning took place.

type - 0 initial so set up save arrays etc

- 1 normal -if good update save
- 2 restoring from saved

3.73.2.6 int ClpSimplexNonlinear::pivotNonlinearResult()

Do last half of an iteration.

Return codes Reasons to come out normal mode -1 normal -2 factorize now - good iteration -3 slight inaccuracy - refactorize - iteration done -4 inaccuracy - refactorize - no iteration -5 something flagged - go round again +2 looks unbounded +3 max iterations (iteration done)

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

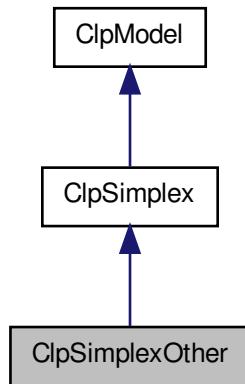
- ClpSimplexNonlinear.hpp

3.74 ClpSimplexOther Class Reference

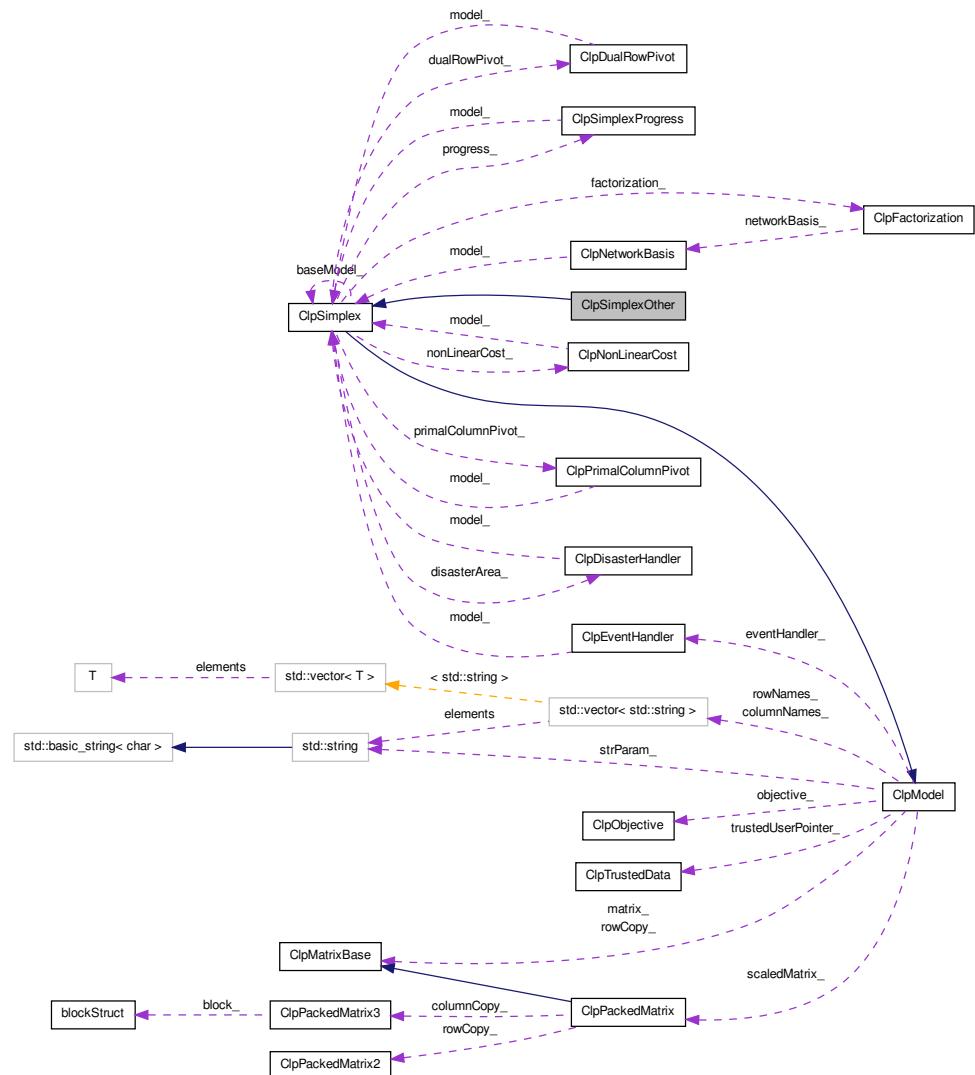
This is for Simplex stuff which is neither dual nor primal.

```
#include <ClpSimplexOther.hpp>
```

Inheritance diagram for ClpSimplexOther:



Collaboration diagram for ClpSimplexOther:



Classes

- struct [parametricsData](#)

Methods

- void **dualRanging** (int numberCheck, const int *which, double *costIncrease, int *sequenceIncrease, double *costDecrease, int *sequenceDecrease, double *valueIncrease=NULL, double *valueDecrease=NULL)

Dual ranging.

- void **primalRanging** (int numberCheck, const int *which, double *valueIncrease, int *sequenceIncrease, double *valueDecrease, int *sequenceDecrease)

Primal ranging.

- int **parametrics** (double startingTheta, double &endingTheta, double reportIncrement, const double *changeLowerBound, const double *changeUpperBound, const double *changeLowerRhs, const double *changeUpperRhs, const double *changeObjective)

Parametrics This is an initial slow version.

- int **parametrics** (const char *dataFile)

Version of parametrics which reads from file See CbcClpParam.cpp for details of format Returns -2 if unable to open file.

- int **parametrics** (double startingTheta, double &endingTheta, const double *changeLowerBound, const double *changeUpperBound, const double *changeLowerRhs, const double *changeUpperRhs)

Parametrics This is an initial slow version.

- int **parametricsObj** (double startingTheta, double &endingTheta, const double *changeObjective)

- double **bestPivot** (bool justColumns=false)

Finds best possible pivot.

- int **writeBasis** (const char *filename, bool writeValues=false, int formatType=0) const

Write the basis in MPS format to the specified file.

- int **readBasis** (const char *filename)

Read a basis from the given filename.

- **ClpSimplex *** **dualOfModel** (double fractionRowRanges=1.0, double fractionColumnRanges=1.0) const

Creates dual of a problem if looks plausible (defaults will always create model) fractionRowRanges is fraction of rows allowed to have ranges fractionColumnRanges is fraction of columns allowed to have ranges.

- int `restoreFromDual` (const `ClpSimplex` *dualProblem, bool checkAccuracy=false)

Restores solution from dualized problem non-zero return code indicates minor problems.

- `ClpSimplex` * `crunch` (double *rhs, int *whichRows, int *whichColumns, int &nBound, bool moreBounds=false, bool tightenBounds=false)

Does very cursory presolve.

- void `afterCrunch` (const `ClpSimplex` &small, const int *whichRows, const int *whichColumns, int nBound)

After very cursory presolve.

- `ClpSimplex` * `gubVersion` (int *whichRows, int *whichColumns, int neededGub, int factorizationFrequency=50)

Returns gub version of model or NULL whichRows has to be numberRows whichColumns has to be numberRows+numberColumns.

- void `setGubBasis` (`ClpSimplex` &original, const int *whichRows, const int *whichColumns)

Sets basis from original.

- void `getGubBasis` (`ClpSimplex` &original, const int *whichRows, const int *whichColumns) const

Restores basis to original.

- void `cleanupAfterPostsolve` ()

Quick try at cleaning up duals if postsolve gets wrong.

- int `tightenIntegerBounds` (double *rhsSpace)

Tightens integer bounds - returns number tightened or -1 if infeasible.

- int `expandKnapsack` (int knapsackRow, int &numberOutput, double *buildObj, CoinBigIndex *buildStart, int *buildRow, double *buildElement, int reConstruct=-1) const

Expands out all possible combinations for a knapsack If buildObj NULL then just computes space needed - returns number elements On entry numberOutput is maximum allowed, on exit it is number needed or -1 (as will be number elements) if maximum exceeded.

3.74.1 Detailed Description

This is for Simplex stuff which is neither dual nor primal. It inherits from [ClpSimplex](#). It has no data of its own and is never created - only cast from a [ClpSimplex](#) object at algorithm time.

Definition at line 23 of file ClpSimplexOther.hpp.

3.74.2 Member Function Documentation

**3.74.2.1 void ClpSimplexOther::dualRanging (int *numberCheck*, const int *
 which, double * *costIncrease*, int * *sequenceIncrease*, double *
 costDecrease, int * *sequenceDecrease*, double * *valueIncrease* =
 NULL, double * *valueDecrease* = NULL)**

Dual ranging.

This computes increase/decrease in cost for each given variable and corresponding sequence numbers which would change basis. Sequence numbers are 0..numberColumns and numberColumns.. for artificials/slacks. For non-basic variables the information is trivial to compute and the change in cost is just minus the reduced cost and the sequence number will be that of the non-basic variables. For basic variables a ratio test is between the reduced costs for non-basic variables and the row of the tableau corresponding to the basic variable. The increase/decrease value is always ≥ 0.0 .

Up to user to provide correct length arrays where each array is of length *numberCheck*. which contains list of variables for which information is desired. All other arrays will be filled in by function. If fifth entry in *which* is variable 7 then fifth entry in output arrays will be information for variable 7.

If *valueIncrease*/*Decrease* not NULL (both must be NULL or both non NULL) then these are filled with the value of variable if such a change in cost were made (the existing bounds are ignored)

When here - guaranteed optimal

Reimplemented from [ClpSimplex](#).

**3.74.2.2 void ClpSimplexOther::primalRanging (int *numberCheck*, const int
 * *which*, double * *valueIncrease*, int * *sequenceIncrease*, double *
 valueDecrease, int * *sequenceDecrease*)**

Primal ranging.

This computes increase/decrease in value for each given variable and corresponding se-

quence numbers which would change basis. Sequence numbers are 0..numberColumns and numberColumns.. for artificials/slacks. This should only be used for non-basic variablrs as otherwise information is pretty useless For basic variables the sequence number will be that of the basic variables.

Up to user to provide correct length arrays where each array is of length numberCheck. which contains list of variables for which information is desired. All other arrays will be filled in by function. If fifth entry in which is variable 7 then fifth entry in output arrays will be information for variable 7.

When here - guaranteed optimal

Reimplemented from [ClpSimplex](#).

```
3.74.2.3 int ClpSimplexOther::parametrics ( double startingTheta,
double & endingTheta, double reportIncrement, const double *
changeLowerBound, const double * changeUpperBound, const double
* changeLowerRhs, const double * changeUpperRhs, const double *
changeObjective )
```

Parametrics This is an initial slow version.

The code uses current bounds + theta * change (if change array not NULL) and similarly for objective. It starts at startingTheta and returns ending theta in endingTheta. If reportIncrement 0.0 it will report on any movement If reportIncrement >0.0 it will report at startingTheta+k*reportIncrement. If it can not reach input endingTheta return code will be 1 for infeasible, 2 for unbounded, if error on ranges -1, otherwise 0. Normal report is just theta and objective but if event handler exists it may do more On exit endingTheta is maximum reached (can be used for next startingTheta)

```
3.74.2.4 int ClpSimplexOther::parametrics ( double startingTheta, double &
endingTheta, const double * changeLowerBound, const double *
changeUpperBound, const double * changeLowerRhs, const double *
changeUpperRhs )
```

Parametrics This is an initial slow version.

The code uses current bounds + theta * change (if change array not NULL) It starts at startingTheta and returns ending theta in endingTheta. If it can not reach input endingTheta return code will be 1 for infeasible, 2 for unbounded, if error on ranges -1, otherwise 0. Event handler may do more On exit endingTheta is maximum reached (can be used for next startingTheta)

3.74.2.5 int ClpSimplexOther::writeBasis (const char * *filename*, bool *writeValues* = **false, int *formatType* = 0) const**

Write the basis in MPS format to the specified file.

If *writeValues* true writes values of structurals (and adds VALUES to end of NAME card)

Row and column names may be null. *formatType* is

- 0 - normal
- 1 - extra accuracy
- 2 - IEEE hex (later)

Returns non-zero on I/O error

Reimplemented from [ClpSimplex](#).

3.74.2.6 ClpSimplex* ClpSimplexOther::crunch (double * *rhs*, int * *whichRows*, int * *whichColumns*, int & *nBound*, bool *moreBounds* = **false, bool *tightenBounds* = **false**)**

Does very cursory presolve.

rhs is *numberRows*, *whichRows* is 3**numberRows* and *whichColumns* is 2**numberColumns*.

3.74.2.7 void ClpSimplexOther::afterCrunch (const ClpSimplex & *small*, const int * *whichRows*, const int * *whichColumns*, int *nBound*)

After very cursory presolve.

rhs is *numberRows*, *whichRows* is 3**numberRows* and *whichColumns* is 2**numberColumns*.

3.74.2.8 int ClpSimplexOther::expandKnapsack (int *knapsackRow*, int & *numberOutput*, double * *buildObj*, CoinBigIndex * *buildStart*, int * *buildRow*, double * *buildElement*, int *reConstruct* = -1) const

Expands out all possible combinations for a knapsack If buildObj NULL then just computes space needed - returns number elements On entry numberOutput is maximum allowed, on exit it is number needed or -1 (as will be number elements) if maximum exceeded.

numberOutput will have at least space to return values which reconstruct input. Rows returned will be original rows but no entries will be returned for any rows all of whose entries are in knapsack. So up to user to allow for this. If reConstruct >=0 then returns number of entries which make up item "reConstruct" in expanded knapsack. Values in buildRow and buildElement;

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

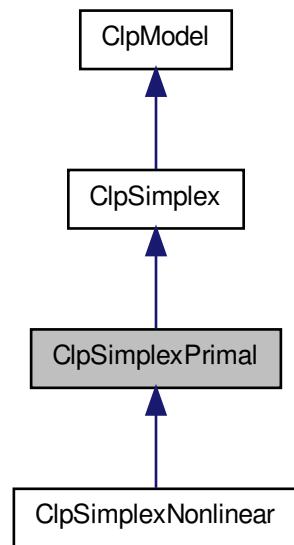
- ClpSimplexOther.hpp

3.75 ClpSimplexPrimal Class Reference

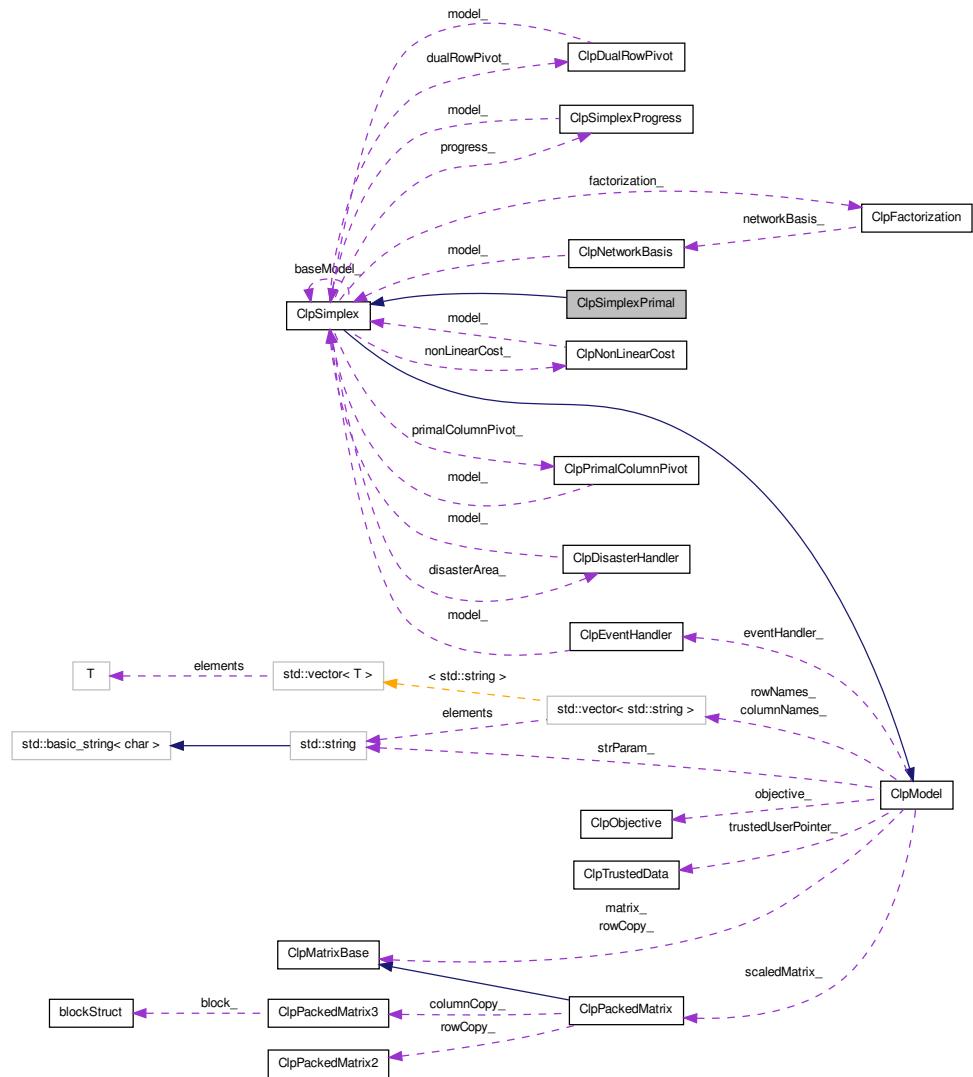
This solves LPs using the primal simplex method.

```
#include <ClpSimplexPrimal.hpp>
```

Inheritance diagram for ClpSimplexPrimal:



Collaboration diagram for ClpSimplexPrimal:



Public Member Functions

Description of algorithm

- `int primal (int ifValuesPass=0, int startFinishOptions=0)`

Primal algorithm.

For advanced users

- void **alwaysOptimal** (bool onOff)
Do not change infeasibility cost and always say optimal.
- bool **alwaysOptimal** () const
- void **exactOutgoing** (bool onOff)
Normally outgoing variables can go out to slightly negative values (but within tolerance) - this is to help stability and degeneracy.
- bool **exactOutgoing** () const

Functions used in primal

- int **whileIterating** (int valuesOption)
This has the flow between re-factorizations.
- int **pivotResult** (int ifValuesPass=0)
Do last half of an iteration.
- int **updatePrimalsInPrimal** (CoinIndexedVector *rowArray, double theta, double &objectiveChange, int valuesPass)
The primals are updated by the given array.
- void **primalRow** (CoinIndexedVector *rowArray, CoinIndexedVector *rhsArray, CoinIndexedVector *spareArray, int valuesPass)
Row array has pivot column This chooses pivot row.
- void **primalColumn** (CoinIndexedVector *updateArray, CoinIndexedVector *spareRow1, CoinIndexedVector *spareRow2, CoinIndexedVector *spareColumn1, CoinIndexedVector *spareColumn2)
Chooses primal pivot column updateArray has cost updates (also use pivotRow_ from last iteration) Would be faster with separate region to scan and will have this (with square of infeasibility) when steepest For easy problems we can just choose one of the first columns we look at.
- int **checkUnbounded** (CoinIndexedVector *ray, CoinIndexedVector *spare, double changeCost)
Checks if tentative optimal actually means unbounded in primal Returns -3 if not, 2 if is unbounded.
- void **statusOfProblemInPrimal** (int &lastCleaned, int type, ClpSimplexProgress *progress, bool doFactorization, int ifValuesPass, ClpSimplex *saveModel=NULL)

Refactorizes if necessary Checks iff finished.

- void **perturb** (int type)
Perturbs problem (method depends on [perturbation\(\)](#)).
- bool **unPerturb** ()
Take off effect of perturbation and say whether to try dual.
- int **unflag** ()
Unflag all variables and return number unflagged.
- int **nextSuperBasic** (int superBasicType, CoinIndexedVector *columnArray)
Get next superbasic -1 if none, Normal type is 1 If type is 3 then initializes sorted list if 2 uses list.
- void **primalRay** (CoinIndexedVector *rowArray)
Create primal ray.
- void **clearAll** ()
Clears all bits and clears rowArray[1] etc.
- int **lexSolve** ()
Sort of lexicographic resolve.

3.75.1 Detailed Description

This solves LPs using the primal simplex method. It inherits from [ClpSimplex](#). It has no data of its own and is never created - only cast from a [ClpSimplex](#) object at algorithm time.

Definition at line 23 of file ClpSimplexPrimal.hpp.

3.75.2 Member Function Documentation

3.75.2.1 int ClpSimplexPrimal::primal (int *ifValuesPass* = 0, int *startFinishOptions* = 0)

Primal algorithm.

Method

It tries to be a single phase approach with a weight of 1.0 being given to getting optimal and a weight of infeasibilityCost_ being given to getting primal feasible. In this version

I have tried to be clever in a stupid way. The idea of fake bounds in dual seems to work so the primal analogue would be that of getting bounds on reduced costs (by a presolve approach) and using these for being above or below feasible region. I decided to waste memory and keep these explicitly. This allows for non-linear costs! I have not tested non-linear costs but will be glad to do something if a reasonable example is provided.

The code is designed to take advantage of sparsity so arrays are seldom zeroed out from scratch or gone over in their entirety. The only exception is a full scan to find incoming variable for Dantzig row choice. For steepest edge we keep an updated list of dual infeasibilities (actually squares). On easy problems we don't need full scan - just pick first reasonable. This method has not been coded.

One problem is how to tackle degeneracy and accuracy. At present I am using the modification of costs which I put in OSL and which was extended by Gill et al. I am still not sure whether we will also need explicit perturbation.

The flow of primal is three while loops as follows:

```
while (not finished) {
    while (not clean solution) {
```

Factorize and/or clean up solution by changing bounds so primal feasible. If looks finished check fake primal bounds. Repeat until status is iterating (-1) or finished (0,1,2)

```
}
```

```
while (status===-1) {
```

Iterate until no pivot in or out or time to re-factorize.

Flow is:

choose pivot column (incoming variable). if none then we are primal feasible so looks as if done but we need to break and check bounds etc.

Get pivot column in tableau

Choose outgoing row. If we don't find one then we look primal unbounded so break and check bounds etc. (Also the pivot tolerance is larger after any iterations so that may be reason)

If we do find outgoing row, we may have to adjust costs to keep going forwards (anti-degeneracy). Check pivot will be stable and if unstable throw away iteration and break to re-factorize. If minor error re-factorize after iteration.

Update everything (this may involve changing bounds on variables to stay primal feasible.

```
}
```

```
}
```

TODO's (or maybe not)

At present we never check we are going forwards. I overdid that in OSL so will try and make a last resort.

Needs partial scan pivot in option.

May need other anti-degeneracy measures, especially if we try and use loose tolerances as a way to solve in fewer iterations.

I like idea of dynamic scaling. This gives opportunity to decouple different implications of scaling for accuracy, iteration count and feasibility tolerance.

for use of exotic parameter startFinishoptions see Clpsimplex.hpp

Reimplemented from [ClpSimplex](#).

3.75.2.2 void ClpSimplexPrimal::exactOutgoing (bool *onOff*)

Normally outgoing variables can go out to slightly negative values (but within tolerance) - this is to help stability and and degeneracy.

This can be switched off

3.75.2.3 int ClpSimplexPrimal::whileIterating (int *valuesOption*)

This has the flow between re-factorizations.

Returns a code to say where decision to exit was made Problem status set to:

-2 re-factorize -4 Looks optimal/infeasible -5 Looks unbounded +3 max iterations

valuesOption has original value of valuesPass

3.75.2.4 int ClpSimplexPrimal::pivotResult (int *ifValuesPass = 0*)

Do last half of an iteration.

This is split out so people can force incoming variable. If solveType_ is 2 then this may re-factorize while normally it would exit to re-factorize. Return codes Reasons to come out (normal mode/user mode): -1 normal -2 factorize now - good iteration/ NA -3 slight inaccuracy - refactorize - iteration done/ same but factor done -4 inaccuracy - refactorize - no iteration/ NA -5 something flagged - go round again/ pivot not possible +2 looks unbounded +3 max iterations (iteration done)

With solveType_ ==2 this should Pivot in a variable and choose an outgoing one. Assumes primal feasible - will not go through a bound. Returns step length in theta

Returns ray in ray_

**3.75.2.5 int ClpSimplexPrimal::updatePrimalsInPrimal (CoinIndexedVector *
rowArray, double theta, double & objectiveChange, int valuesPass)**

The primals are updated by the given array.

Returns number of infeasibilities. After rowArray will have cost changes for use next iteration

**3.75.2.6 void ClpSimplexPrimal::primalRow (CoinIndexedVector * rowArray,
CoinIndexedVector * rhsArray, CoinIndexedVector * spareArray, int
valuesPass)**

Row array has pivot column This chooses pivot row.

Rhs array is used for distance to next bound (for speed) For speed, we may need to go to a bucket approach when many variables go through bounds If valuesPass non-zero then compute dj for direction

**3.75.2.7 void ClpSimplexPrimal::statusOfProblemInPrimal (int &
lastCleaned, int type, ClpSimplexProgress * progress, bool
doFactorization, int ifValuesPass, ClpSimplex * saveModel = NULL)**

Refactorizes if necessary Checks if finished.

Updates status. lastCleaned refers to iteration at which some objective/feasibility cleaning took place.

type - 0 initial so set up save arrays etc

- 1 normal -if good update save

2 restoring from saved saveModel is normally NULL but may not be if doing Sprint

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

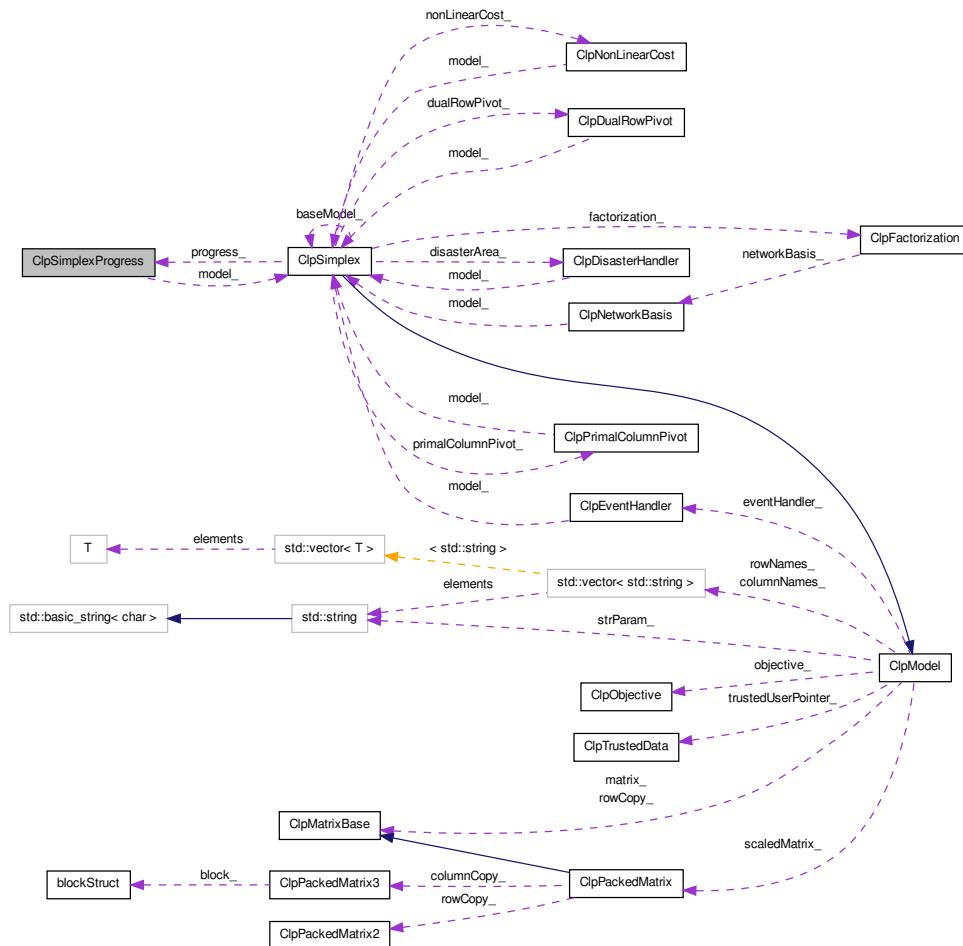
- ClpSimplexPrimal.hpp

3.76 ClpSimplexProgress Class Reference

For saving extra information to see if looping.

```
#include <ClpSolve.hpp>
```

Collaboration diagram for ClpSimplexProgress:



Public Member Functions

Constructors and destructor and copy

- `ClpSimplexProgress ()`
Default constructor.
- `ClpSimplexProgress (ClpSimplex *model)`
Constructor from model.
- `ClpSimplexProgress (const ClpSimplexProgress &)`
Copy constructor.
- `ClpSimplexProgress & operator= (const ClpSimplexProgress &rhs)`
Assignment operator. This copies the data.
- `~ClpSimplexProgress ()`
Destructor.
- `void reset ()`
Resets as much as possible.
- `void fillFromModel (ClpSimplex *model)`
Fill from model.

Check progress

- `int looping ()`
Returns -1 if okay, -n+1 (n number of times bad) if bad but action taken, >=0 if give up and use as problem status.
- `void startCheck ()`
Start check at beginning of whileIterating.
- `int cycle (int in, int out, int wayIn, int wayOut)`
Returns cycle length in whileIterating.
- `double lastObjective (int back=1) const`
Returns previous objective (if -1) - current if (0).
- `void setInfeasibility (double value)`
Set real primal infeasibility and move back.
- `double lastInfeasibility (int back=1) const`
Returns real primal infeasibility (if -1) - current if (0).
- `void modifyObjective (double value)`
Modify objective e.g. if dual infeasible in dual.

- int **lastIterationNumber** (int back=1) const
Returns previous iteration number (if -1) - current if (0).
- void **clearIterationNumbers** ()
clears all iteration numbers (to switch off panic)
- void **newOddState** ()
Odd state.
- void **endOddState** ()
- void **clearOddState** ()
- int **oddState** () const
- int **badTimes** () const
number of bad times
- void **clearBadTimes** ()
- int **reallyBadTimes** () const
number of really bad times
- void **incrementReallyBadTimes** ()
- int **timesFlagged** () const
number of times flagged
- void **clearTimesFlagged** ()
- void **incrementTimesFlagged** ()

Public Attributes

Data

- double **objective_** [CLP_PROGRESS]
Objective values.
- double **infeasibility_** [CLP_PROGRESS]
Sum of infeasibilities for algorithm.
- double **realInfeasibility_** [CLP_PROGRESS]
Sum of real primal infeasibilities for primal.
- double **initialWeight_**
Initial weight for weights.
- int **in_** [CLP_CYCLE]
For cycle checking.

- int **out_** [CLP_CYCLE]
- char **way_** [CLP_CYCLE]
- **ClpSimplex * model_**

Pointer back to model so we can get information.

- int **numberInfeasibilities_** [CLP_PROGRESS]

Number of infeasibilities.

- int **iterationNumber_** [CLP_PROGRESS]

Iteration number at which occurred.

- int **numberTimes_**

Number of times checked (so won't stop too early).

- int **numberBadTimes_**

Number of times it looked like loop.

- int **numberReallyBadTimes_**

Number really bad times.

- int **numberTimesFlagged_**

Number of times no iterations as flagged.

- int **oddState_**

If things are in an odd state.

3.76.1 Detailed Description

For saving extra information to see if looping.

Definition at line 252 of file ClpSolve.hpp.

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

- ClpSolve.hpp

3.77 ClpSolve Class Reference

This is a very simple class to guide algorithms.

```
#include <ClpSolve.hpp>
```

Public Types

- enum [SolveType](#)
enums for solve function

Public Member Functions

Constructors and destructor and copy

- [ClpSolve \(\)](#)
Default constructor.
- [ClpSolve \(SolveType method, PresolveType presolveType, int numberPasses, int options\[6\], int extraInfo\[6\], int independentOptions\[3\]\)](#)
Constructor when you really know what you are doing.
- void [generateCpp \(FILE *fp\)](#)
Generates code for above constructor.
- [ClpSolve \(const ClpSolve &\)](#)
Copy constructor.
- [ClpSolve & operator= \(const ClpSolve &rhs\)](#)
Assignment operator. This copies the data.
- [~ClpSolve \(\)](#)
Destructor.

Functions most useful to user

- void [setSpecialOption \(int which, int value, int extraInfo=-1\)](#)
Special options - bits 0 4 - use crash (default allslack in dual, idiot in primal) 8 - all slack basis in primal 2 16 - switch off interrupt handling 3 32 - do not try and make plus minus one matrix 64 - do not use sprint even if problem looks good.
- int [getSpecialOption \(int which\) const](#)
- void [setSolveType \(SolveType method, int extraInfo=-1\)](#)
Solve types.
- [SolveType getSolveType \(\)](#)
- void [setPresolveType \(PresolveType amount, int extraInfo=-1\)](#)
- PresolveType [getPresolveType \(\)](#)
- int [getPresolvePasses \(\) const](#)
- int [getExtraInfo \(int which\) const](#)

Extra info for idiot (or sprint).

- void **setInfeasibleReturn** (bool trueFalse)

Say to return at once if infeasible, default is to solve.

- bool **infeasibleReturn** () const
- bool **doDual** () const

Whether we want to do dual part of presolve.

- void **setDoDual** (bool doDual_)
- bool **doSingleton** () const

Whether we want to do singleton part of presolve.

- void **setDoSingleton** (bool doSingleton_)
- bool **doDoubleton** () const

Whether we want to do doubleton part of presolve.

- void **setDoDoubleton** (bool doDoubleton_)
- bool **doTripleton** () const

Whether we want to do tripleton part of presolve.

- void **setDoTripleton** (bool doTripleton_)
- bool **doTighten** () const

Whether we want to do tighten part of presolve.

- void **setDoTighten** (bool doTighten_)
- bool **doForcing** () const

Whether we want to do forcing part of presolve.

- void **setDoForcing** (bool doForcing_)
- bool **doImpliedFree** () const

Whether we want to do impliedfree part of presolve.

- void **setDoImpliedFree** (bool doImpliedfree)
- bool **doDupcol** () const

Whether we want to do dupcol part of presolve.

- void **setDoDupcol** (bool doDupcol_)
- bool **doDuprow** () const

Whether we want to do duprow part of presolve.

- void **setDoDuprow** (bool doDuprow_)
- bool **doSingletonColumn** () const

Whether we want to do singleton column part of presolve.

- void **setDoSingletonColumn** (bool doSingleton_)

- bool `doKillSmall () const`
Whether we want to kill small substitutions.
- void `setDoKillSmall (bool doKill)`
- int `presolveActions () const`
Set whole group.
- void `setPresolveActions (int action)`
- int `substitution () const`
Largest column for substitution (normally 3).
- void `setSubstitution (int value)`

3.77.1 Detailed Description

This is a very simple class to guide algorithms. It is used to tidy up passing parameters to initialSolve and maybe for output from that

Definition at line 20 of file ClpSolve.hpp.

3.77.2 Member Function Documentation

3.77.2.1 void ClpSolve::setSpecialOption (int *which*, int *value*, int *extraInfo* = -1)

Special options - bits 0 4 - use crash (default allslack in dual, idiot in primal) 8 - all slack basis in primal 2 16 - switch off interrupt handling 3 32 - do not try and make plus minus one matrix 64 - do not use sprint even if problem looks good.

which translation is: which: 0 - startup in Dual (nothing if basis exists).: 0 - no basis 1 - crash 2 - use initiative about idiot! but no crash 1 - startup in Primal (nothing if basis exists): 0 - use initiative 1 - use crash 2 - use idiot and look at further info 3 - use sprint and look at further info 4 - use all slack 5 - use initiative but no idiot 6 - use initiative but no sprint 7 - use initiative but no crash 8 - do allslack or idiot 9 - do allslack or sprint 10 - slp before 11 - no nothing and primal(0) 2 - interrupt handling - 0 yes, 1 no (for threadsafe) 3 - whether to make +- 1matrix - 0 yes, 1 no 4 - for barrier 0 - dense cholesky 1 - Wssmp allowing some long columns 2 - Wssmp not allowing long columns 3 - Wssmp using KKT 4 - Using Florida ordering 8 - bit set to do scaling 16 - set to be aggressive with gamma/delta? 32 - Use KKT 5 - for presolve 1 - switch off dual stuff 6 - for detailed printout (initially just presolve) 1 - presolve statistics

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

- ClpSolve.hpp

3.78 ClpTrustedData Struct Reference

For a structure to be used by trusted code.

```
#include <ClpParameters.hpp>
```

3.78.1 Detailed Description

For a structure to be used by trusted code.

Definition at line 119 of file ClpParameters.hpp.

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

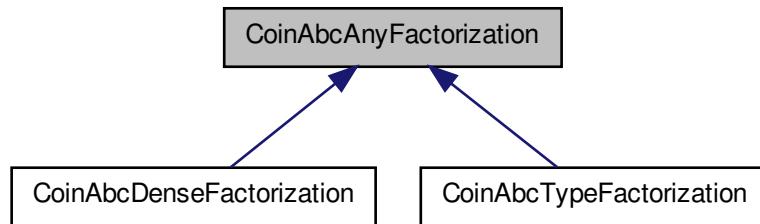
- ClpParameters.hpp

3.79 CoinAbcAnyFactorization Class Reference

Abstract base class which also has some scalars so can be used from Dense or Simp.

```
#include <CoinAbcDenseFactorization.hpp>
```

Inheritance diagram for CoinAbcAnyFactorization:



Public Member Functions

Constructors and destructor and copy

- [CoinAbcAnyFactorization \(\)](#)

Default constructor.

- `CoinAbcAnyFactorization (const CoinAbcAnyFactorization &other)`
Copy constructor.
- `virtual ~CoinAbcAnyFactorization ()`
Destructor.
- `CoinAbcAnyFactorization & operator= (const CoinAbcAnyFactorization &other)`
 $= \text{copy}$
- `virtual CoinAbcAnyFactorization * clone () const =0`
Clone.

general stuff such as status

- `int status () const`
Returns status.
- `void setStatus (int value)`
Sets status.
- `int pivots () const`
Returns number of pivots since factorization.
- `void setPivots (int value)`
Sets number of pivots since factorization.
- `int numberSlacks () const`
Returns number of slacks.
- `void setNumberSlacks (int value)`
Sets number of slacks.
- `void setNumberRows (int value)`
Set number of Rows after factorization.
- `int numberRows () const`
Number of Rows after factorization.
- `CoinSimplexInt numberDense () const`
Number of dense rows after factorization.
- `int numberGoodColumns () const`

Number of good columns in factorization.

- void **relaxAccuracyCheck** (double value)
Allows change of pivot accuracy check $1.0 == \text{none} > 1.0$ relaxed.

- double **getAccuracyCheck** () const
- int **maximumPivots** () const

Maximum number of pivots between factorizations.

- virtual void **maximumPivots** (int value)
Set maximum pivots.

- double **pivotTolerance** () const
Pivot tolerance.

- void **pivotTolerance** (double value)
- double **minimumPivotTolerance** () const

Minimum pivot tolerance.

- void **minimumPivotTolerance** (double value)
- virtual CoinFactorizationDouble * **pivotRegion** () const
- double **areaFactor** () const

Area factor.

- void **areaFactor** (CoinSimplexDouble value)
- double **zeroTolerance** () const

Zero tolerance.

- void **zeroTolerance** (double value)
- virtual CoinFactorizationDouble * **elements** () const

Returns array to put basis elements in.

- virtual int * **pivotRow** () const
Returns pivot row.

- virtual CoinFactorizationDouble * **workArea** () const
Returns work area.

- virtual int * **intWorkArea** () const
Returns int work area.

- virtual int * **numberInRow** () const
Number of entries in each row.

- virtual int * **numberInColumn** () const
Number of entries in each column.

- virtual CoinBigIndex * **starts** () const
Returns array to put basis starts in.
- virtual int * **permuteBack** () const
Returns permute back.
- virtual void **goSparse** ()
Sees whether to go sparse.
- virtual void **checkMarkArrays** () const
- int **solveMode** () const
Get solve mode e.g.
- void **setSolveMode** (int value)
Set solve mode e.g.
- virtual bool **wantsTableauColumn** () const
Returns true if wants tableauColumn in replaceColumn.
- virtual void **setUsefulInformation** (const int *info, int whereFrom)
Useful information for factorization 0 - iteration number whereFrom is 0 for factorize and 1 for replaceColumn.
- virtual void **clearArrays** ()
Get rid of all memory.

virtual general stuff such as permutation

- virtual int * **indices** () const =0
Returns array to put basis indices in.
- virtual int * **permute** () const =0
Returns permute in.
- virtual int * **pivotColumn** () const
Returns pivotColumn or permute.
- virtual int **numberElements** () const =0
Total number of elements in factorization.

Do factorization - public

- virtual void **getAreas** (int numberOfRows, int numberOfColumns, CoinBigIndex maximumL, CoinBigIndex maximumU)=0

Gets space for a factorization.

- virtual void [preProcess \(\)=0](#)
PreProcesses column ordered copy of basis.
- virtual int [factor \(AbcSimplex *model\)=0](#)
Does most of factorization returning status 0 - OK -99 - needs more memory -1 - singular - use numberGoodColumns and redo.
- virtual void [postProcess \(const int *sequence, int *pivotVariable\)=0](#)
Does post processing on valid factorization - putting variables on correct rows.
- virtual void [makeNonSingular \(int *sequence\)=0](#)
Makes a non-singular basis by replacing variables.

rank one updates which do exist

- virtual double [checkReplacePart1 \(CoinIndexedVector *, int\)](#)
Checks if can replace one Column to basis, returns update alpha Fills in region for use later partial update already in U.
- virtual double [checkReplacePart1 \(CoinIndexedVector *, CoinIndexedVector *, int\)](#)
- virtual void [checkReplacePart1a \(CoinIndexedVector *, int\)](#)
- virtual double [checkReplacePart1b \(CoinIndexedVector *, int\)](#)
- virtual int [checkReplacePart2 \(int pivotRow, double btranAlpha, double ftranAlpha, double ftAlpha, double acceptablePivot=1.0e-8\)=0](#)
Checks if can replace one Column to basis, returns 0=OK, 1=Probably OK, 2=singular, 3=no room, 5 max pivots.
- virtual void [replaceColumnPart3 \(const AbcSimplex *model, CoinIndexedVector *regionSparse, CoinIndexedVector *tableauColumn, int pivotRow, double alpha\)=0](#)
Replaces one Column to basis, partial update already in U.
- virtual void [replaceColumnPart3 \(const AbcSimplex *model, CoinIndexedVector *regionSparse, CoinIndexedVector *tableauColumn, CoinIndexedVector *partialUpdate, int pivotRow, double alpha\)=0](#)
Replaces one Column to basis, partial update in vector.

various uses of factorization (return code number elements)

which user may want to know about

- virtual int [updateColumnFT \(CoinIndexedVector ®ionSparse\)=0](#)

Updates one column (FTRAN) from unpacked regionSparse Tries to do FT update number returned is negative if no room.

- virtual int **updateColumnFTPart1** (CoinIndexedVector ®ionSparse)=0
- virtual void **updateColumnFTPart2** (CoinIndexedVector ®ionSparse)=0
- virtual void **updateColumnFT** (CoinIndexedVector ®ionSparseFT, CoinIndexedVector &partialUpdate, int which)=0
- virtual int **updateColumn** (CoinIndexedVector ®ionSparse) const =0
This version has same effect as above with FTUpdate==false so number returned is always >=0.
- virtual int **updateTwoColumnsFT** (CoinIndexedVector ®ionFT, CoinIndexedVector ®ionOther)=0
does FTRAN on two unpacked columns
- virtual int **updateColumnTranspose** (CoinIndexedVector ®ionSparse) const =0
Updates one column (BTRAN) from unpacked regionSparse.
- virtual void **updateFullColumn** (CoinIndexedVector ®ionSparse) const =0
This version does FTRAN on array when indices not set up.
- virtual void **updateFullColumnTranspose** (CoinIndexedVector ®ionSparse) const =0
Updates one column (BTRAN) from unpacked regionSparse.
- virtual void **updateWeights** (CoinIndexedVector ®ionSparse) const =0
Updates one column for dual steepest edge weights (FTRAN).
- virtual void **updateColumnCpu** (CoinIndexedVector ®ionSparse, int whichCpu) const
Updates one column (FTRAN).
- virtual void **updateColumnTransposeCpu** (CoinIndexedVector ®ionSparse, int whichCpu) const
Updates one column (BTRAN).

Protected Attributes

data

- double **pivotTolerance_**
Pivot tolerance.

- double **minimumPivotTolerance_**
Minimum pivot tolerance.
- double **areaFactor_**
Area factor.
- double **zeroTolerance_**
Zero tolerance.
- double **relaxCheck_**
Relax check on accuracy in replaceColumn.
- CoinBigIndex **factorElements_**
Number of elements after factorization.
- int **numberRows_**
Number of Rows in factorization.
- int **numberDense_**
Number of dense rows in factorization.
- int **numberGoodU_**
Number factorized in U (not row singletons).
- int **maximumPivots_**
Maximum number of pivots before factorization.
- int **numberPivots_**
Number pivots since last factorization.
- int **numberSlacks_**
Number slacks.
- int **status_**
Status of factorization.
- int **maximumRows_**
Maximum rows ever (i.e. use to copy arrays etc).
- int * **pivotRow_**
Pivot row.
- CoinFactorizationDouble * **elements_**
*Elements of factorization and updates length is maxR*maxR+maxSpace will always be long enough so can have nR*nR ints in maxSpace.*

- CoinFactorizationDouble * `workArea_`
Work area of numberRows_.
- int `solveMode_`
Solve mode e.g.

3.79.1 Detailed Description

Abstract base class which also has some scalars so can be used from Dense or Simp.
Definition at line 24 of file CoinAbcDenseFactorization.hpp.

3.79.2 Member Function Documentation

3.79.2.1 int CoinAbcAnyFactorization::solveMode () const [inline]

Get solve mode e.g.

0 C++ code, 1 Lapack, 2 choose If 4 set then values pass if 8 set then has iterated
Definition at line 148 of file CoinAbcDenseFactorization.hpp.

3.79.2.2 void CoinAbcAnyFactorization::setSolveMode (int value) [inline]

Set solve mode e.g.

0 C++ code, 1 Lapack, 2 choose If 4 set then values pass if 8 set then has iterated
Definition at line 154 of file CoinAbcDenseFactorization.hpp.

3.79.3 Member Data Documentation

3.79.3.1 int CoinAbcAnyFactorization::solveMode_ [protected]

Solve mode e.g.

0 C++ code, 1 Lapack, 2 choose If 4 set then values pass if 8 set then has iterated
Definition at line 382 of file CoinAbcDenseFactorization.hpp.

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

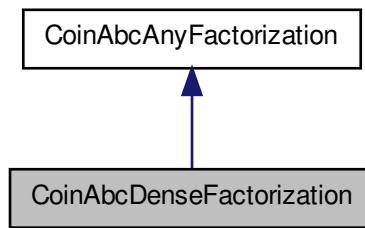
- CoinAbcDenseFactorization.hpp

3.80 CoinAbcDenseFactorization Class Reference

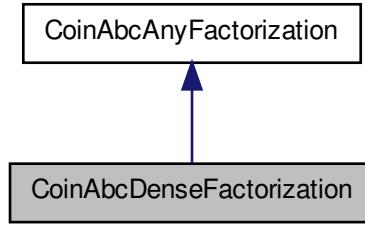
This deals with Factorization and Updates This is a simple dense version so other people can write a better one.

```
#include <CoinAbcDenseFactorization.hpp>
```

Inheritance diagram for CoinAbcDenseFactorization:



Collaboration diagram for CoinAbcDenseFactorization:



Public Member Functions

- void [gutsOfDestructor \(\)](#)
The real work of desstructor.
- void [gutsOfInitialize \(\)](#)
The real work of constructor.
- void [gutsOfCopy \(const CoinAbcDenseFactorization &other\)](#)
The real work of copy.

Constructors and destructor and copy

- [CoinAbcDenseFactorization \(\)](#)
Default constructor.
- [CoinAbcDenseFactorization \(const CoinAbcDenseFactorization &other\)](#)
Copy constructor.
- virtual [~CoinAbcDenseFactorization \(\)](#)
Destructor.
- [CoinAbcDenseFactorization & operator= \(const CoinAbcDenseFactorization &other\)](#)
 $= \text{copy}$
- virtual [CoinAbcAnyFactorization * clone \(\) const](#)
Clone.

Do factorization - public

- virtual void [getAreas \(int numberOfRows, int numberColumns, CoinBigIndex maximumL, CoinBigIndex maximumU\)](#)
Gets space for a factorization.
- virtual void [preProcess \(\)](#)
PreProcesses column ordered copy of basis.
- virtual int [factor \(AbcSimplex *model\)](#)
Does most of factorization returning status 0 - OK -99 - needs more memory -1 - singular - use numberGoodColumns and redo.
- virtual void [postProcess \(const int *sequence, int *pivotVariable\)](#)

Does post processing on valid factorization - putting variables on correct rows.

- virtual void `makeNonSingular` (int *sequence)
Makes a non-singular basis by replacing variables.

general stuff such as number of elements

- virtual int `numberElements` () const
Total number of elements in factorization.
- double `maximumCoefficient` () const
Returns maximum absolute value in factorization.

rank one updates which do exist

- virtual int `replaceColumn` (CoinIndexedVector *regionSparse, int pivotRow, double pivotCheck, bool skipBtranU=false, double acceptablePivot=1.0e-8)
Replaces one Column to basis, returns 0=OK, 1=Probably OK, 2=singular, 3=no room If skipBtranU is false will do btran part partial update already in U.
- virtual int `checkReplacePart2` (int pivotRow, double btranAlpha, double ftranAlpha, double ftAlpha, double acceptablePivot=1.0e-8)
Checks if can replace one Column to basis, returns 0=OK, 1=Probably OK, 2=singular, 3=no room, 5 max pivots.
- virtual void `replaceColumnPart3` (const `AbcSimplex` *model, CoinIndexedVector *regionSparse, CoinIndexedVector *tableauColumn, int pivotRow, double alpha)
Replaces one Column to basis, partial update already in U.
- virtual void `replaceColumnPart3` (const `AbcSimplex` *model, CoinIndexedVector *regionSparse, CoinIndexedVector *tableauColumn, CoinIndexedVector *, int pivotRow, double alpha)
Replaces one Column to basis, partial update in vector.

various uses of factorization (return code number elements)

which user may want to know about

- virtual int `updateColumnFT` (CoinIndexedVector ®ionSparse)
Updates one column (FTRAN) from unpacked regionSparse Tries to do FT update number returned is negative if no room.
- virtual int `updateColumnFTPart1` (CoinIndexedVector ®ionSparse)

- virtual void **updateColumnFTPart2** (CoinIndexedVector &)
- virtual void **updateColumnFT** (CoinIndexedVector ®ionSparseFT, CoinIndexedVector &, int)
- virtual int **updateColumn** (CoinIndexedVector ®ionSparse) const

This version has same effect as above with FTUpdate==false so number returned is always >=0.
- virtual int **updateTwoColumnsFT** (CoinIndexedVector ®ionFT, CoinIndexedVector ®ionOther)

does FTRAN on two unpacked columns
- virtual int **updateColumnTranspose** (CoinIndexedVector ®ionSparse) const

Updates one column (BTRAN) from unpacked regionSparse.
- virtual void **updateFullColumn** (CoinIndexedVector ®ionSparse) const

This version does FTRAN on array when indices not set up.
- virtual void **updateFullColumnTranspose** (CoinIndexedVector ®ionSparse) const

Updates one column (BTRAN) from unpacked regionSparse.
- virtual void **updateWeights** (CoinIndexedVector ®ionSparse) const

Updates one column for dual steepest edge weights (FTRAN).

various uses of factorization

*** Below this user may not want to know about
 which user may not want to know about (left over from my LP code)

- void **clearArrays** ()

Get rid of all memory.
- virtual int * **indices** () const

Returns array to put basis indices in.
- virtual int * **permute** () const

Returns permute in.

Protected Member Functions

- int **checkPivot** (double saveFromU, double oldPivot) const

Returns accuracy status of replaceColumn returns 0=OK, 1=Probably OK, 2=singular.

Protected Attributes

- CoinBigIndex [maximumSpace_](#)
Maximum length of iterating area.
- CoinSimplexInt [maximumRowsAdjusted_](#)
Use for array size to get multiple of 8.

3.80.1 Detailed Description

This deals with Factorization and Updates This is a simple dense version so other people can write a better one. I am assuming that 32 bits is enough for number of rows or columns, but CoinBigIndex may be redefined to get 64 bits.

Definition at line 394 of file CoinAbcDenseFactorization.hpp.

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

- CoinAbcDenseFactorization.hpp

3.81 CoinAbcStack Struct Reference

3.81.1 Detailed Description

Definition at line 71 of file CoinAbcCommonFactorization.hpp.

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

- CoinAbcCommonFactorization.hpp

3.82 CoinAbcStatistics Struct Reference

3.82.1 Detailed Description

Definition at line 32 of file CoinAbcCommonFactorization.hpp.

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

- CoinAbcCommonFactorization.hpp

3.83 CoinAbcThreadInfo Struct Reference

3.83.1 Detailed Description

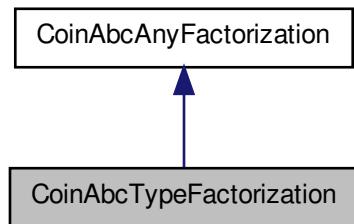
Definition at line 62 of file AbcSimplex.hpp.

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

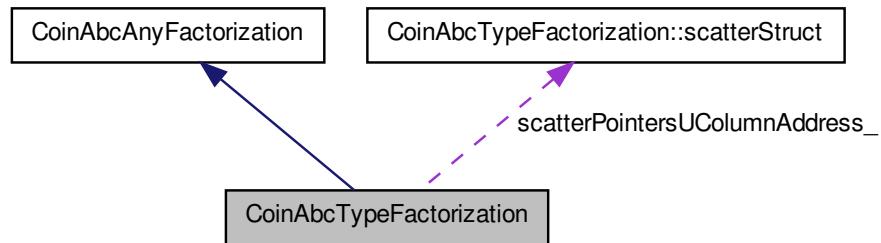
- AbcSimplex.hpp

3.84 CoinAbcTypeFactorization Class Reference

Inheritance diagram for CoinAbcTypeFactorization:



Collaboration diagram for CoinAbcTypeFactorization:



Classes

- struct `scatterStruct`

Public Member Functions

Constructors and destructor and copy

- `CoinAbcTypeFactorization ()`
Default constructor.
- `CoinAbcTypeFactorization (const CoinAbcTypeFactorization &other)`
Copy constructor.
- `CoinAbcTypeFactorization (const CoinFactorization &other)`
Copy constructor.
- virtual `~CoinAbcTypeFactorization ()`
Destructor.
- virtual `CoinAbcAnyFactorization * clone () const`
Clone.
- void `almostDestructor ()`
Delete all stuff (leaves as after CoinAbcFactorization()).
- void `show_self () const`

Debug show object (shows one representation).

- void `sort () const`
Debug - sort so can compare.
- `CoinAbcTypeFactorization & operator= (const CoinAbcTypeFactorization &other)`
= copy

Do factorization

- `CoinSimplexDouble conditionNumber () const`
Condition number - product of pivots after factorization.

some simple stuff

- `CoinBigIndex numberElementsU () const`
Returns number in U area.
- `void setNumberElementsU (CoinBigIndex value)`
Setss number in U area.
- `CoinBigIndex lengthAreaU () const`
Returns length of U area.
- `CoinBigIndex numberElementsL () const`
Returns number in L area.
- `CoinBigIndex lengthAreaL () const`
Returns length of L area.
- `CoinBigIndex numberElementsR () const`
Returns number in R area.
- `CoinBigIndex numberCompressions () const`
Number of compressions done.
- `virtual CoinBigIndex * starts () const`
Returns pivot row.
- `virtual CoinSimplexInt * numberInRow () const`
Number of entries in each row.
- `virtual CoinSimplexInt * numberInColumn () const`

Number of entries in each column.

- virtual CoinFactorizationDouble * **elements** () const
Returns array to put basis elements in.
- CoinBigIndex * **startColumnR** () const
Start of columns for R.
- CoinFactorizationDouble * **elementU** () const
Elements of U.
- CoinSimplexInt * **indexRowU** () const
Row indices of U.
- CoinBigIndex * **startColumnU** () const
Start of each column in U.
- double * **denseVector** (CoinIndexedVector *vector) const
*Returns double * associated with vector.*
- double * **denseVector** (CoinIndexedVector &vector) const
- const double * **denseVector** (const CoinIndexedVector *vector) const
*Returns double * associated with vector.*
- const double * **denseVector** (const CoinIndexedVector &vector) const
- void **toLongArray** (CoinIndexedVector *vector, int which) const
To a work array and associate vector.
- void **fromLongArray** (CoinIndexedVector *vector) const
From a work array and dis-associate vector.
- void **fromLongArray** (int which) const
From a work array and dis-associate vector.
- void **scan** (CoinIndexedVector *vector) const
Scans region to find nonzeros.

rank one updates which do exist

Array persistence flag If 0 then as now (delete/new) 1 then only do arrays if bigger needed 2 as 1 but give a bit extra if bigger needed

- virtual double **checkReplacePart1** (CoinIndexedVector *regionSparse, int pivotRow)
Checks if can replace one Column to basis, returns update alpha Fills in region for use later partial update already in U.

- virtual double `checkReplacePart1` (CoinIndexedVector *regionSparse, CoinIndexedVector *partialUpdate, int pivotRow)

Checks if can replace one Column to basis, returns update alpha Fills in region for use later partial update in vector.
- virtual int `checkReplacePart2` (int pivotRow, CoinSimplexDouble btranAlpha, double ftranAlpha, double ftAlpha, double acceptablePivot=1.0e-8)

Checks if can replace one Column to basis, returns 0=OK, 1=Probably OK, 2=singular, 3=no room, 5 max pivots.
- virtual void `replaceColumnPart3` (const `AbcSimplex` *model, CoinIndexedVector *regionSparse, CoinIndexedVector *tableauColumn, int pivotRow, double alpha)

Replaces one Column to basis, partial update already in U.
- virtual void `replaceColumnPart3` (const `AbcSimplex` *model, CoinIndexedVector *regionSparse, CoinIndexedVector *tableauColumn, CoinIndexedVector *partialUpdate, int pivotRow, double alpha)

Replaces one Column to basis, partial update in vector.
- void `updatePartialUpdate` (CoinIndexedVector &partialUpdate)

Update partial Ftran by R update.
- virtual bool `wantsTableauColumn` () const

Returns true if wants tableauColumn in replaceColumn.
- int `replaceColumnU` (CoinIndexedVector *regionSparse, CoinBigIndex *deletedPosition, CoinSimplexInt *deletedColumns, CoinSimplexInt pivotRow)

Combines BtranU and store which elements are to be deleted returns number to be deleted.

various uses of factorization (return code number elements)

*** Below this user may not want to know about
 which user may not want to know about (left over from my LP code)

- virtual CoinSimplexInt `updateColumnFT` (CoinIndexedVector ®ionSparse)

Later take out return codes (apart from +- 1 on FT).
- virtual int `updateColumnFTPPart1` (CoinIndexedVector ®ionSparse)
- virtual void `updateColumnFTPPart2` (CoinIndexedVector ®ionSparse)
- virtual void `updateColumnFT` (CoinIndexedVector ®ionSparseFT, CoinIndexedVector &partialUpdate, int which)

Updates one column (FTRAN) Tries to do FT update puts partial update in vector.

- virtual CoinSimplexInt [updateColumn](#) (CoinIndexedVector ®ionSparse) const

This version has same effect as above with FTUpdate==false so number returned is always >=0.

- virtual CoinSimplexInt [updateTwoColumnsFT](#) (CoinIndexedVector ®ionFT, CoinIndexedVector ®ionOther)

Updates one column (FTRAN) from region2 Tries to do FT update number returned is negative if no room.

- virtual CoinSimplexInt [updateColumnTranspose](#) (CoinIndexedVector ®ionSparse) const

Updates one column (BTRAN) from regionSparse2 regionSparse starts as zero and is zero at end Note - if regionSparse2 packed on input - will be packed on output.

- virtual void [updateFullColumn](#) (CoinIndexedVector ®ionSparse) const

Updates one full column (FTRAN).

- virtual void [updateFullColumnTranspose](#) (CoinIndexedVector ®ionSparse) const

Updates one full column (BTRAN).

- virtual void [updateWeights](#) (CoinIndexedVector ®ionSparse) const

Updates one column for dual steepest edge weights (FTRAN).

- virtual void [updateColumnCpu](#) (CoinIndexedVector ®ionSparse, int whichCpu) const

Updates one column (FTRAN).

- virtual void [updateColumnTransposeCpu](#) (CoinIndexedVector ®ionSparse, int whichCpu) const

Updates one column (BTRAN).

- void [unpack](#) (CoinIndexedVector *regionFrom, CoinIndexedVector *regionTo) const

- void [pack](#) (CoinIndexedVector *regionFrom, CoinIndexedVector *regionTo) const

- void [goSparse](#) ()

makes a row copy of L for speed and to allow very sparse problems

- void [goSparse2](#) ()

- virtual void [checkMarkArrays](#) () const

- CoinSimplexInt [sparseThreshold](#) () const

get sparse threshold

- void **sparseThreshold** (CoinSimplexInt value)
set sparse threshold
- void **clearArrays** ()
Get rid of all memory.

used by ClpFactorization

- void **checkSparse** ()
See if worth going sparse.
- void **gutsOfDestructor** (CoinSimplexInt type=1)
The real work of constructors etc 0 just scalars, 1 bit normal.
- void **gutsOfInitialize** (CoinSimplexInt type)
1 bit - tolerances etc, 2 more, 4 dummy arrays
- void **gutsOfCopy** (const CoinAbcTypeFactorization &other)
- void **resetStatistics** ()
Reset all sparsity etc statistics.
- void **printRegion** (const CoinIndexedVector &vector, const char *where)
const

general stuff such as permutation or status

- typedef void(* **scatterUpdate**)(int, CoinFactorizationDouble, const CoinFactorizationDouble *, CoinFactorizationDouble *)
- CoinSimplexInt * **permute** () const
Returns address of permute region.
- virtual CoinSimplexInt * **indices** () const
Returns array to put basis indices in.
- virtual CoinSimplexInt * **pivotColumn** () const
Returns address of pivotColumn region (also used for permuting).
- virtual CoinFactorizationDouble * **pivotRegion** () const
Returns address of pivot region.
- CoinBigIndex * **startRowL** () const
Start of each row in L.

- `CoinBigIndex * startColumnL () const`
Start of each column in L.
- `CoinSimplexInt * indexColumnL () const`
Index of column in row for L.
- `CoinSimplexInt * indexRowL () const`
Row indices of L.
- `CoinFactorizationDouble * elementByRowL () const`
Elements in L (row copy).
- `CoinSimplexInt * pivotLinkedBackwards () const`
Forward and backward linked lists (numberRows_+2).
- `CoinSimplexInt * pivotLinkedForwards () const`
- `CoinSimplexInt * pivotLOrder () const`
- `scatterStruct * scatterUColumn () const`
Array of function pointers PLUS for U Column.
- `CoinSimplexInt * firstCount () const`
For equal counts in factorization.
- `CoinSimplexInt * nextCount () const`
Next Row/Column with count.
- `CoinSimplexInt * lastCount () const`
Previous Row/Column with count.
- `CoinSimplexInt numberOfRowsExtra () const`
Number of Rows after iterating.
- `CoinBigIndex numberL () const`
Number in L.
- `CoinBigIndex baseL () const`
Base of L.
- `CoinSimplexInt maximumRowsExtra () const`
Maximum of Rows after iterating.

- virtual CoinBigIndex **numberElements** () const
Total number of elements in factorization.
- CoinSimplexInt **numberForrestTomlin** () const
Length of FT vector.
- CoinSimplexDouble **adjustedAreaFactor** () const
Returns areaFactor but adjusted for dense.
- CoinSimplexInt **messageLevel** () const
Level of detail of messages.
- void **messageLevel** (CoinSimplexInt value)
- virtual void **maximumPivots** (CoinSimplexInt value)
Set maximum pivots.
- CoinSimplexInt **denseThreshold** () const
Gets dense threshold.
- void **setDenseThreshold** (CoinSimplexInt value)
Sets dense threshold.
- CoinSimplexDouble **maximumCoefficient** () const
Returns maximum absolute value in factorization.
- bool **spaceForForrestTomlin** () const
True if FT update and space.

data

- CoinSimplexInt * **pivotColumnAddress_**
- CoinSimplexInt * **permuteAddress_**
- CoinFactorizationDouble * **pivotRegionAddress_**
- CoinFactorizationDouble * **elementUAddress_**
- CoinSimplexInt * **indexRowUAddress_**
- CoinSimplexInt * **numberInColumnAddress_**
- CoinSimplexInt * **numberInColumnPlusAddress_**
- scatterStruct * **scatterPointersUColumnAddress_**
Array of function pointers.
- CoinFactorizationDouble * **elementUColumnPlusAddress_**

- CoinBigIndex * **startColumnUAddress_**
- CoinBigIndex * **convertRowToColumnUAddress_**
- CoinBigIndex * **convertColumnToRowUAddress_**
- CoinFactorizationDouble * **elementRowUAddress_**
- CoinBigIndex * **startRowUAddress_**
- CoinSimplexInt * **numberInRowAddress_**
- CoinSimplexInt * **indexColumnUAddress_**
- CoinSimplexInt * **firstCountAddress_**
- CoinSimplexInt * **nextCountAddress_**

Next Row/Column with count.

- CoinSimplexInt * **lastCountAddress_**

Previous Row/Column with count.

- CoinSimplexInt * **nextColumnAddress_**
- CoinSimplexInt * **lastColumnAddress_**
- CoinSimplexInt * **nextRowAddress_**
- CoinSimplexInt * **lastRowAddress_**
- CoinSimplexInt * **saveColumnAddress_**
- CoinCheckZero * **markRowAddress_**
- CoinSimplexInt * **listAddress_**
- CoinFactorizationDouble * **elementLAddress_**
- CoinSimplexInt * **indexRowLAddress_**
- CoinBigIndex * **startColumnLAddress_**
- CoinBigIndex * **startRowLAddress_**
- CoinSimplexInt * **pivotLinkedBackwardsAddress_**
- CoinSimplexInt * **pivotLinkedForwardsAddress_**
- CoinSimplexInt * **pivotLOrderAddress_**
- CoinBigIndex * **startColumnRAddress_**
- CoinFactorizationDouble * **elementRAddress_**

Elements of R.

- CoinSimplexInt * **indexRowRAddress_**

Row indices for R.

- CoinSimplexInt * **indexColumnLAddress_**
- CoinFactorizationDouble * **elementByRowLAddress_**
- CoinFactorizationDouble * **denseAreaAddress_**
- CoinFactorizationDouble * **workAreaAddress_**
- CoinSimplexUnsignedInt * **workArea2Address_**
- CoinSimplexInt * **sparseAddress_**
- CoinSimplexInt * **fromSmallToBigRow_**
- CoinSimplexInt * **fromSmallToBigColumn_**

- CoinSimplexInt [numberRowsExtra_](#)
Number of Rows after iterating.
- CoinSimplexInt [maximumRowsExtra_](#)
Maximum number of Rows after iterating.
- CoinSimplexInt [numberRowsSmall_](#)
Size of small inverse.
- CoinSimplexInt [numberGoodL_](#)
Number factorized in L.
- CoinSimplexInt [numberRowsLeft_](#)
Number Rows left (numberRows-numberGood).
- CoinBigIndex [totalElements_](#)
Number of elements in U (to go) or while iterating total overall.
- CoinBigIndex [firstZeroed_](#)
First place in funny copy zeroed out.
- CoinSimplexInt [sparseThreshold_](#)
Below this use sparse technology - if 0 then no L row copy.
- CoinSimplexInt [numberR_](#)
Number in R.
- CoinBigIndex [lengthR_](#)
Length of R stuff.
- CoinBigIndex [lengthAreaR_](#)
length of area reserved for R
- CoinBigIndex [numberL_](#)
Number in L.
- CoinBigIndex [baseL_](#)
Base of L.
- CoinBigIndex [lengthL_](#)
Length of L.

- CoinBigIndex [lengthAreaL_](#)
Length of area reserved for L.
- CoinSimplexInt [numberU_](#)
Number in U.
- CoinBigIndex [maximumU_](#)
Maximum space used in U.
- CoinBigIndex [lengthU_](#)
Length of U.
- CoinBigIndex [lengthAreaU_](#)
Length of area reserved for U.
- CoinBigIndex [lastEntryByColumnU_](#)
Last entry by column for U.
- CoinBigIndex [lastEntryByColumnUPlus_](#)
Last entry by column for U.
- CoinBigIndex [lengthAreaUPlus_](#)
Length of U.
- CoinBigIndex [lastEntryByRowU_](#)
Last entry by row for U.
- CoinSimplexInt [numberTrials_](#)
Number of trials before rejection.
- CoinSimplexInt [leadingDimension_](#)
Leading dimension for dense.
- CoinIntArrayWithLength [pivotColumn_](#)
Pivot order for each Column.
- CoinIntArrayWithLength [permute_](#)
Permutation vector for pivot row order.
- CoinBigIndexArrayWithLength [startRowU_](#)
Start of each Row as pointer.

- CoinIntArrayWithLength [numberInRow_](#)
Number in each Row.
- CoinIntArrayWithLength [numberInColumn_](#)
Number in each Column.
- CoinIntArrayWithLength [numberInColumnPlus_](#)
Number in each Column including pivoted.
- CoinIntArrayWithLength [firstCount_](#)
First Row/Column with count of k, can tell which by offset - Rows then Columns.
- CoinIntArrayWithLength [nextColumn_](#)
Next Column in memory order.
- CoinIntArrayWithLength [lastColumn_](#)
Previous Column in memory order.
- CoinIntArrayWithLength [nextRow_](#)
Next Row in memory order.
- CoinIntArrayWithLength [lastRow_](#)
Previous Row in memory order.
- CoinIntArrayWithLength [saveColumn_](#)
Columns left to do in a single pivot.
- CoinIntArrayWithLength [markRow_](#)
Marks rows to be updated.
- CoinIntArrayWithLength [indexColumnU_](#)
Base address for U (may change).
- CoinFactorizationDoubleArrayWithLength [pivotRegion_](#)
Inverses of pivot values.
- CoinFactorizationDoubleArrayWithLength [elementU_](#)
Elements of U.
- CoinIntArrayWithLength [indexRowU_](#)
Row indices of U.

- CoinBigIndexArrayWithLength [startColumnU_](#)
Start of each column in U.
- CoinArbitraryArrayWithLength [scatterUColumn_](#)
Array of structs for U Column.
- CoinBigIndexArrayWithLength [convertRowToColumnU_](#)
Converts rows to columns in U.
- CoinBigIndexArrayWithLength [convertColumnToRowU_](#)
Converts columns to rows in U.
- CoinFactorizationDoubleArrayWithLength [elementRowU_](#)
Elements of U by row.
- CoinFactorizationDoubleArrayWithLength [elementL_](#)
Elements of L.
- CoinIntArrayWithLength [indexRowL_](#)
Row indices of L.
- CoinBigIndexArrayWithLength [startColumnL_](#)
Start of each column in L.
- CoinFactorizationDoubleArrayWithLength [denseArea_](#)
Dense area.
- CoinFactorizationDoubleArrayWithLength [workArea_](#)
First work area.
- CoinUnsignedIntArrayWithLength [workArea2_](#)
Second work area.
- CoinBigIndexArrayWithLength [startRowL_](#)
Start of each row in L.
- CoinIntArrayWithLength [indexColumnL_](#)
Index of column in row for L.
- CoinFactorizationDoubleArrayWithLength [elementByRowL_](#)
Elements in L (row copy).

- CoinIntArrayWithLength [sparse_](#)
Sparse regions.
- CoinSimplexInt [messageLevel_](#)
Detail in messages.
- CoinBigIndex [numberCompressions_](#)
Number of compressions done.
- CoinSimplexInt [lastSlack_](#)
- double [ftranCountInput_](#)
To decide how to solve.
- double [ftranCountAfterL_](#)
- double [ftranCountAfterR_](#)
- double [ftranCountAfterU_](#)
- double [ftranAverageAfterL_](#)
- double [ftranAverageAfterR_](#)
- double [ftranAverageAfterU_](#)
- CoinSimplexInt [numberFtranCounts_](#)
- CoinSimplexInt [maximumRows_](#)
Maximum rows (ever) (here to use double alignment).
- double [ftranFTCountInput_](#)
- double [ftranFTCountAfterL_](#)
- double [ftranFTCountAfterR_](#)
- double [ftranFTCountAfterU_](#)
- double [ftranFTAverageAfterL_](#)
- double [ftranFTAverageAfterR_](#)
- double [ftranFTAverageAfterU_](#)
- CoinSimplexInt [numberFtranFTCounts_](#)
- CoinSimplexInt [denseThreshold_](#)
Dense threshold (here to use double alignment).
- double [btranCountInput_](#)
- double [btranCountAfterU_](#)
- double [btranCountAfterR_](#)
- double [btranCountAfterL_](#)
- double [btranAverageAfterU_](#)
- double [btranAverageAfterR_](#)
- double [btranAverageAfterL_](#)
- CoinSimplexInt [numberBtranCounts_](#)
- CoinSimplexInt [maximumMaximumPivots_](#)

Maximum maximum pivots.

- double **ftranFullCountInput_**

To decide how to solve.

- double **ftranFullCountAfterL_**
- double **ftranFullCountAfterR_**
- double **ftranFullCountAfterU_**
- double **ftranFullAverageAfterL_**
- double **ftranFullAverageAfterR_**
- double **ftranFullAverageAfterU_**
- CoinSimplexInt **numberFtranFullCounts_**
- CoinSimplexInt **initialNumberRows_**

Rows first time nonzero.

- double **btranFullCountInput_**

To decide how to solve.

- double **btranFullCountAfterL_**
- double **btranFullCountAfterR_**
- double **btranFullCountAfterU_**
- double **btranFullAverageAfterL_**
- double **btranFullAverageAfterR_**
- double **btranFullAverageAfterU_**
- CoinSimplexInt **numberBtranFullCounts_**
- CoinSimplexInt **state_**

State of saved version and what can be done 0 - nothing saved 1 - saved and can go back to previous save by unwinding 2 - saved - getting on for a full copy higher bits - see ABC_FAC....

- CoinBigIndex **sizeSparseArray_**

Size in bytes of a sparseArray.

- bool **gotLCopy () const**
- void **setNoGotLCopy ()**
- void **setYesGotLCopy ()**
- bool **gotRCopy () const**
- void **setNoGotRCopy ()**
- void **setYesGotRCopy ()**
- bool **gotUCopy () const**
- void **setNoGotUCopy ()**
- void **setYesGotUCopy ()**
- bool **gotSparse () const**
- void **setNoGotSparse ()**
- void **setYesGotSparse ()**

used by factorization

- virtual void [getAreas](#) (CoinSimplexInt numberOfRows, CoinSimplexInt numberColumns, CoinBigIndex maximumL, CoinBigIndex maximumU)
Gets space for a factorization, called by constructors.
- virtual void [preProcess](#) ()
PreProcesses column ordered copy of basis.
- void [preProcess](#) (CoinSimplexInt)
- double [preProcess3](#) ()
Return largest element.
- void [preProcess4](#) ()
- virtual CoinSimplexInt [factor](#) (AbcSimplex *model)
Does most of factorization.
- virtual void [postProcess](#) (const CoinSimplexInt *sequence, CoinSimplexInt *pivotVariable)
Does post processing on valid factorization - putting variables on correct rows.
- virtual void [makeNonSingular](#) (CoinSimplexInt *sequence)
Makes a non-singular basis by replacing variables.
- CoinSimplexInt [replaceColumnPFI](#) (CoinIndexedVector *regionSparse, CoinSimplexInt pivotRow, CoinSimplexDouble alpha)
Replaces one Column to basis for PFI returns 0=OK, 1=Probably OK, 2=singular, 3=no room.
- CoinSimplexInt [factorSparse](#) ()
Does sparse phase of factorization return code is <0 error, 0= finished.
- CoinSimplexInt [factorDense](#) ()
Does dense phase of factorization return code is <0 error, 0= finished.
- bool [pivotOneOtherRow](#) (CoinSimplexInt pivotRow, CoinSimplexInt pivotColumn)
Pivots when just one other row so faster?
- bool [pivotRowSingleton](#) (CoinSimplexInt pivotRow, CoinSimplexInt pivotColumn)
Does one pivot on Row Singleton in factorization.

- void [pivotColumnSingleton](#) (CoinSimplexInt pivotRow, CoinSimplexInt pivotColumn)

Does one pivot on Column Singleton in factorization (can't return false).

- void [afterPivot](#) (CoinSimplexInt pivotRow, CoinSimplexInt pivotColumn)

After pivoting.

- int [wantToGoDense](#) ()

After pivoting - returns true if need to go dense.

- bool [getColumnSpace](#) (CoinSimplexInt iColumn, CoinSimplexInt extraNeeded)

Gets space for one Column with given length, may have to do compression (returns True if successful), also moves existing vector, extraNeeded is over and above present.

- bool [reorderU](#) ()

Reorders U so contiguous and in order (if there is space) Returns true if it could.

- bool [getColumnSpaceIterateR](#) (CoinSimplexInt iColumn, CoinFactorizationDouble value, CoinSimplexInt iRow)

getColumnSpaceIterateR.

- CoinBigIndex [getColumnSpaceIterate](#) (CoinSimplexInt iColumn, CoinFactorizationDouble value, CoinSimplexInt iRow)

getColumnSpaceIterate.

- bool [getRowSpace](#) (CoinSimplexInt iRow, CoinSimplexInt extraNeeded)

Gets space for one Row with given length, may have to do compression (returns True if successful), also moves existing vector.

- bool [getRowSpaceIterate](#) (CoinSimplexInt iRow, CoinSimplexInt extraNeeded)

Gets space for one Row with given length while iterating, may have to do compression (returns True if successful), also moves existing vector.

- void [checkConsistency](#) ()

Checks that row and column copies look OK.

- void [addLink](#) (CoinSimplexInt index, CoinSimplexInt count)

Adds a link in chain of equal counts.

- void [deleteLink](#) (CoinSimplexInt index)

Deletes a link in chain of equal counts.

- void **modifyLink** (CoinSimplexInt index, CoinSimplexInt count)
Modifies links in chain of equal counts.
- void **separateLinks** ()
Separate out links with same row/column count.
- void **separateLinks** (CoinSimplexInt, CoinSimplexInt)
- void **cleanup** ()
Cleans up at end of factorization.
- void **doAddresses** ()
Set up addresses from arrays.
- void **updateColumnL** (CoinIndexedVector *region, **CoinAbcStatistics** &statistics) const
Updates part of column (FTRANL).
- void **updateColumnLDensish** (CoinIndexedVector *region) const
Updates part of column (FTRANL) when densish.
- void **updateColumnLDense** (CoinIndexedVector *region) const
Updates part of column (FTRANL) when dense (i.e. do as inner products).
- void **updateColumnLSparse** (CoinIndexedVector *region) const
Updates part of column (FTRANL) when sparse.
- void **updateColumnR** (CoinIndexedVector *region, **CoinAbcStatistics** &statistics) const
Updates part of column (FTRANR) without FT update.
- bool **storeFT** (const CoinIndexedVector *regionFT)
Store update after doing L and R - retuns false if no room.
- void **updateColumnU** (CoinIndexedVector *region, **CoinAbcStatistics** &statistics) const
Updates part of column (FTRANU).
- void **updateColumnUSparse** (CoinIndexedVector *regionSparse) const
Updates part of column (FTRANU) when sparse.
- void **updateColumnUDensish** (CoinIndexedVector *regionSparse) const
Updates part of column (FTRANU).

- void [updateColumnUDense](#) (CoinIndexedVector *regionSparse) const
Updates part of column (FTRANU) when dense (i.e. do as inner products).
- void [updateTwoColumnsUDensish](#) (CoinSimplexInt &numberNonZero1, CoinFactorizationDouble *COIN_RESTRICT region1, CoinSimplexInt *COIN_RESTRICT index1, CoinSimplexInt &numberNonZero2, CoinFactorizationDouble *COIN_RESTRICT region2, CoinSimplexInt *COIN_RESTRICT index2) const
Updates part of 2 columns (FTRANU) real work.
- void [updateColumnPFI](#) (CoinIndexedVector *regionSparse) const
Updates part of column PFI (FTRAN) (after rest).
- void [updateColumnTransposePFI](#) (CoinIndexedVector *region) const
Updates part of column transpose PFI (BTRAN) (before rest).
- void [updateColumnTransposeU](#) (CoinIndexedVector *region, CoinSimplexInt smallestIndex, [CoinAbcStatistics](#) &statistics) const
Updates part of column transpose (BTRANU), assumes index is sorted i.e.
- void [updateColumnTransposeUDensish](#) (CoinIndexedVector *region, CoinSimplexInt smallestIndex) const
Updates part of column transpose (BTRANU) when densish, assumes index is sorted i.e.
- void [updateColumnTransposeUSparse](#) (CoinIndexedVector *region) const
Updates part of column transpose (BTRANU) when sparse, assumes index is sorted i.e.
- void [updateColumnTransposeUByColumn](#) (CoinIndexedVector *region, CoinSimplexInt smallestIndex) const
Updates part of column transpose (BTRANU) by column assumes index is sorted i.e.
- void [updateColumnTransposeR](#) (CoinIndexedVector *region, [CoinAbcStatistics](#) &statistics) const
Updates part of column transpose (BTRANR).
- void [updateColumnTransposeRDensish](#) (CoinIndexedVector *region) const
Updates part of column transpose (BTRANR) when dense.
- void [updateColumnTransposeRSparse](#) (CoinIndexedVector *region) const
Updates part of column transpose (BTRANR) when sparse.

- void `updateColumnTransposeL` (CoinIndexedVector *region, `CoinAbcStatistics &statistics`) const
Updates part of column transpose (BTRANL).
- void `updateColumnTransposeLDensish` (CoinIndexedVector *region) const
Updates part of column transpose (BTRANL) when densish by column.
- void `updateColumnTransposeLByRow` (CoinIndexedVector *region) const
Updates part of column transpose (BTRANL) when densish by row.
- void `updateColumnTransposeLSparse` (CoinIndexedVector *region) const
Updates part of column transpose (BTRANL) when sparse (by Row).
- CoinSimplexInt `checkPivot` (CoinSimplexDouble saveFromU, CoinSimplexDouble oldPivot) const
Returns accuracy status of replaceColumn returns 0=OK, 1=Probably OK, 2=singular.
- int `pivot` (CoinSimplexInt pivotRow, CoinSimplexInt pivotColumn, CoinBigIndex pivotRowPosition, CoinBigIndex pivotColumnPosition, CoinFactorizationDouble *COIN_RESTRICT work, CoinSimplexUnsignedInt *COIN_RESTRICT workArea2, CoinSimplexInt increment2, int *COIN_RESTRICT markRow)
0 fine, -99 singular, 2 dense
- int `pivot` (CoinSimplexInt &pivotRow, CoinSimplexInt &pivotColumn, CoinBigIndex pivotRowPosition, CoinBigIndex pivotColumnPosition, int *COIN_RESTRICT markRow)

3.84.1 Detailed Description

Definition at line 28 of file CoinAbcBaseFactorization.hpp.

3.84.2 Member Function Documentation

3.84.2.1 CoinSimplexInt* CoinAbcTypeFactorization::firstCount () const [inline]

For equal counts in factorization.

First Row/Column with count of k, can tell which by offset - Rows then Columns actually comes before nextCount

Definition at line 143 of file CoinAbcBaseFactorization.hpp.

3.84.2.2 virtual CoinBigIndex* CoinAbcTypeFactorization::starts () const [inline, virtual]

Returns pivot row.

Returns work area Returns CoinSimplexInt work area Returns array to put basis starts in

Reimplemented from [CoinAbcAnyFactorization](#).

Definition at line 250 of file CoinAbcBaseFactorization.hpp.

3.84.2.3 virtual CoinSimplexInt CoinAbcTypeFactorization::updateColumnFT (CoinIndexedVector & *regionSparse*) [virtual]

Later take out return codes (apart from +- 1 on FT).

Updates one column (FTRAN) from regionSparse2 Tries to do FT update number returned is negative if no room regionSparse starts as zero and is zero at end. Note - if regionSparse2 packed on input - will be packed on output

Implements [CoinAbcAnyFactorization](#).

3.84.2.4 virtual CoinSimplexInt CoinAbcTypeFactorization::updateTwoColumnsFT (CoinIndexedVector & *regionFT*, CoinIndexedVector & *regionOther*) [virtual]

Updates one column (FTRAN) from region2 Tries to do FT update number returned is negative if no room.

Also updates region3 region1 starts as zero and is zero at end

Implements [CoinAbcAnyFactorization](#).

3.84.2.5 bool CoinAbcTypeFactorization::getColumnSpaceIterateR (CoinSimplexInt *iColumn*, CoinFactorizationDouble *value*, CoinSimplexInt *iRow*) [protected]

getColumnSpaceIterateR.

Gets space for one extra R element in Column may have to do compression (returns true) also moves existing vector

3.84.2.6 `CoinBigIndex CoinAbcTypeFactorization::getColumnSpaceIterate (CoinSimplexInt iColumn, CoinFactorizationDouble value, CoinSimplexInt iRow) [protected]`

getColumnSpaceIterate.

Gets space for one extra U element in Column may have to do compression (returns true) also moves existing vector. Returns -1 if no memory or where element was put
Used by replaceRow (turns off R version)

3.84.2.7 `void CoinAbcTypeFactorization::updateColumnTransposeU (CoinIndexedVector * region, CoinSimplexInt smallestIndex, CoinAbcStatistics & statistics) const [protected]`

Updates part of column transpose (BTRANU), assumes index is sorted i.e.
region is correct

3.84.2.8 `void CoinAbcTypeFactorization::updateColumnTransposeUDensish (CoinIndexedVector * region, CoinSimplexInt smallestIndex) const [protected]`

Updates part of column transpose (BTRANU) when densish, assumes index is sorted i.e.

region is correct

3.84.2.9 `void CoinAbcTypeFactorization::updateColumnTransposeUSparse (CoinIndexedVector * region) const [protected]`

Updates part of column transpose (BTRANU) when sparse, assumes index is sorted i.e.

region is correct

3.84.2.10 void CoinAbcTypeFactorization::updateColumnTransposeUByColumn (CoinIndexedVector * *region*, CoinSimplexInt *smallestIndex*) const [protected]

Updates part of column transpose (BTRANU) by column assumes index is sorted i.e. region is correct

3.84.2.11 CoinSimplexInt CoinAbcTypeFactorization::replaceColumnPFI (CoinIndexedVector * *regionSparse*, CoinSimplexInt *pivotRow*, CoinSimplexDouble *alpha*)

Replaces one Column to basis for PFI returns 0=OK, 1=Probably OK, 2=singular, 3=no room.

In this case region is not empty - it is incoming variable (updated)

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

- CoinAbcBaseFactorization.hpp

3.85 ClpHashValue::CoinHashLink Struct Reference

Data.

```
#include <ClpNode.hpp>
```

3.85.1 Detailed Description

Data.

Definition at line 335 of file ClpNode.hpp.

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

- ClpNode.hpp

3.86 dualColumnResult Struct Reference

3.86.1 Detailed Description

Definition at line 23 of file AbcSimplexDual.hpp.

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

- AbcSimplexDual.hpp

3.87 Idiot Class Reference

This class implements a very silly algorithm.

```
#include <Idiot.hpp>
```

Public Member Functions

- void **solve2** (CoinMessageHandler *handler, const CoinMessages *messages)
Stuff for internal use.

Constructors and destructor

Just a pointer to model is kept

- **Idiot ()**
Default constructor.
- **Idiot** (OsiSolverInterface &model)
Constructor with model.
- **Idiot** (const **Idiot** &)
Copy constructor.
- **Idiot** & **operator=** (const **Idiot** &rhs)
Assignment operator. This copies the data.
- **~Idiot ()**
Destructor.

Algorithmic calls

- void **solve** ()
Get an approximate solution with the idiot code.
- void **crash** (int numberPass, CoinMessageHandler *handler, const CoinMessages *messages, bool doCrossover=true)
Lightweight "crash".

- void **crossOver** (int mode)

Use simplex to get an optimal solution mode is how many steps the simplex crossover should take to arrive to an extreme point: 0 - chosen, all ever used, all 1 - chosen, all 2 - all 3 - do not do anything - maybe basis + 16 do presolves.

Gets and sets of most useful data

- double **getStartingWeight** () const

Starting weight - small emphasizes feasibility, default 1.0e-4.

- void **setStartingWeight** (double value)

- double **getWeightFactor** () const

Weight factor - weight multiplied by this when changes, default 0.333.

- void **setWeightFactor** (double value)

- double **getFeasibilityTolerance** () const

Feasibility tolerance - problem essentially feasible if individual infeasibilities less than this.

- void **setFeasibilityTolerance** (double value)

- double **getReasonablyFeasible** () const

Reasonably feasible.

- void **setReasonablyFeasible** (double value)

- double **getExitInfeasibility** () const

Exit infeasibility - exit if sum of infeasibilities less than this.

- void **setExitInfeasibility** (double value)

- int **getMajorIterations** () const

Major iterations.

- void **setMajorIterations** (int value)

- int **getMinorIterations** () const

Minor iterations.

- void **setMinorIterations** (int value)

- int **getMinorIterations0** () const

- void **setMinorIterations0** (int value)

- int **getReduceIterations** () const

Reduce weight after this many major iterations.

- void **setReduceIterations** (int value)

- int **getLogLevel** () const

Amount of information - default of 1 should be okay.

- void **setLogLevel** (int value)

- int **getLightweight** () const
How lightweight - 0 not, 1 yes, 2 very lightweight.
- void **setLightweight** (int value)
- int **getStrategy** () const
strategy
- void **setStrategy** (int value)
- double **getDropEnoughFeasibility** () const
Fine tuning - okay if feasibility drop this factor.
- void **setDropEnoughFeasibility** (double value)
- double **getDropEnoughWeighted** () const
Fine tuning - okay if weighted obj drop this factor.
- void **setDropEnoughWeighted** (double value)

3.87.1 Detailed Description

This class implements a very silly algorithm. It has no merit apart from the fact that it gets an approximate solution to some classes of problems. Better if vaguely homogeneous. It works on problems where volume algorithm works and often gets a better primal solution but it has no dual solution.

It can also be used as a "crash" to get a problem started. This is probably its most useful function.

It is based on the idea that algorithms with terrible convergence properties may be okay at first. Throw in some random dubious tricks and the resulting code may be worth keeping as long as you don't look at it.

Definition at line 48 of file Idiot.hpp.

3.87.2 Member Function Documentation

3.87.2.1 double Idiot::getFeasibilityTolerance () const [inline]

Feasibility tolerance - problem essentially feasible if individual infeasibilities less than this.

default 0.1

Definition at line 113 of file Idiot.hpp.

3.87.2.2 double Idiot::getReasonablyFeasible () const [inline]

Reasonably feasible.

Dubious method concentrates more on objective when sum of infeasibilities less than this. Very dubious default value of (Number of rows)/20

Definition at line 122 of file Idiot.hpp.

3.87.2.3 double Idiot::getExitInfeasibility () const [inline]

Exit infeasibility - exit if sum of infeasibilities less than this.

Default -1.0 (i.e. switched off)

Definition at line 130 of file Idiot.hpp.

3.87.2.4 int Idiot::getMajorIterations () const [inline]

Major iterations.

stop after this number. Default 30. Use 2-5 for "crash" 50-100 for serious crunching

Definition at line 138 of file Idiot.hpp.

3.87.2.5 int Idiot::getMinorIterations () const [inline]

Minor iterations.

Do this number of tiny steps before deciding whether to change weights etc. Default - dubious sqrt(Number of Rows). Good numbers 105 to 405 say (5 is dubious method of making sure idiot is not trying to be clever which it may do every 10 minor iterations)

Definition at line 150 of file Idiot.hpp.

3.87.2.6 int Idiot::getReduceIterations () const [inline]

Reduce weight after this many major iterations.

It may get reduced before this but this is a maximum. Default 3. 3-10 plausible.

Definition at line 166 of file Idiot.hpp.

3.87.2.7 void Idiot::solve2 (CoinMessageHandler * *handler*, const CoinMessages * *messages*)

Stuff for internal use.

Does actual work

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

- Idiot.hpp

3.88 IdiotResult Struct Reference

for use internally

```
#include <Idiot.hpp>
```

3.88.1 Detailed Description

for use internally

Definition at line 22 of file Idiot.hpp.

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

- Idiot.hpp

3.89 Info Struct Reference

***** DATA to be moved into protected section of [ClpInterior](#)

```
#include <ClpInterior.hpp>
```

3.89.1 Detailed Description

***** DATA to be moved into protected section of [ClpInterior](#)

Definition at line 27 of file ClpInterior.hpp.

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

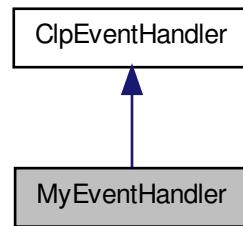
- ClpInterior.hpp

3.90 MyEventHandler Class Reference

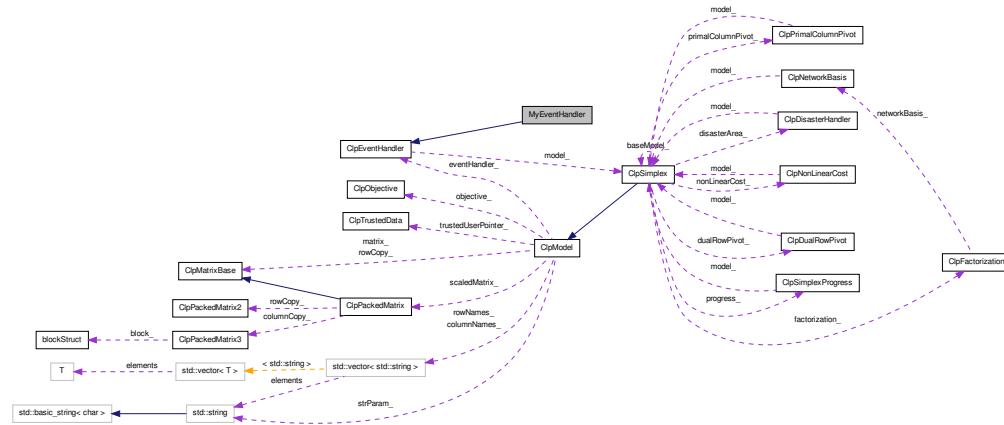
This is so user can trap events and do useful stuff.

```
#include <MyEventHandler.hpp>
```

Inheritance diagram for MyEventHandler:



Collaboration diagram for MyEventHandler:



Public Member Functions

Overrides

- virtual int `event (Event whichEvent)`

This can do whatever it likes.

Constructors, destructor etc

- `MyEventHandler ()`

Default constructor.

- `MyEventHandler (ClpSimplex *model)`

Constructor with pointer to model (redundant as setEventHandler does).

- virtual `~MyEventHandler ()`

Destructor.

- `MyEventHandler (const MyEventHandler &rhs)`

The copy constructor.

- `MyEventHandler & operator= (const MyEventHandler &rhs)`

Assignment.

- virtual `ClpEventHandler * clone () const`

Clone.

3.90.1 Detailed Description

This is so user can trap events and do useful stuff. This is used in Clp/Test/unitTest.cpp
`ClpSimplex` `model_` is available as well as anything else you care to pass in
Definition at line 18 of file MyEventHandler.hpp.

3.90.2 Constructor & Destructor Documentation

3.90.2.1 MyEventHandler::MyEventHandler ()

Default constructor.

3.90.2.2 MyEventHandler::MyEventHandler (const MyEventHandler & rhs)

The copy constructor.

3.90.3 Member Function Documentation

3.90.3.1 virtual int MyEventHandler::event (Event whichEvent) [virtual]

This can do whatever it likes.

If return code -1 then carries on if 0 sets [ClpModel::status\(\)](#) to 5 (stopped by event) and will return to user. At present if <-1 carries on and if >0 acts as if 0 - this may change. For [ClpSolve](#) 2 -> too big return status of -2 and -> too small 3

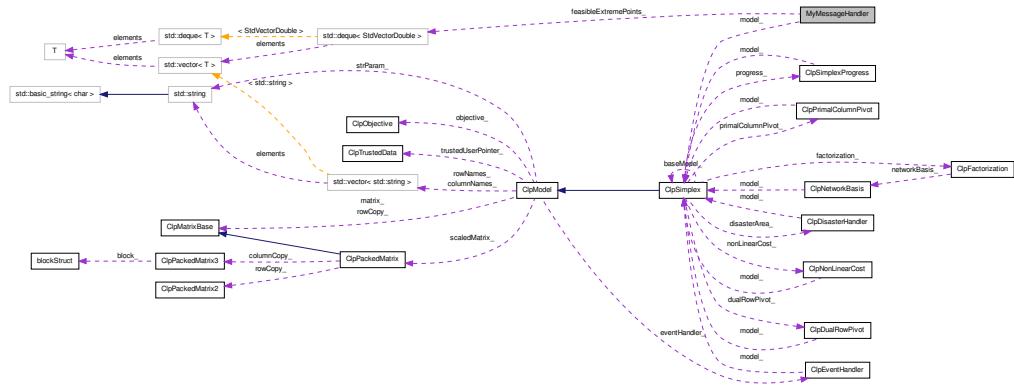
Reimplemented from [ClpEventHandler](#).

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

- MyEventHandler.hpp

3.91 MyMessageHandler Class Reference

Collaboration diagram for MyMessageHandler:



Public Member Functions

Overrides

- virtual int `print ()`

set and get

- const `ClpSimplex * model () const`
Model.
- void `setModel (ClpSimplex *model)`
- const std::deque< StdVectorDouble > & `getFeasibleExtremePoints () const`
Get queue of feasible extreme points.
- void `clearFeasibleExtremePoints ()`
Empty queue of feasible extreme points.

Constructors, destructor

- `MyMessageHandler ()`
Default constructor.
- `MyMessageHandler (ClpSimplex *model, FILE *userPointer=NULL)`
Constructor with pointer to model.
- virtual `~MyMessageHandler ()`
Destructor.

Copy method

- `MyMessageHandler (const MyMessageHandler &)`
The copy constructor.
- `MyMessageHandler (const CoinMessageHandler &)`
The copy constructor from an CoinSimplexMessageHandler.
- `MyMessageHandler & operator= (const MyMessageHandler &)`
- virtual `CoinMessageHandler * clone () const`
Clone.

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `ClpSimplex * model_`
Pointer back to model.
- `std::deque< StdVectorDouble > feasibleExtremePoints_`
Saved extreme points.
- int `iterationNumber_`
Iteration number so won't do same one twice.

3.91.1 Detailed Description

Definition at line 28 of file MyMessageHandler.hpp.

3.91.2 Constructor & Destructor Documentation

3.91.2.1 MyMessageHandler::MyMessageHandler ()

Default constructor.

3.91.2.2 MyMessageHandler::MyMessageHandler (const MyMessageHandler &)

The copy constructor.

3.91.2.3 MyMessageHandler::MyMessageHandler (const CoinMessageHandler &)

The copy constructor from an CoinSimplexMessageHandler.

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

- MyMessageHandler.hpp

3.92 Options Struct Reference

***** DATA to be moved into protected section of [ClpInterior](#)

```
#include <ClpInterior.hpp>
```

3.92.1 Detailed Description

***** DATA to be moved into protected section of [ClpInterior](#)

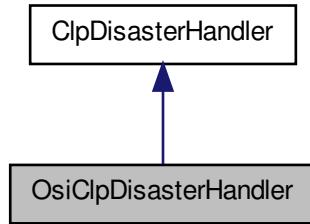
Definition at line 44 of file ClpInterior.hpp.

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

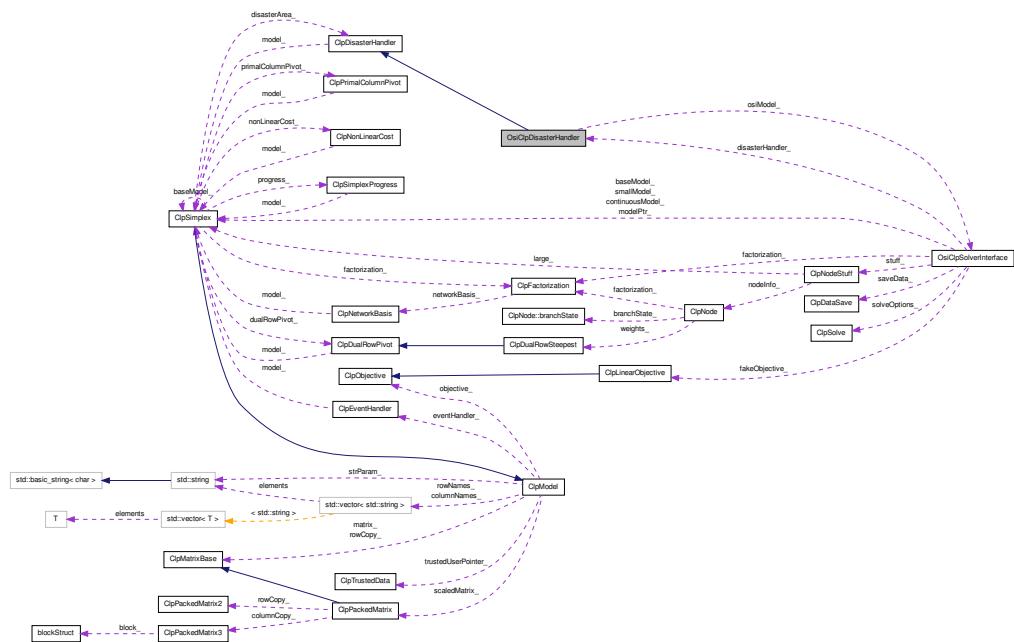
- ClpInterior.hpp

3.93 OsiClpDisasterHandler Class Reference

Inheritance diagram for OsiClpDisasterHandler:



Collaboration diagram for OsiClpDisasterHandler:



Public Member Functions

Virtual methods that the derived classe should provide.

- virtual void `intoSimplex` ()
Into simplex.
- virtual bool `check` () const
Checks if disaster.
- virtual void `saveInfo` ()
saves information for next attempt
- virtual int `typeOfDisaster` ()
Type of disaster 0 can fix, 1 abort.

Constructors, destructor

- `OsiClpDisasterHandler` (`OsiClpSolverInterface` *model=NULL)
Default constructor.
- virtual `~OsiClpDisasterHandler` ()
Destructor.
- `OsiClpDisasterHandler` (`const OsiClpDisasterHandler &`)
- `OsiClpDisasterHandler & operator=` (`const OsiClpDisasterHandler &`)
- virtual `ClpDisasterHandler` * `clone` () const
Clone.

Sets/gets

- void `setOsiModel` (`OsiClpSolverInterface` *model)
set model.
- `OsiClpSolverInterface` * `osiModel` () const
Get model.
- void `setWhereFrom` (int value)
Set where from.
- int `whereFrom` () const
Get where from.
- void `setPhase` (int value)

Set phase.

- int `phase () const`
Get phase.
- bool `inTrouble () const`
are we in trouble

Protected Attributes

Data members

The data members are protected to allow access for derived classes.

- `OsiClpSolverInterface * osiModel_`
Pointer to model.
- int `whereFrom_`
Where from 0 dual (resolve) 1 crunch 2 primal (resolve) 4 dual (initialSolve) 6 primal (initialSolve).
- int `phase_`
phase 0 initial 1 trying continuing with back in and maybe different perturb 2 trying continuing with back in and different scaling 3 trying dual from all slack 4 trying primal from previous stored basis
- bool `inTrouble_`
Are we in trouble.

3.93.1 Detailed Description

Definition at line 1405 of file OsiClpSolverInterface.hpp.

3.93.2 Constructor & Destructor Documentation

3.93.2.1 OsiClpDisasterHandler::OsiClpDisasterHandler (

`OsiClpSolverInterface * model = NULL`)

Default constructor.

3.93.3 Member Function Documentation

3.93.3.1 void OsiClpDisasterHandler::setOsiModel (OsiClpSolverInterface * *model*)

set model.

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

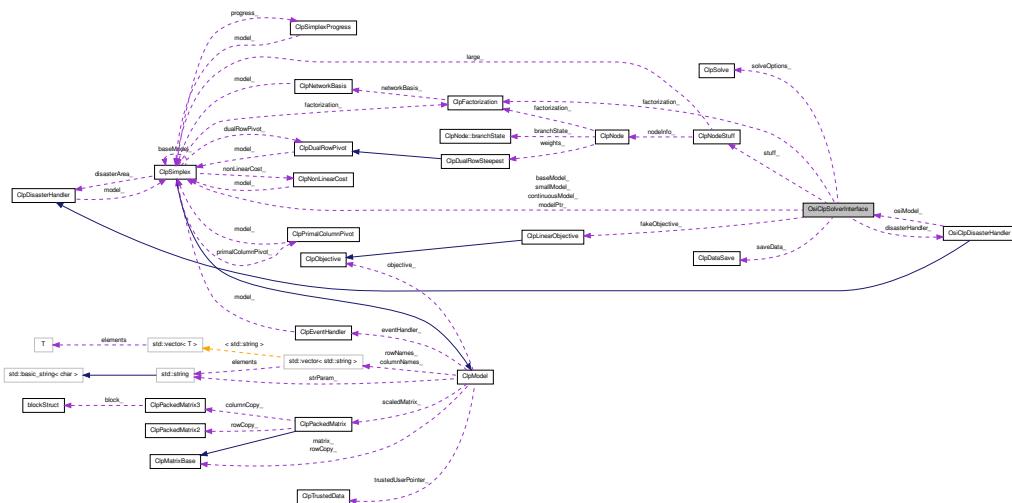
- OsiClpSolverInterface.hpp

3.94 OsiClpSolverInterface Class Reference

Clp Solver Interface.

```
#include <OsiClpSolverInterface.hpp>
```

Collaboration diagram for OsiClpSolverInterface:



Public Member Functions

- virtual void **setObjSense** (double s)

Set objective function sense (1 for min (default), -1 for max,).

- virtual void **setColSolution** (const double *colsol)

Set the primal solution column values.

- virtual void `setRowPrice` (const double *rowprice)

Set dual solution vector.

Solve methods

- virtual void `initialSolve` ()

Solve initial LP relaxation.

- virtual void `resolve` ()

Resolve an LP relaxation after problem modification.

- virtual void `resolveGub` (int needed)

Resolve an LP relaxation after problem modification (try GUB).

- virtual void `branchAndBound` ()

Invoke solver's built-in enumeration algorithm.

- void `crossover` (int options, int basis)

Solve when primal column and dual row solutions are near-optimal options - 0 no presolve (use primal and dual) 1 presolve (just use primal) 2 no presolve (just use primal) basis - 0 use all slack basis 1 try and put some in basis.

OsiSimplexInterface methods

Methods for the Osi Simplex API.

The current implementation should work for both minimisation and maximisation in mode 1 (tableau access). In mode 2 (single pivot), only minimisation is supported as of 100907.

- virtual int `canDoSimplexInterface` () const

Simplex API capability.

- virtual void `enableFactorization` () const

Enables simplex mode 1 (tableau access).

- virtual void `disableFactorization` () const

Undo any setting changes made by `enableFactorization`.

- virtual bool `basisIsAvailable` () const

Returns true if a basis is available AND problem is optimal.

- virtual void `getBasisStatus` (int *cstat, int *rstat) const

The following two methods may be replaced by the methods of OsiSolverInterface using OsiWarmStartBasis if: 1.

- virtual int [setBasisStatus](#) (const int *cstat, const int *rstat)
Set the status of structural/artificial variables and factorize, update solution etc.
- virtual void [getReducedGradient](#) (double *columnReducedCosts, double *duals, const double *c) const
Get the reduced gradient for the cost vector c.
- virtual void [getBInvARow](#) (int row, double *z, double *slack=NULL) const
Get a row of the tableau (slack part in slack if not NULL).
- virtual void [getBInvARow](#) (int row, CoinIndexedVector *z, CoinIndexedVector *slack=NULL, bool keepScaled=false) const
Get a row of the tableau (slack part in slack if not NULL) If keepScaled is true then scale factors not applied after so user has to use coding similar to what is in this method.
- virtual void [getBInvRow](#) (int row, double *z) const
Get a row of the basis inverse.
- virtual void [getBInvACol](#) (int col, double *vec) const
Get a column of the tableau.
- virtual void [getBInvACol](#) (int col, CoinIndexedVector *vec) const
Get a column of the tableau.
- virtual void [getBInvACol](#) (CoinIndexedVector *vec) const
Update (i.e.
- virtual void [getBInvCol](#) (int col, double *vec) const
Get a column of the basis inverse.
- virtual void [getBasics](#) (int *index) const
Get basic indices (order of indices corresponds to the order of elements in a vector returned by [getBInvACol\(\)](#) and [getBInvCol\(\)](#)).
- virtual void [enableSimplexInterface](#) (bool doingPrimal)
Enables simplex mode 2 (individual pivot control).
- void [copyEnabledStuff](#) (OsiClpSolverInterface &rhs)
Copy across enabled stuff from one solver to another.
- virtual void [disableSimplexInterface](#) ()
Undo setting changes made by [enableSimplexInterface](#).

- void **copyEnabledStuff** (*ClpSimplex &rhs*)
Copy across enabled stuff from one solver to another.
- virtual int **pivot** (int *colIn*, int *colOut*, int *outStatus*)
Perform a pivot by substituting a colIn for colOut in the basis.
- virtual int **primalPivotResult** (int *colIn*, int *sign*, int *&colOut*, int *&outStatus*, double *&t*, CoinPackedVector **dx*)
*Obtain a result of the primal pivot Outputs: colOut -- leaving column, outStatus -- its status, t -- step size, and, if dx!=NULL, *dx -- primal ray direction.*
- virtual int **dualPivotResult** (int *&colIn*, int *&sign*, int *colOut*, int *outStatus*, double *&t*, CoinPackedVector **dx*)
*Obtain a result of the dual pivot (similar to the previous method) Differences: entering variable and a sign of its change are now the outputs, the leaving variable and its status -- the inputs If dx!=NULL, then *dx contains dual ray Return code: same.*

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the clp algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

- bool **setIntParam** (*OsiIntParam key*, int *value*)
- bool **setDblParam** (*OsiDblParam key*, double *value*)
- bool **setStrParam** (*OsiStrParam key*, const std::string &*value*)
- bool **getIntParam** (*OsiIntParam key*, int &*value*) const
- bool **getDblParam** (*OsiDblParam key*, double &*value*) const
- bool **getStrParam** (*OsiStrParam key*, std::string &*value*) const
- virtual bool **setHintParam** (*OsiHintParam key*, bool *yesNo=true*, OsiHintStrength *strength=OsiHintTry*, void **otherInformation=NULL*)

Methods returning info on how the solution process terminated

- virtual bool **isAbandoned** () const
Are there any numerical difficulties?

- virtual bool `isProvenOptimal () const`
Is optimality proven?
- virtual bool `isProvenPrimalInfeasible () const`
Is primal infeasibility proven?
- virtual bool `isProvenDualInfeasible () const`
Is dual infeasibility proven?
- virtual bool `isPrimalObjectiveLimitReached () const`
Is the given primal objective limit reached?
- virtual bool `isDualObjectiveLimitReached () const`
Is the given dual objective limit reached?
- virtual bool `isIterationLimitReached () const`
Iteration limit reached?

WarmStart related methods

- virtual CoinWarmStart * `getEmptyWarmStart () const`
Get an empty warm start object.
- virtual CoinWarmStart * `getWarmStart () const`
Get warmstarting information.
- CoinWarmStartBasis * `getPointerToWarmStart ()`
Get warmstarting information.
- const CoinWarmStartBasis * `getConstPointerToWarmStart () const`
Get warmstarting information.
- virtual bool `setWarmStart (const CoinWarmStart *warmstart)`
Set warmstarting information.
- virtual CoinWarmStart * `getPointerToWarmStart (bool &mustDelete)`
Get warm start information.

Hotstart related methods (primarily used in strong branching).

The user can create a hotstart (a snapshot) of the optimization process then reoptimize over and over again always starting from there.

NOTE: between hotstarted optimizations only bound changes are allowed.

- virtual void **markHotStart** ()

Create a hotstart point of the optimization process.
- virtual void **solveFromHotStart** ()

Optimize starting from the hotstart.
- virtual void **unmarkHotStart** ()

Delete the snapshot.
- int **startFastDual** (int options)

Start faster dual - returns negative if problems 1 if infeasible, Options to pass to solver 1 - create external reduced costs for columns 2 - create external reduced costs for rows 4 - create external row activity (columns always done) Above only done if feasible When set resolve does less work.
- void **stopFastDual** ()

Stop fast dual.
- void **setStuff** (double tolerance, double increment)

Sets integer tolerance and increment.

Methods related to querying the input data

- virtual int **getNumCols** () const

Get number of columns.
- virtual int **getNumRows** () const

Get number of rows.
- virtual int **getNumElements** () const

Get number of nonzero elements.
- virtual std::string **getRowName** (int rowIndex, unsigned maxLen=static_cast<unsigned>(std::string::npos)) const

Return name of row if one exists or Rnnnnnnn maxLen is currently ignored and only there to match the signature from the base class!
- virtual std::string **getColName** (int colIndex, unsigned maxLen=static_cast<unsigned>(std::string::npos)) const

Return name of column if one exists or Cnnnnnnn maxLen is currently ignored and only there to match the signature from the base class!
- virtual const double * **getColLower** () const

Get pointer to array[getNumCols()] of column lower bounds.

- virtual const double * [getColUpper](#) () const
Get pointer to array[getNumCols()] of column upper bounds.
- virtual const char * [getRowSense](#) () const
Get pointer to array[getNumRows()] of row constraint senses.
- virtual const double * [getRightHandSide](#) () const
Get pointer to array[getNumRows()] of rows right-hand sides.
- virtual const double * [getRowRange](#) () const
Get pointer to array[getNumRows()] of row ranges.
- virtual const double * [getRowLower](#) () const
Get pointer to array[getNumRows()] of row lower bounds.
- virtual const double * [getRowUpper](#) () const
Get pointer to array[getNumRows()] of row upper bounds.
- virtual const double * [getObjCoefficients](#) () const
Get pointer to array[getNumCols()] of objective function coefficients.
- virtual double [getObjSense](#) () const
Get objective function sense (1 for min (default), -1 for max).
- virtual bool [isContinuous](#) (int colNumber) const
Return true if column is continuous.
- virtual bool [isBinary](#) (int colIndex) const
Return true if variable is binary.
- virtual bool [isInteger](#) (int colIndex) const
Return true if column is integer.
- virtual bool [isIntegerNonBinary](#) (int colIndex) const
Return true if variable is general integer.
- virtual bool [isFreeBinary](#) (int colIndex) const
Return true if variable is binary and not fixed at either bound.
- virtual const char * [getColType](#) (bool refresh=false) const
Return array of column length 0 - continuous 1 - binary (may get fixed later) 2 - general integer (may get fixed later).
- bool [isOptionalInteger](#) (int colIndex) const
Return true if column is integer but does not have to be declared as such.

- void [setOptionalInteger](#) (int index)
Set the index-th variable to be an optional integer variable.
- virtual const CoinPackedMatrix * [getMatrixByRow](#) () const
Get pointer to row-wise copy of matrix.
- virtual const CoinPackedMatrix * [getMatrixByCol](#) () const
Get pointer to column-wise copy of matrix.
- virtual CoinPackedMatrix * [getMutableMatrixByCol](#) () const
Get pointer to mutable column-wise copy of matrix.
- virtual double [getInfinity](#) () const
Get solver's value for infinity.

Methods related to querying the solution

- virtual const double * [getColSolution](#) () const
Get pointer to array[[getNumCols\(\)](#)] of primal solution vector.
- virtual const double * [getRowPrice](#) () const
Get pointer to array[[getNumRows\(\)](#)] of dual prices.
- virtual const double * [getReducedCost](#) () const
Get a pointer to array[[getNumCols\(\)](#)] of reduced costs.
- virtual const double * [getRowActivity](#) () const
Get pointer to array[[getNumRows\(\)](#)] of row activity levels (constraint matrix times the solution vector).
- virtual double [getObjValue](#) () const
Get objective function value.
- virtual int [getIterationCount](#) () const
Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver).
- virtual std::vector< double * > [getDualRays](#) (int maxNumRays, bool full-Ray=false) const
Get as many dual rays as the solver can provide.
- virtual std::vector< double * > [getPrimalRays](#) (int maxNumRays) const
Get as many primal rays as the solver can provide.

Changing bounds on variables and constraints

- virtual void `setObjCoeff` (int elementIndex, double elementValue)
Set an objective function coefficient.
- virtual void `setColLower` (int elementIndex, double elementValue)
Set a single column lower bound
Use -DBL_MAX for -infinity.
- virtual void `setColUpper` (int elementIndex, double elementValue)
Set a single column upper bound
Use DBL_MAX for infinity.
- virtual void `setColBounds` (int elementIndex, double lower, double upper)
Set a single column lower and upper bound.
- virtual void `setColSetBounds` (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of columns simultaneously
The default implementation just invokes `setColLower()` and `setColUpper()` over and over again.
- virtual void `setRowLower` (int elementIndex, double elementValue)
Set a single row lower bound
Use -DBL_MAX for -infinity.
- virtual void `setRowUpper` (int elementIndex, double elementValue)
Set a single row upper bound
Use DBL_MAX for infinity.
- virtual void `setRowBounds` (int elementIndex, double lower, double upper)
Set a single row lower and upper bound.
- virtual void `setRowType` (int index, char sense, double rightHandSide, double range)
Set the type of a single row
- virtual void `setRowSetBounds` (const int *indexFirst, const int *indexLast, const double *boundList)
Set the bounds on a number of rows simultaneously
The default implementation just invokes `setRowLower()` and `setRowUpper()` over and over again.
- virtual void `setRowSetTypes` (const int *indexFirst, const int *indexLast, const char *senseList, const double *rhsList, const double *rangeList)
Set the type of a number of rows simultaneously
The default implementation just invokes `setRowType()` over and over again.

- virtual void [setObjective](#) (const double *array)
Set the objective coefficients for all columns array [[getNumCols\(\)](#)] is an array of values for the objective.
- virtual void [setColLower](#) (const double *array)
Set the lower bounds for all columns array [[getNumCols\(\)](#)] is an array of values for the objective.
- virtual void [setColUpper](#) (const double *array)
Set the upper bounds for all columns array [[getNumCols\(\)](#)] is an array of values for the objective.
- virtual void [setRowName](#) (int rowIndex, std::string name)
Set name of row.
- virtual void [setColName](#) (int colIndex, std::string name)
Set name of column.

Integrality related changing methods

- virtual void [setContinuous](#) (int index)
Set the index-th variable to be a continuous variable.
- virtual void [setInteger](#) (int index)
Set the index-th variable to be an integer variable.
- virtual void [setContinuous](#) (const int *indices, int len)
Set the variables listed in indices (which is of length len) to be continuous variables.
- virtual void [setInteger](#) (const int *indices, int len)
Set the variables listed in indices (which is of length len) to be integer variables.
- int [numberSOS](#) () const
Number of SOS sets.
- const CoinSet * [setInfo](#) () const
SOS set info.
- virtual int [findIntegersAndSOS](#) (bool justCount)
Identify integer variables and SOS and create corresponding objects.

Methods to expand a problem.

Note that if a column is added then by default it will correspond to a continuous variable.

- virtual void **addCol** (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)
- virtual void **addCol** (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj, std::string name)

Add a named column (primal variable) to the problem.

- virtual void **addCol** (int numberElements, const int *rows, const double *elements, const double collb, const double colub, const double obj)

Add a column (primal variable) to the problem.

- virtual void **addCol** (int numberElements, const int *rows, const double *elements, const double collb, const double colub, const double obj, std::string name)

Add a named column (primal variable) to the problem.

- virtual void **addCols** (const int numcols, const CoinPackedVectorBase *const *cols, const double *collb, const double *colub, const double *obj)

- virtual void **addCols** (const int numcols, const int *columnStarts, const int *rows, const double *elements, const double *collb, const double *colub, const double *obj)

- virtual void **deleteCols** (const int num, const int *colIndices)

- virtual void **addRow** (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)

- virtual void **addRow** (const CoinPackedVectorBase &vec, const double rowlb, const double rowub, std::string name)

Add a named row (constraint) to the problem.

- virtual void **addRow** (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)

- virtual void **addRow** (int numberElements, const int *columns, const double *element, const double rowlb, const double rowub)

Add a row (constraint) to the problem.

- virtual void **addRow** (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng, std::string name)

Add a named row (constraint) to the problem.

- virtual void **addRows** (const int numrows, const CoinPackedVectorBase *const *rows, const double *rowlb, const double *rowub)

- virtual void **addRows** (const int numrows, const CoinPackedVectorBase *const *rows, const char *rowsen, const double *rowrhs, const double *rowrng)

- virtual void **addRows** (const int numrows, const int *rowStarts, const int *columns, const double *element, const double *rowlb, const double *rowub)

- void **modifyCoefficient** (int row, int column, double newElement, bool keepZero=false)

- virtual void **deleteRows** (const int num, const int *rowIndices)
- virtual void **saveBaseModel** ()
If solver wants it can save a copy of "base" (continuous) model here.
- virtual void **restoreBaseModel** (int numberOfRows)
Strip off rows to get to this number of rows.
- virtual void **applyRowCuts** (int numberCuts, const OsiRowCut *cuts)
Apply a collection of row cuts which are all effective.
- virtual void **applyRowCuts** (int numberCuts, const OsiRowCut **cuts)
Apply a collection of row cuts which are all effective.
- virtual ApplyCutsReturnCode **applyCuts** (const OsiCuts &cs, double effectivenessLb=0.0)
Apply a collection of cuts.

Methods to input a problem

- virtual void **loadProblem** (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)
Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void **assignProblem** (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, double *&rowlb, double *&rowub)
Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void **loadProblem** (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)
Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void **assignProblem** (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, char *&rowsen, double *&rowrhs, double *&rowrng)
Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void **loadProblem** (const ClpMatrixBase &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

Just like the other [loadProblem\(\)](#) methods except that the matrix is given as a [ClpMatrixBase](#).

- virtual void [loadProblem](#) (const int numcols, const int numrows, const CoinBigIndex *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

Just like the other [loadProblem\(\)](#) methods except that the matrix is given in a standard column major ordered format (without gaps).

- virtual void [loadProblem](#) (const int numcols, const int numrows, const CoinBigIndex *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)

Just like the other [loadProblem\(\)](#) methods except that the matrix is given in a standard column major ordered format (without gaps).

- virtual int [loadFromCoinModel](#) (CoinModel &modelObject, bool keepSolution=false)

This loads a model from a coinModel object - returns number of errors.

- virtual int [readMps](#) (const char *filename, const char *extension="mps")

Read an mps file from the given filename (defaults to Osi reader) - returns number of errors (see [OsiMpsReader](#) class).

- int [readMps](#) (const char *filename, bool keepNames, bool allowErrors)

Read an mps file from the given filename returns number of errors (see [OsiMpsReader](#) class).

- virtual int [readMps](#) (const char *filename, const char *extension, int &numberSets, CoinSet **&sets)

Read an mps file.

- virtual void [writeMps](#) (const char *filename, const char *extension="mps", double objSense=0.0) const

Write the problem into an mps file of the given filename.

- virtual int [writeMpsNative](#) (const char *filename, const char **rowNames, const char **columnNames, int formatType=0, int numberAcross=2, double objSense=0.0) const

Write the problem into an mps file of the given filename, names may be null.

- virtual int [readLp](#) (const char *filename, const double epsilon=1e-5)

Read file in LP format (with names).

- virtual void [writeLp](#) (const char *filename, const char *extension="lp", double epsilon=1e-5, int numberAcross=10, int decimals=5, double objSense=0.0, bool useRowNames=true) const

Write the problem into an Lp file of the given filename.

- virtual void `writeLp` (FILE *fp, double epsilon=1e-5, int numberAcross=10, int decimals=5, double objSense=0.0, bool useRowNames=true) const

Write the problem into the file pointed to by the parameter fp.

- virtual void `replaceMatrixOptional` (const CoinPackedMatrix &matrix)

I (JJF) am getting annoyed because I can't just replace a matrix.

- virtual void `replaceMatrix` (const CoinPackedMatrix &matrix)

And if it does matter (not used at present).

Message handling (extra for Clp messages).

Normally I presume you would want the same language.

If not then you could use underlying model pointer

- virtual void `passInMessageHandler` (CoinMessageHandler *handler)

Pass in a message handler.

- void `newLanguage` (CoinMessages::Language language)

Set language.

- void `setLanguage` (CoinMessages::Language language)

- void `setLogLevel` (int value)

Set log level (will also set underlying solver's log level).

- void `generateCpp` (FILE *fp)

Create C++ lines to get to current state.

Clp specific public interfaces

- `ClpSimplex * getModelPtr` () const

Get pointer to Clp model.

- `ClpSimplex * swapModelPtr` (ClpSimplex *newModel)

Set pointer to Clp model and return old.

- unsigned int `specialOptions` () const

Get special options.

- void `setSpecialOptions` (unsigned int value)

- int `lastAlgorithm` () const

Last algorithm used , 1 = primal, 2 = dual other unknown.

- void **setLastAlgorithm** (int value)
Set last algorithm used , 1 = primal, 2 = dual other unknown.
- int **cleanupScaling** () const
Get scaling action option.
- void **setCleanupScaling** (int value)
Set Scaling option When scaling is on it is possible that the scaled problem is feasible but the unscaled is not.
- double **smallestElementInCut** () const
Get smallest allowed element in cut.
- void **setSmallestElementInCut** (double value)
Set smallest allowed element in cut.
- double **smallestChangeInCut** () const
Get smallest change in cut.
- void **setSmallestChangeInCut** (double value)
Set smallest change in cut.
- void **setSolveOptions** (const **ClpSolve** &options)
Pass in initial solve options.
- virtual int **tightenBounds** (int lightweight=0)
Tighten bounds - lightweight or very lightweight 0 - normal, 1 lightweight but just integers, 2 lightweight and all.
- virtual CoinBigIndex **getSizeL** () const
Return number of entries in L part of current factorization.
- virtual CoinBigIndex **getSizeU** () const
Return number of entries in U part of current factorization.
- const **OsiClpDisasterHandler** * **disasterHandler** () const
Get disaster handler.
- void **passInDisasterHandler** (**OsiClpDisasterHandler** *handler)
Pass in disaster handler.
- **ClpLinearObjective** * **fakeObjective** () const
Get fake objective.
- void **setFakeObjective** (**ClpLinearObjective** *fakeObjective)
Set fake objective (and take ownership).

- void [setFakeObjective](#) (double *fakeObjective)
Set fake objective.
- void [setupForRepeatedUse](#) (int senseOfAdventure=0, int printOut=0)
Set up solver for repeated use by Osi interface.
- virtual void [synchronizeModel](#) ()
Synchronize model (really if no cuts in tree).
- void [setSpecialOptionsMutable](#) (unsigned int value) const
Set special options in underlying clp solver.

Constructors and destructors

- [OsiClpSolverInterface](#) ()
Default Constructor.
- virtual OsiSolverInterface * [clone](#) (bool copyData=true) const
Clone.
- [OsiClpSolverInterface](#) (const [OsiClpSolverInterface](#) &)
Copy constructor.
- [OsiClpSolverInterface](#) ([ClpSimplex](#) *rhs, bool reallyOwn=false)
Borrow constructor - only delete one copy.
- void [releaseClp](#) ()
Releases so won't error.
- [OsiClpSolverInterface](#) & [operator=](#) (const [OsiClpSolverInterface](#) &rhs)
Assignment operator.
- virtual [~OsiClpSolverInterface](#) ()
Destructor.
- virtual void [reset](#) ()
Resets as if default constructor.

Protected Attributes

Protected member data

- **ClpSimplex * modelPtr_**
Clp model represented by this class instance.

Cached information derived from the OSL model

- **char * rowsense_**
Pointer to dense vector of row sense indicators.
- **double * rhs_**
Pointer to dense vector of row right-hand side values.
- **double * rowrange_**
Pointer to dense vector of slack upper bounds for range constraints (undefined for non-range rows).
- **CoinWarmStartBasis * ws_**
A pointer to the warmstart information to be used in the hotstarts.
- **double * rowActivity_**
also save row and column information for hot starts only used in hotstarts so can be casual
- **double * columnActivity_**
- **ClpNodeStuff stuff_**
Stuff for fast dual.
- **int numberSOS_**
Number of SOS sets.
- **CoinSet * setInfo_**
SOS set info.
- **ClpSimplex * smallModel_**
Alternate model (hot starts) - but also could be permanent and used for crunch.
- **ClpFactorization * factorization_**
factorization for hot starts
- **double smallestElementInCut_**
Smallest allowed element in cut.
- **double smallestChangeInCut_**
Smallest change in cut.
- **double largestAway_**

Largest amount continuous away from bound.

- `char * spareArrays_`
Arrays for hot starts.
- `CoinWarmStartBasis basis_`
Warmstart information to be used in resolves.
- `int itlimOrig_`
The original iteration limit before hotstarts started.
- `int lastAlgorithm_`
Last algorithm used.
- `bool notOwned_`
To say if destructor should delete underlying model.
- `CoinPackedMatrix * matrixByRow_`
Pointer to row-wise copy of problem matrix coefficients.
- `CoinPackedMatrix * matrixByRowAtContinuous_`
Pointer to row-wise copy of continuous problem matrix coefficients.
- `char * integerInformation_`
Pointer to integer information.
- `int * whichRange_`
Pointer to variables for which we want range information. The number is in [0] memory is not owned by OsiClp.
- `bool fakeMinInSimplex_`
Faking min to get proper dual solution signs in simplex API.
- `double * linearObjective_`
Linear objective.
- `ClpDataSave saveData_`
To save data in OsiSimplex stuff.
- `ClpSolve solveOptions_`
Options for initialSolve.
- `int cleanupScaling_`
Scaling option When scaling is on it is possible that the scaled problem is feasible but the unscaled is not.

- `unsigned int specialOptions_`

Special options 0x80000000 off 0 simple stuff for branch and bound 1 try and keep work regions as much as possible 2 do not use any perturbation 4 allow exit before re-factorization 8 try and re-use factorization if no cuts 16 use standard strong branching rather than clp's 32 Just go to first factorization in fast dual 64 try and tighten bounds in crunch 128 Model will only change in column bounds 256 Clean up model before hot start 512 Give user direct access to Clp regions in getBInvARow etc (i.e., do not unscale, and do not return result in getBInv parameters; you have to know where to look for the answer) 1024 Don't "borrow" model in initialSolve 2048 Don't crunch 4096 quick check for optimality Bits above 8192 give where called from in Cbc At present 0 is normal, 1 doing fast hotstarts, 2 is can do quick check 65536 Keep simple i.e.

- `ClpSimplex * baseModel_`

Copy of model when option 131072 set.

- `int lastNumberRows_`

Number of rows when last "scaled".

- `ClpSimplex * continuousModel_`

Continuous model.

- `OsiClpDisasterHandler * disasterHandler_`

Possible disaster handler.

- `ClpLinearObjective * fakeObjective_`

Fake objective.

- `CoinDoubleArrayWithLength rowScale_`

Row scale factors (has inverse at end).

- `CoinDoubleArrayWithLength columnScale_`

Column scale factors (has inverse at end).

Friends

- `void OsiClpSolverInterfaceUnitTest (const std::string &mpsDir, const std::string &netlibDir)`

A function that tests the methods in the `OsiClpSolverInterface` class.

Protected methods

- `void setBasis (const CoinWarmStartBasis &basis)`

Sets up working basis as a copy of input and puts in as basis.

- void **setBasis** ()
Just puts current basis_ into ClpSimplex model.
- CoinWarmStartDiff * **getBasisDiff** (const unsigned char *statusArray) const
Warm start difference from basis_ to statusArray.
- CoinWarmStartBasis * **getBasis** (const unsigned char *statusArray) const
Warm start from statusArray.
- void **deleteScaleFactors** ()
Delete all scale factor stuff and reset option.
- const double * **upRange** () const
If doing fast hot start then ranges are computed.
- const double * **downRange** () const
- void **passInRanges** (int *array)
Pass in range array.
- void **setSOSData** (int numberSOS, const char *type, const int *start, const int *indices, const double *weights=NULL)
Pass in sos stuff from AMPL.
- void **computeLargestAway** ()
Compute largest amount any at continuous away from bound.
- double **largestAway** () const
Get largest amount continuous away from bound.
- void **setLargestAway** (double value)
Set largest amount continuous away from bound.
- void **lexSolve** ()
Sort of lexicographic resolve.
- virtual void **applyRowCut** (const OsiRowCut &rc)
Apply a row cut (append to constraint matrix).
- virtual void **applyColCut** (const OsiColCut &cc)
Apply a column cut (adjust one or more bounds).

- void [gutsOfDestructor \(\)](#)
The real work of a copy constructor (used by copy and assignment).
- void [freeCachedResults \(\) const](#)
Deletes all mutable stuff.
- void [freeCachedResults0 \(\) const](#)
Deletes all mutable stuff for row ranges etc.
- void [freeCachedResults1 \(\) const](#)
Deletes all mutable stuff for matrix etc.
- void [extractSenseRhsRange \(\) const](#)
A method that fills up the rowsense_, rhs_ and rowrange_ arrays.
- void [fillParamMaps \(\)](#)
- CoinWarmStartBasis [getBasis \(ClpSimplex *model\) const](#)
Warm start.
- void [setBasis \(const CoinWarmStartBasis &basis, ClpSimplex *model\)](#)
Sets up working basis as a copy of input.
- void [crunch \(\)](#)
Crunch down problem a bit.
- void [redoScaleFactors \(int numberOfRows, const CoinBigIndex *starts, const int *indices, const double *elements\)](#)
Extend scale factors.

3.94.1 Detailed Description

Clp Solver Interface. Instantiation of [OsiClpSolverInterface](#) for the Model Algorithm.
Definition at line 38 of file OsiClpSolverInterface.hpp.

3.94.2 Member Function Documentation

3.94.2.1 virtual int OsiClpSolverInterface::canDoSimplexInterface () const [virtual]

Simplex API capability.

Returns

- 0 if no simplex API
- 1 if can just do getBInv etc
- 2 if has all OsiSimplex methods

3.94.2.2 virtual void OsiClpSolverInterface::enableFactorization () const [virtual]

Enables simplex mode 1 (tableau access).

Tells solver that calls to getBInv etc are about to take place. Underlying code may need mutable as this may be called from CglCut::generateCuts which is const. If that is too horrific then each solver e.g. BCP or CBC will have to do something outside main loop.

3.94.2.3 virtual bool OsiClpSolverInterface::basisIsAvailable () const [virtual]

Returns true if a basis is available AND problem is optimal.

This should be used to see if the BInvARow type operations are possible and meaningful.

3.94.2.4 virtual void OsiClpSolverInterface::getBasisStatus (int * cstat, int * rstat) const [virtual]

The following two methods may be replaced by the methods of OsiSolverInterface using OsiWarmStartBasis if: 1.

OsiWarmStartBasis resize operation is implemented more efficiently and 2. It is ensured that effects on the solver are the same

Returns a basis status of the structural/artificial variables At present as warm start i.e 0 free, 1 basic, 2 upper, 3 lower

NOTE artificial are treated as +1 elements so for \leq rhs artificial will be at lower bound if constraint is tight

This means that Clpsimplex flips artificial as it works in terms of row activities

3.94.2.5 virtual int OsiClpSolverInterface::setBasisStatus (const int * *cstat*, const int * *rstat*) [virtual]

Set the status of structural/artificial variables and factorize, update solution etc.

NOTE artificials are treated as +1 elements so for \leq rhs artificial will be at lower bound if constraint is tight

This means that Clpsimplex flips artificials as it works in terms of row activities Returns 0 if OK, 1 if problem is bad e.g. duplicate elements, too large ...

3.94.2.6 virtual void OsiClpSolverInterface::getBInvACol (CoinIndexedVector * *vec*) const [virtual]

Update (i.e.

ftran) the vector passed in. Unscaling is applied after - can't be applied before

3.94.2.7 virtual void OsiClpSolverInterface::enableSimplexInterface (bool *doingPrimal*) [virtual]

Enables simplex mode 2 (individual pivot control).

This method is supposed to ensure that all typical things (like reduced costs, etc.) are updated when individual pivots are executed and can be queried by other methods.

3.94.2.8 virtual int OsiClpSolverInterface::pivot (int *colIn*, int *colOut*, int *outStatus*) [virtual]

Perform a pivot by substituting a colIn for colOut in the basis.

The status of the leaving variable is given in statOut. Where 1 is to upper bound, -1 to lower bound Return code is 0 for okay, 1 if inaccuracy forced re-factorization (should be okay) and -1 for singular factorization

3.94.2.9 virtual int OsiClpSolverInterface::primalPivotResult (int *colIn*, int *sign*, int & *colOut*, int & *outStatus*, double & *t*, CoinPackedVector * *dx*) [virtual]

Obtain a result of the primal pivot Outputs: colOut -- leaving column, outStatus -- its status, t -- step size, and, if dx!=NULL, *dx -- primal ray direction.

Inputs: colIn -- entering column, sign -- direction of its change (+/-1). Both for colIn and colOut, artificial variables are index by the negative of the row index minus 1. Return code (for now): 0 -- leaving variable found, -1 -- everything else? Clearly, more informative set of return values is required Primal and dual solutions are updated

3.94.2.10 virtual CoinWarmStart* OsiClpSolverInterface::getEmptyWarmStart () const [virtual]

Get an empty warm start object.

This routine returns an empty CoinWarmStartBasis object. Its purpose is to provide a way to give a client a warm start basis object of the appropriate type, which can be resized and modified as desired.

3.94.2.11 virtual bool OsiClpSolverInterface::setWarmStart (const CoinWarmStart * *warmstart*) [virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

3.94.2.12 virtual CoinWarmStart* OsiClpSolverInterface::getPointerToWarmStart (bool & *mustDelete*) [virtual]

Get warm start information.

Return warm start information for the current state of the solver interface. If there is no valid warm start information, an empty warm start object will be returned. This does not necessarily create an object - may just point to one. must Delete set true if user should delete returned object. OsiClp version always returns pointer and false.

3.94.2.13 virtual const char* OsiClpSolverInterface::getRowSense () const [virtual]

Get pointer to array[getNumRows()] of row constraint senses.

- 'L' <= constraint
- 'E' = constraint
- 'G' >= constraint
- 'R' ranged constraint
- 'N' free constraint

3.94.2.14 virtual const double* OsiClpSolverInterface::getRightHandSide () const [virtual]

Get pointer to array[getNumRows()] of rows right-hand sides.

- if rowsense()[i] == 'L' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'G' then rhs()[i] == rowlower()[i]
- if rowsense()[i] == 'R' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'N' then rhs()[i] == 0.0

3.94.2.15 virtual const double* OsiClpSolverInterface::getRowRange () const [virtual]

Get pointer to array[getNumRows()] of row ranges.

- if rowsense()[i] == 'R' then rowrange()[i] == rowupper()[i] - rowlower()[i]
- if rowsense()[i] != 'R' then rowrange()[i] is undefined

3.94.2.16 virtual bool OsiClpSolverInterface::isInteger (int colIndex) const [virtual]

Return true if column is integer.

Note: This function returns true if the the column is binary or a general integer.

3.94.2.17 bool OsiClpSolverInterface::isOptionalInteger (int *colIndex*) const

Return true if column is integer but does not have to be declared as such.

Note: This function returns true if the the column is binary or a general integer.

**3.94.2.18 virtual int OsiClpSolverInterface::getIterationCount () const
[inline, virtual]**

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.

Definition at line 502 of file OsiClpSolverInterface.hpp.

3.94.2.19 virtual std::vector<double*> OsiClpSolverInterface::getDualRays (int *maxNumRays*, bool *fullRay* = *false*) const [virtual]

Get as many dual rays as the solver can provide.

(In case of proven primal infeasibility there should be at least one.)

The first `getNumRows()` ray components will always be associated with the row duals (as returned by `getRowPrice()`). If `fullRay` is true, the final `getNumCols()` entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length `getNumRows()` and they should be allocated via `new[]`.

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using `delete[]`.

3.94.2.20 virtual std::vector<double*> OsiClpSolverInterface::getPrimalRays (int *maxNumRays*) const [virtual]

Get as many primal rays as the solver can provide.

(In case of proven dual infeasibility there should be at least one.)

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length `getNumCols()` and they should be allocated via `new[]`.

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using `delete[]`.

**3.94.2.21 virtual void OsiClpSolverInterface::setColLower (int *elementIndex*,
double *elementType*) [virtual]**

Set a single column lower bound

Use -DBL_MAX for -infinity.

**3.94.2.22 virtual void OsiClpSolverInterface::setColUpper (int *elementIndex*,
double *elementType*) [virtual]**

Set a single column upper bound

Use DBL_MAX for infinity.

**3.94.2.23 virtual void OsiClpSolverInterface::setColSetBounds (const int
* *indexFirst*, const int * *indexLast*, const double * *boundList*)
[virtual]**

Set the bounds on a number of columns simultaneously

The default implementation just invokes `setColLower()` and `setColUpper()` over and over again.

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes

boundList the new lower/upper bound pairs for the variables

**3.94.2.24 virtual void OsiClpSolverInterface::setRowLower (int
elementIndex, double elementType) [virtual]**

Set a single row lower bound

Use -DBL_MAX for -infinity.

3.94.2.25 virtual void OsiClpSolverInterface::setRowLower (int *elementIndex*, double *elementValue*) [virtual]

Set a single row upper bound

Use DBL_MAX for infinity.

3.94.2.26 virtual void OsiClpSolverInterface::setRowSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [virtual]

Set the bounds on a number of rows simultaneously

The default implementation just invokes [setRowLower\(\)](#) and [setRowUpper\(\)](#) over and over again.

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the constraints whose *either* bound changes

boundList the new lower/upper bound pairs for the constraints

3.94.2.27 virtual void OsiClpSolverInterface::setRowSetTypes (const int * *indexFirst*, const int * *indexLast*, const char * *senseList*, const double * *rhsList*, const double * *rangeList*) [virtual]

Set the type of a number of rows simultaneously

The default implementation just invokes [setRowType\(\)](#) over and over again.

Parameters

indexFirst,*indexLast* pointers to the beginning and after the end of the array of the indices of the constraints whose *any* characteristics changes

senseList the new senses

rhsList the new right hand sides

rangeList the new ranges

**3.94.2.28 virtual void OsiClpSolverInterface::setObjective (const double *
array) [virtual]**

Set the objective coefficients for all columns array [[getNumCols\(\)](#)] is an array of values for the objective.

This defaults to a series of set operations and is here for speed.

**3.94.2.29 virtual void OsiClpSolverInterface::setColLower (const double *
array) [virtual]**

Set the lower bounds for all columns array [[getNumCols\(\)](#)] is an array of values for the objective.

This defaults to a series of set operations and is here for speed.

**3.94.2.30 virtual void OsiClpSolverInterface::setColUpper (const double *
array) [virtual]**

Set the upper bounds for all columns array [[getNumCols\(\)](#)] is an array of values for the objective.

This defaults to a series of set operations and is here for speed.

**3.94.2.31 virtual int OsiClpSolverInterface::findIntegersAndSOS (bool
justCount) [virtual]**

Identify integer variables and SOS and create corresponding objects.

Record integer variables and create an OsiSimpleInteger object for each one. All existing OsiSimpleInteger objects will be destroyed. If the solver supports SOS then do the same for SOS. If justCount then no objects created and we just store numberIntegers_ Returns number of SOS

**3.94.2.32 virtual void OsiClpSolverInterface::setColSolution (const double *
colsol) [virtual]**

Set the primal solution column values.

colsol[numcols()] is an array of values of the problem column variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of colsol() until changed by another call to setColsol() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

**3.94.2.33 virtual void OsiClpSolverInterface::setRowPrice (const double *
rowprice) [virtual]**

Set dual solution vector.

rowprice[numrows()] is an array of values of the problem row dual variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of rowprice() until changed by another call to setRowprice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

**3.94.2.34 virtual void OsiClpSolverInterface::addCol (int numberElements,
const int * rows, const double * elements, const double collb, const
double colub, const double obj) [virtual]**

Add a column (primal variable) to the problem.

**3.94.2.35 virtual void OsiClpSolverInterface::addRow (const
CoinPackedVectorBase & vec, const double rowlb, const double
rowub, std::string name) [virtual]**

Add a named row (constraint) to the problem.

The default implementation adds the row, then changes the name. This can surely be made more efficient within an OsiXXX class.

**3.94.2.36 virtual void OsiClpSolverInterface::addRow (int numberElements,
const int * columns, const double * element, const double rowlb,
const double rowub) [virtual]**

Add a row (constraint) to the problem.

3.94.2.37 virtual void OsiClpSolverInterface::restoreBaseModel (int numberRows) [virtual]

Strip off rows to get to this number of rows.

If solver wants it can restore a copy of "base" (continuous) model here

3.94.2.38 virtual void OsiClpSolverInterface::applyRowCuts (int numberCuts, const OsiRowCut * cuts) [virtual]

Apply a collection of row cuts which are all effective.

applyCuts seems to do one at a time which seems inefficient.

3.94.2.39 virtual void OsiClpSolverInterface::applyRowCuts (int numberCuts, const OsiRowCut ** cuts) [virtual]

Apply a collection of row cuts which are all effective.

applyCuts seems to do one at a time which seems inefficient. This uses array of pointers

3.94.2.40 virtual ApplyCutsReturnCode OsiClpSolverInterface::applyCuts (const OsiCuts & cs, double effectivenessLb = 0.0) [virtual]

Apply a collection of cuts.

Only cuts which have an effectiveness \geq effectivenessLb are applied.

- ReturnCode.getNumineffective() -- number of cuts which were not applied because they had an effectiveness $<$ effectivenessLb
- ReturnCode.getNuminconsistent() -- number of invalid cuts
- ReturnCode.getNuminconsistentWrtIntegerModel() -- number of cuts that are invalid with respect to this integer model
- ReturnCode.getNuminfeasible() -- number of cuts that would make this integer model infeasible
- ReturnCode.getNumApplied() -- number of integer cuts which were applied to the integer model

- `cs.size() == getNumineffective() + getNuminconsistent() + getNuminconsistentWrtIntegerModel() + getNuminfeasible() + getNumApplied()`

3.94.2.41 `virtual void OsiClpSolverInterface::loadProblem (const CoinPackedMatrix & matrix, const double * collb, const double * colub, const double * obj, const double * rowlb, const double * rowub) [virtual]`

Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

If a pointer is NULL then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

3.94.2.42 `virtual void OsiClpSolverInterface::assignProblem (CoinPackedMatrix *& matrix, double *& collb, double *& colub, double *& obj, double *& rowlb, double *& rowub) [virtual]`

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

3.94.2.43 `virtual void OsiClpSolverInterface::loadProblem (const CoinPackedMatrix & matrix, const double * collb, const double * colub, const double * obj, const char * rowsen, const double * rowrhs, const double * rowrng) [virtual]`

Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

If a pointer is NULL then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are \geq
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

3.94.2.44 virtual void OsiClpSolverInterface::assignProblem (
`CoinPackedMatrix *& matrix, double *& collb, double *& colub,`
`double *& obj, char *& rowsen, double *& rowrhs, double *&`
`rowrng) [virtual]`

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

3.94.2.45 virtual void OsiClpSolverInterface::loadProblem (const
`ClpMatrixBase & matrix, const double * collb, const double *`
`colub, const double * obj, const double * rowlb, const double *`
`rowub) [virtual]`

Just like the other `loadProblem()` methods except that the matrix is given as a `ClpMatrixBase`.

3.94.2.46 virtual void OsiClpSolverInterface::loadProblem (const int
`numcols, const int numrows, const CoinBigIndex * start, const int *`
`index, const double * value, const double * collb, const double *`
`colub, const double * obj, const double * rowlb, const double *`
`rowub) [virtual]`

Just like the other [loadProblem\(\)](#) methods except that the matrix is given in a standard column major ordered format (without gaps).

3.94.2.47 `virtual void OsiClpSolverInterface::loadProblem (const int numcols, const int numrows, const CoinBigIndex * start, const int * index, const double * value, const double * collb, const double * colub, const double * obj, const char * rowsen, const double * rowrhs, const double * rowrng) [virtual]`

Just like the other [loadProblem\(\)](#) methods except that the matrix is given in a standard column major ordered format (without gaps).

3.94.2.48 `virtual void OsiClpSolverInterface::writeMps (const char * filename, const char * extension = "mps", double objSense = 0.0) const [virtual]`

Write the problem into an mps file of the given filename.

If objSense is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants

3.94.2.49 `virtual int OsiClpSolverInterface::writeMpsNative (const char * filename, const char ** rowNames, const char ** columnNames, int formatType = 0, int numberAcross = 2, double objSense = 0.0) const [virtual]`

Write the problem into an mps file of the given filename, names may be null.

formatType is 0 - normal 1 - extra accuracy 2 - IEEE hex (later)

Returns non-zero on I/O error

3.94.2.50 `virtual void OsiClpSolverInterface::writeLp (const char * filename, const char * extension = "lp", double epsilon = 1e-5, int numberAcross = 10, int decimals = 5, double objSense = 0.0, bool useRowNames = true) const [virtual]`

Write the problem into an Lp file of the given filename.

If objSense is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants. This version calls writeLpNative with names

```
3.94.2.51 virtual void OsiClpSolverInterface::writeLp ( FILE * fp, double  
epsilon = 1e-5, int numberAcross = 10, int decimals = 5, double  
objSense = 0.0, bool useRowNames = true ) const [virtual]
```

Write the problem into the file pointed to by the parameter fp.

Other parameters are similar to those of [writeLp\(\)](#) with first parameter filename.

```
3.94.2.52 virtual void OsiClpSolverInterface::replaceMatrixOptional ( const  
CoinPackedMatrix & matrix ) [virtual]
```

I (JJF) am getting annoyed because I can't just replace a matrix.

The default behavior of this is do nothing so only use where that would not matter e.g. strengthening a matrix for MIP

```
3.94.2.53 virtual void OsiClpSolverInterface::passInMessageHandler (   
CoinMessageHandler * handler ) [virtual]
```

Pass in a message handler.

It is the client's responsibility to destroy a message handler installed by this routine; it will not be destroyed when the solver interface is destroyed.

```
3.94.2.54 void OsiClpSolverInterface::setCleanupScaling ( int value )  
[inline]
```

Set Scaling option When scaling is on it is possible that the scaled problem is feasible but the unscaled is not.

Clp returns a secondary status code to that effect. This option allows for a cleanup. If you use it I would suggest 1. This only affects actions when scaled optimal 0 - no action 1 - clean up using dual if primal infeasibility 2 - clean up using dual if dual infeasibility 3 - clean up using dual if primal or dual infeasibility 11,12,13 - as 1,2,3 but use primal

Definition at line 1046 of file OsiClpSolverInterface.hpp.

**3.94.2.55 double OsiClpSolverInterface::smallestElementInCut () const
[inline]**

Get smallest allowed element in cut.

If smaller than this then ignored

Definition at line 1050 of file OsiClpSolverInterface.hpp.

**3.94.2.56 void OsiClpSolverInterface::setSmallestElementInCut (double
value) [inline]**

Set smallest allowed element in cut.

If smaller than this then ignored

Definition at line 1054 of file OsiClpSolverInterface.hpp.

**3.94.2.57 double OsiClpSolverInterface::smallestChangeInCut () const
[inline]**

Get smallest change in cut.

If (upper-lower)*element < this then element is taken out and cut relaxed. (upper-lower) is taken to be at least 1.0 and this is assumed \geq smallestElementInCut_

Definition at line 1062 of file OsiClpSolverInterface.hpp.

**3.94.2.58 void OsiClpSolverInterface::setSmallestChangeInCut (double value
) [inline]**

Set smallest change in cut.

If (upper-lower)*element < this then element is taken out and cut relaxed. (upper-lower) is taken to be at least 1.0 and this is assumed \geq smallestElementInCut_

Definition at line 1070 of file OsiClpSolverInterface.hpp.

3.94.2.59 void OsiClpSolverInterface::setupForRepeatedUse (int *senseOfAdventure* = 0, int *printOut* = 0)

Set up solver for repeated use by Osi interface.

The normal usage does things like keeping factorization around so can be used. Will also do things like keep scaling and row copy of matrix if matrix does not change.

senseOfAdventure:

- 0 - safe stuff as above
- 1 - will take more risks - if it does not work then bug which will be fixed
- 2 - don't bother doing most extreme termination checks e.g. don't bother re-factorizing if less than 20 iterations.
- 3 - Actually safer than 1 (mainly just keeps factorization)

printOut

- -1 always skip round common messages instead of doing some work
- 0 skip if normal defaults
- 1 leaves

3.94.2.60 void OsiClpSolverInterface::setSpecialOptionsMutable (unsigned int *value*) const

Set special options in underlying clp solver.

Safe as const because [modelPtr_](#) is mutable.

3.94.2.61 virtual void OsiClpSolverInterface::applyRowCut (const OsiRowCut & *rc*) [protected, virtual]

Apply a row cut (append to constraint matrix).

3.94.2.62 virtual void OsiClpSolverInterface::applyColCut (const OsiColCut & cc) [protected, virtual]

Apply a column cut (adjust one or more bounds).

3.94.2.63 CoinWarmStartBasis OsiClpSolverInterface::getBasis (ClpSimplex * model) const [protected]

Warm start.

NOTE artificial are treated as +1 elements so for \leq rhs artificial will be at lower bound if constraint is tight

This means that Clpsimplex flips artificial as it works in terms of row activities

3.94.2.64 void OsiClpSolverInterface::setBasis (const CoinWarmStartBasis & basis, ClpSimplex * model) [protected]

Sets up working basis as a copy of input.

NOTE artificial are treated as +1 elements so for \leq rhs artificial will be at lower bound if constraint is tight

This means that Clpsimplex flips artificial as it works in terms of row activities

3.94.3 Friends And Related Function Documentation

3.94.3.1 void OsiClpSolverInterfaceUnitTest (const std::string & mpsDir, const std::string & netlibDir) [friend]

A function that tests the methods in the [OsiClpSolverInterface](#) class.

3.94.4 Member Data Documentation

3.94.4.1 CoinWarmStartBasis* OsiClpSolverInterface::ws_ [mutable, protected]

A pointer to the warmstart information to be used in the hotstarts.

This is NOT efficient and more thought should be given to it...

Definition at line 1268 of file OsiClpSolverInterface.hpp.

3.94.4.2 double OsiClpSolverInterface::smallestElementInCut_ [protected]

Smallest allowed element in cut.

If smaller than this then ignored

Definition at line 1285 of file OsiClpSolverInterface.hpp.

3.94.4.3 double OsiClpSolverInterface::smallestChangeInCut_ [protected]

Smallest change in cut.

If (upper-lower)*element < this then element is taken out and cut relaxed.

Definition at line 1289 of file OsiClpSolverInterface.hpp.

3.94.4.4 CoinWarmStartBasis OsiClpSolverInterface::basis_ [protected]

Warmstart information to be used in resolves.

Definition at line 1295 of file OsiClpSolverInterface.hpp.

3.94.4.5 int OsiClpSolverInterface::itlimOrig_ [protected]

The original iteration limit before hotstarts started.

Definition at line 1297 of file OsiClpSolverInterface.hpp.

3.94.4.6 int OsiClpSolverInterface::lastAlgorithm_ [mutable, protected]

Last algorithm used.

Coded as

- 0 invalid
- 1 primal
- 2 dual
- -911 disaster in the algorithm that was attempted
- 999 current solution no longer optimal due to change in problem or basis

Definition at line 1309 of file OsiClpSolverInterface.hpp.

3.94.4.7 double* OsiClpSolverInterface::linearObjective_ [mutable, protected]

Linear objective.

Normally a pointer to the linear coefficient array in the clp objective. An independent copy when [fakeMinInSimplex_](#) is true, because we need something permanent to point to when [getObjCoefficients](#) is called.

Definition at line 1341 of file OsiClpSolverInterface.hpp.

3.94.4.8 int OsiClpSolverInterface::cleanupScaling_ [protected]

Scaling option When scaling is on it is possible that the scaled problem is feasible but the unscaled is not.

Clp returns a secondary status code to that effect. This option allows for a cleanup. If you use it I would suggest 1. This only affects actions when scaled optimal 0 - no action 1 - clean up using dual if primal infeasibility 2 - clean up using dual if dual infeasibility 3 - clean up using dual if primal or dual infeasibility 11,12,13 - as 1,2,3 but use primal

Definition at line 1359 of file OsiClpSolverInterface.hpp.

3.94.4.9 unsigned int OsiClpSolverInterface::specialOptions_ [mutable, protected]

Special options 0x80000000 off 0 simple stuff for branch and bound 1 try and keep work regions as much as possible 2 do not use any perturbation 4 allow exit before re-factorization 8 try and re-use factorization if no cuts 16 use standard strong branching rather than clp's 32 Just go to first factorization in fast dual 64 try and tighten bounds in crunch 128 Model will only change in column bounds 256 Clean up model before hot start 512 Give user direct access to Clp regions in getBInvARow etc (i.e., do not unscale, and do not return result in getBInv parameters; you have to know where to look for the answer) 1024 Don't "borrow" model in initialSolve 2048 Don't crunch 4096 quick check for optimality Bits above 8192 give where called from in Cbc At present 0 is normal, 1 doing fast hotstarts, 2 is can do quick check 65536 Keep simple i.e.

no crunch etc 131072 Try and keep scaling factors around 262144 Don't try and tighten bounds (funny global cuts) 524288 Fake objective and 0-1 1048576 Don't recompute ray after crunch 2097152

Definition at line 1387 of file OsiClpSolverInterface.hpp.

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

- OsiClpSolverInterface.hpp

3.95 Outfo Struct Reference

***** DATA to be moved into protected section of [ClpInterior](#)

```
#include <ClpInterior.hpp>
```

3.95.1 Detailed Description

***** DATA to be moved into protected section of [ClpInterior](#)

Definition at line 35 of file ClpInterior.hpp.

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

- ClpInterior.hpp

3.96 ClpSimplexOther::parametricsData Struct Reference

3.96.1 Detailed Description

Definition at line 107 of file ClpSimplexOther.hpp.

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

- ClpSimplexOther.hpp

3.97 AbcSimplexPrimal::pivotStruct Struct Reference

3.97.1 Detailed Description

Definition at line 210 of file AbcSimplexPrimal.hpp.

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

- AbcSimplexPrimal.hpp

3.98 scatterStruct Struct Reference

3.98.1 Detailed Description

Definition at line 534 of file CoinAbcHelperFunctions.hpp.

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

- CoinAbcHelperFunctions.hpp

3.99 CoinAbcTypeFactorization::scatterStruct Struct Reference

3.99.1 Detailed Description

Definition at line 129 of file CoinAbcBaseFactorization.hpp.

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

- CoinAbcBaseFactorization.hpp

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