qpp

0.1

Generated by Doxygen 1.8.5

Tue Apr 22 2014 19:26:35

Contents

Chapter 1

Namespace Index

1.1 Namespace List

Here is a list of all namespaces with brief descriptions:

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

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

Chapter 3

Class Index

3.1 Class List

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

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

Chapter 5

Namespace Documentation

5.1 qpp Namespace Reference

Namespaces

- ct
- internal
- types

Classes

- class Exception
- class Gates
- class Qudit
- class RandomDevices
- class NormalDistribution
- class UniformRealDistribution
- class DiscreteDistribution
- class DiscreteDistributionAbsSquare
- class States
- class Timer

Functions

- template<typename Derived >
  types::cmat channel (const Eigen::MatrixBase< Derived > &rho, const std::vector< types::cmat > &Ks)
- types::cmat super (const std::vector< types::cmat > &Ks)
- types::cmat choi (const std::vector< types::cmat > &Ks)
- std::vector< types::cmat > choi2kraus (const types::cmat &A)
- template<typename Derived >
  types::cmat channel (const Eigen::MatrixBase< Derived > &rho, const std::vector< types::cmat > &Ks, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Derived >
  types::cmat schmidtcoeff (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  types::cmat schmidtU (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  types::cmat schmidtV (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)

- template<typename Derived >
  types::cmat schmidtprob (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  double entanglement (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  double gconcurrence (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double shannon (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double renyi (const double alpha, const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double renyi_inf (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double tsallis (const double alpha, const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double qmutualinfo (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename Derived::Scalar > transpose (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::DynMat< typename Derived::Scalar > conjugate (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::DynMat< typename Derived::Scalar > adjoint (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::DynMat< typename Derived::Scalar > inverse (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  Derived::Scalar trace (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  Derived::Scalar det (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  Derived::Scalar logdet (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  Derived::Scalar sum (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double norm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat evals (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat evects (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::dmat hevals (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat hevects (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat funm (const Eigen::MatrixBase< Derived > &A, types::cplx(∗f)(const types::cplx &))
- template<typename Derived >
  types::cmat sqrtm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat absm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat expm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat logm (const Eigen::MatrixBase< Derived > &A)

- template<typename Derived >
  types::cmat sinm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat cosm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat spectralpowm (const Eigen::MatrixBase< Derived > &A, const types::cplx z)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > powm (const Eigen::MatrixBase< Derived > &A, size_t n)
- template<typename OutputScalar , typename Derived >
  types::DynMat< OutputScalar > cwise (const Eigen::MatrixBase< Derived > &A, OutputScalar(∗f)(const typename Derived::Scalar &))
- template<typename Derived1 , typename Derived2 >
  types::DynMat< typename
  Derived1::Scalar > kron (const Eigen::MatrixBase< Derived1 > &A, const Eigen::MatrixBase< Derived2 > &B)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > kronlist (const std::vector< types::DynMat< typename Derived::Scalar > > &As)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > kronpow (const Eigen::MatrixBase< Derived > &A, size_t n)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > reshape (const Eigen::MatrixBase< Derived > &A, size_t rows, size_t cols)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > syspermute (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &perm, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > ptrace1 (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > ptrace2 (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > ptrace (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > ptranspose (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Derived1 , typename Derived2 >
  types::DynMat< typename
  Derived1::Scalar > comm (const Eigen::MatrixBase< Derived1 > &A, const Eigen::MatrixBase< Derived2 > &B)
- template<typename Derived1 , typename Derived2 >
  types::DynMat< typename
  Derived1::Scalar > anticomm (const Eigen::MatrixBase< Derived1 > &A, const Eigen::MatrixBase< Derived2 > &B)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > prj (const Eigen::MatrixBase< Derived > &V)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > expandout (const Eigen::MatrixBase< Derived > &A, size_t pos, const std::vector< size_t > &dims)

- template<typename Derived1 , typename Derived2 >
  types::DynMat< typename
  Derived1::Scalar > gate (const Eigen::MatrixBase< Derived1 > &state, const Eigen::MatrixBase< Derived2 > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > grams (const std::vector< types::DynMat< typename Derived::Scalar > > &Vs)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > grams (const Eigen::MatrixBase< Derived > &A)
- std::vector< size_t > n2multiidx (size_t n, const std::vector< size_t > &dims)
- size_t multiidx2n (const std::vector< size_t > &midx, const std::vector< size_t > &dims)
- types::ket mket (const std::vector< size_t > &mask)
- types::ket mket (const std::vector< size_t > &mask, const std::vector< size_t > &dims)
- types::ket mket (const std::vector< size_t > &mask, size_t d)
- std::vector< size_t > invperm (const std::vector< size_t > &perm)
- std::vector< size_t > compperm (const std::vector< size_t > &perm, const std::vector< size_t > &sigma)
- template<typename T >
  void disp (const T &x, const std::string &separator, const std::string &start="[", const std::string &end="]", std::ostream &os=std::cout)
- template<typename T >
  void displn (const T &x, const std::string &separator, const std::string &start="[", const std::string &end="]", std::ostream &os=std::cout)
- template<typename T >
  void disp (const T ∗x, const size_t n, const std::string &separator, const std::string &start="[", const std::string &end="]", std::ostream &os=std::cout)
- template<typename T >
  void displn (const T ∗x, const size_t n, const std::string &separator, const std::string &start="[", const std::string &end="]", std::ostream &os=std::cout)
- template<typename Derived >
  void disp (const Eigen::MatrixBase< Derived > &A, double chop=ct::chop, std::ostream &os=std::cout)
- template<typename Derived >
  void displn (const Eigen::MatrixBase< Derived > &A, double chop=ct::chop, std::ostream &os=std::cout)
- void disp (const types::cplx c, double chop=ct::chop, std::ostream &os=std::cout)
- void displn (const types::cplx c, double chop=ct::chop, std::ostream &os=std::cout)
- template<typename Derived >
  void save (const Eigen::MatrixBase< Derived > &A, const std::string &fname)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > load (const std::string &fname)
- template<typename Derived >
  Derived loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<>
  types::dmat loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<>
  types::cmat loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<typename Derived >
  void saveMATLABmatrix (const Eigen::MatrixBase< Derived > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- template<>
  void saveMATLABmatrix (const Eigen::MatrixBase< typename types::dmat > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- template<>
  void saveMATLABmatrix (const Eigen::MatrixBase< typename types::cmat > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- template<typename Derived >
  Derived rand (size_t rows, size_t cols, double a=0, double b=1)

- template<>
  types::dmat rand (size_t rows, size_t cols, double a, double b)
- template<>
  types::cmat rand (size_t rows, size_t cols, double a, double b)
- double rand (double a=0, double b=1)
- int randint (int a, int b)
- template<typename Derived >
  Derived randn (size_t rows, size_t cols, double mean=0, double sigma=1)
- template<>
  types::dmat randn (size_t rows, size_t cols, double mean, double sigma)
- template<>
  types::cmat randn (size_t rows, size_t cols, double mean, double sigma)
- double randn (double mean=0, double sigma=1)
- types::cmat randU (size_t D)
- types::cmat randV (size_t Din, size_t Dout)
- std::vector< types::cmat > randkraus (size_t n, size_t D)
- types::cmat randH (size_t D)
- types::ket randket (size_t D)
- types::cmat randrho (size_t D)
- std::vector< size_t > randperm (size_t n)

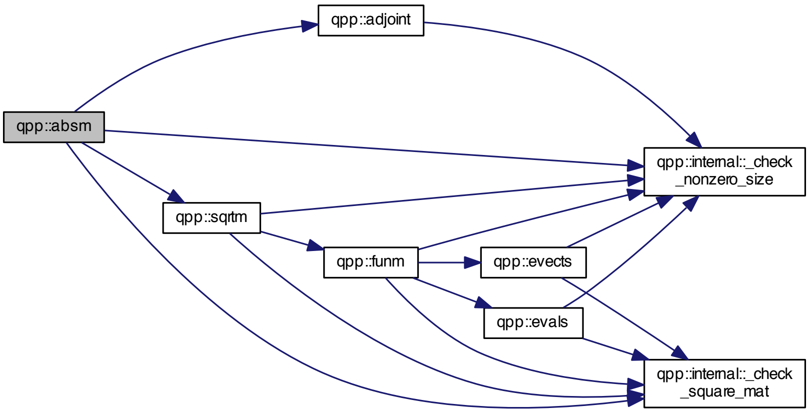
Variables

- RandomDevices & rdevs = RandomDevices::getInstance()
- const Gates & gt = Gates::getInstance()
- const States & st = States::getInstance()

5.1.1 Function Documentation

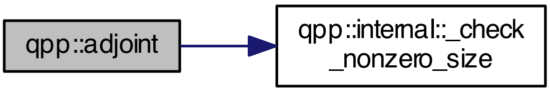
5.1.1.1 template<typename Derived > types::cmat qpp::absm (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



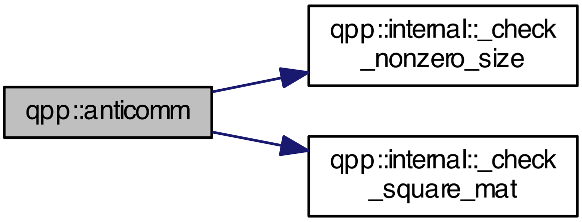
5.1.1.2 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::adjoint (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



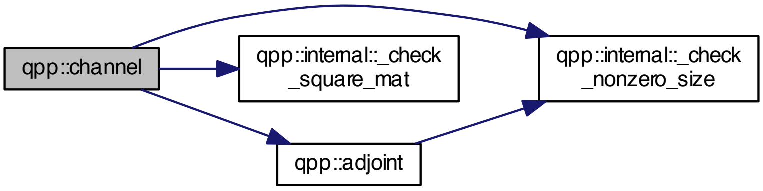
5.1.1.3 template<typename Derived1 , typename Derived2 > types::DynMat<typename Derived1::Scalar> qpp::anticomm (const Eigen::MatrixBase< Derived1 > & *A,* const Eigen::MatrixBase< Derived2 > & *B*)

Here is the call graph for this function:


qpp::anticomm
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat

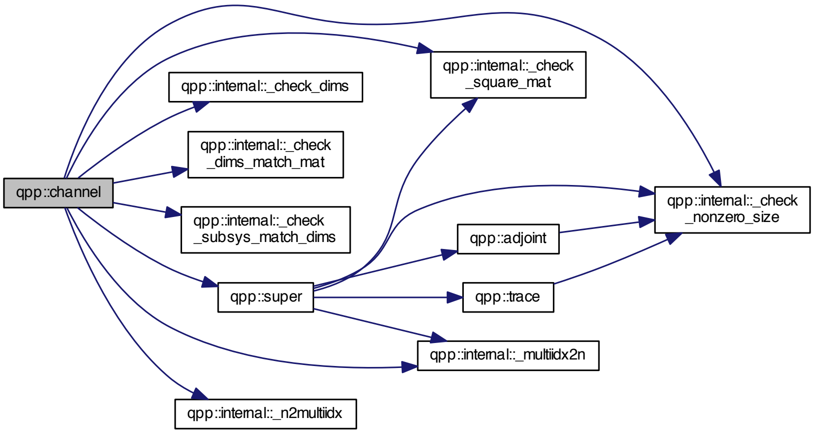
5.1.1.4 template<typename Derived > types::cmat qpp::channel (const Eigen::MatrixBase< Derived > & *rho,* const std::vector< types::cmat > & *Ks*)

Here is the call graph for this function:


qpp::channel
qpp::internal::_check _square_mat
qpp::internal::_check _nonzero_size
qpp::adjoint

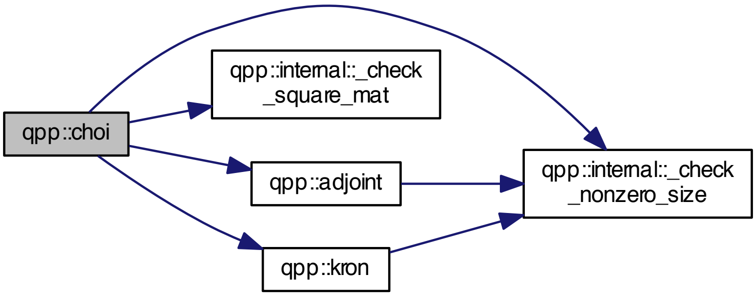
5.1.1.5 template<typename Derived > types::cmat qpp::channel (const Eigen::MatrixBase< Derived > & *rho*, const std::vector< types::cmat > & *Ks*, const std::vector< size_t > & *subsys*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::channel
qpp::internal::_check_dims
qpp::internal::_check_dims_match_mat
qpp::internal::_check_subsys_match_dims
qpp::super
qpp::internal::_n2multiidx
qpp::internal::_check_square_mat
qpp::adjoint
qpp::trace
qpp::internal::_multiidx2n
qpp::internal::_check_nonzero_size

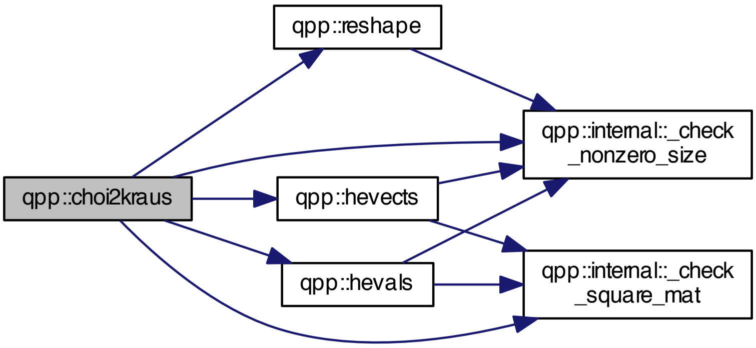
5.1.1.6 types::cmat qpp::choi (const std::vector< types::cmat > & *Ks*)

Here is the call graph for this function:


qpp::choi
qpp::internal::_check_square_mat
qpp::adjoint
qpp::kron
qpp::internal::_check_nonzero_size

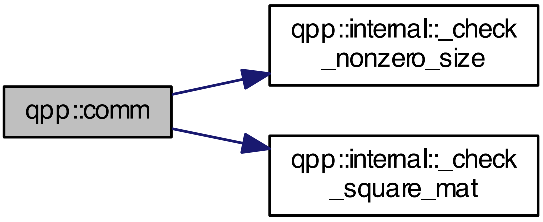
5.1.1.7 std::vector<**types::cmat**> qpp::choi2kraus (const types::cmat & *A*)

Here is the call graph for this function:


qpp::reshape
qpp::internal::_check _nonzero_size
qpp::choi2kraus
qpp::hevects
qpp::hevals
qpp::internal::_check _square_mat

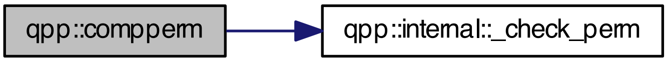
5.1.1.8 template<typename Derived1 , typename Derived2 > **types::DynMat**<typename Derived1::Scalar> qpp::comm (const Eigen::MatrixBase< Derived1 > & *A*, const Eigen::MatrixBase< Derived2 > & *B*)

Here is the call graph for this function:


qpp::internal::_check _nonzero_size
qpp::comm
qpp::internal::_check _square_mat

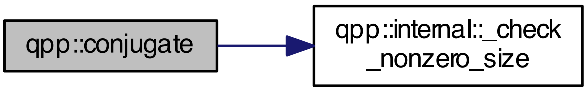
5.1.1.9 std::vector<size_t> qpp::compperm (const std::vector< size_t > & *perm*, const std::vector< size_t > & *sigma*)

Here is the call graph for this function:



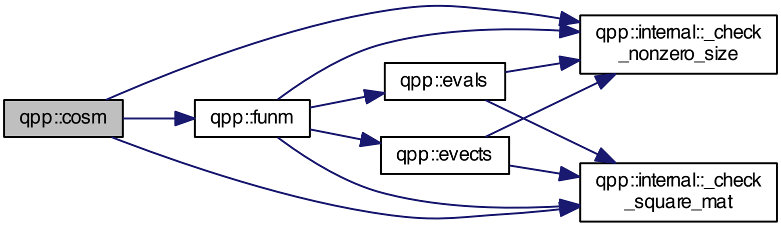
5.1.1.10 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::conjugate (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



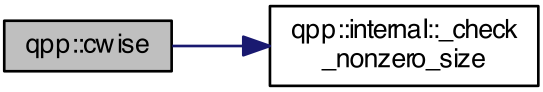
5.1.1.11 template<typename Derived > types::cmat qpp::cosm (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



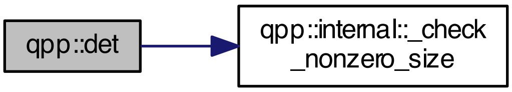
5.1.1.12 template<typename OutputScalar , typename Derived > types::DynMat<OutputScalar> qpp::cwise (const Eigen::MatrixBase< Derived > & *A,* OutputScalar(∗)(const typename Derived::Scalar &) *f*)

Here is the call graph for this function:



5.1.1.13 template<typename Derived > Derived::Scalar qpp::det (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



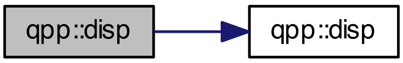
5.1.1.14 template<typename T > void qpp::disp (const T & *x,* const std::string & *separator,* const std::string & *start* = " [", const std::string & *end* = "] ", std::ostream & *os* = `std::cout`)

5.1.1.15 template<typename T > void qpp::disp (const T ∗ *x,* const size_t *n,* const std::string & *separator,* const std::string & *start* = " [", const std::string & *end* = "] ", std::ostream & *os* = `std::cout`)

5.1.1.16 template<typename Derived > void qpp::disp (const Eigen::MatrixBase< Derived > & *A,* double *chop* = `ct::chop`, std::ostream & *os* = `std::cout`)

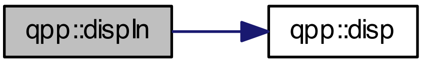
5.1.1.17 void qpp::disp (const types::cplx *c,* double *chop* = `ct::chop`, std::ostream & *os* = `std::cout`)

Here is the call graph for this function:



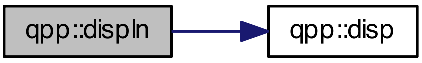
5.1.1.18 template<typename T > void qpp::displn (const T & *x*, const std::string & *separator*, const std::string & *start* = " [", const std::string & *end* = "] ", std::ostream & *os* = `std::cout`)

Here is the call graph for this function:



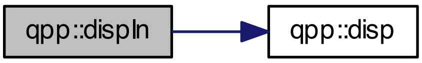
5.1.1.19 template<typename T > void qpp::displn (const T ∗ *x*, const size_t *n*, const std::string & *separator*, const std::string & *start* = " [", const std::string & *end* = "] ", std::ostream & *os* = `std::cout`)

Here is the call graph for this function:



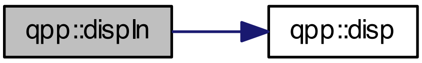
5.1.1.20 template<typename Derived > void qpp::displn (const Eigen::MatrixBase< Derived > & *A*, double *chop* = `ct::chop`, std::ostream & *os* = `std::cout`)

Here is the call graph for this function:



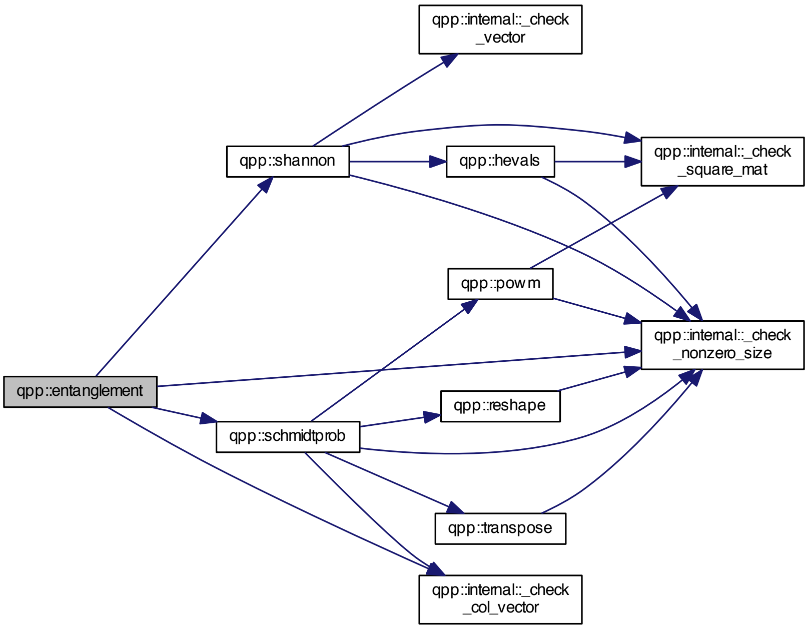
5.1.1.21 void qpp::dispIn (const types::cplx *c*, double *chop* = `ct::chop`, std::ostream & *os* = `std::cout`)

Here is the call graph for this function:



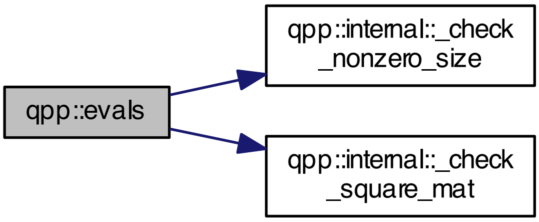
5.1.1.22 template<typename Derived > double qpp::entanglement (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::internal::_check_vector
qpp::shannon
qpp::hevals
qpp::internal::_check_square_mat
qpp::powm
qpp::internal::_check_nonzero_size
qpp::entanglement
qpp::reshape
qpp::schmidtprob
qpp::transpose
qpp::internal::_check_col_vector

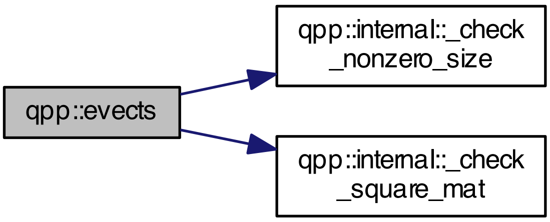
5.1.1.23 template<typename Derived > types::cmat qpp::evals (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::evals
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat

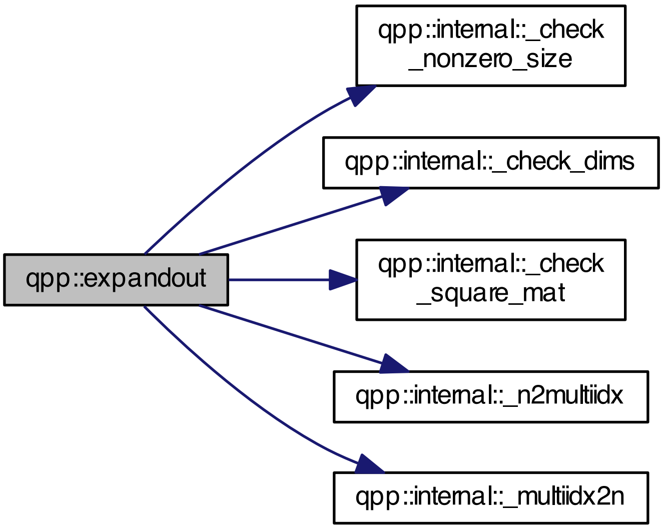
5.1.1.24 template<typename Derived > types::cmat qpp::evects (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::evects
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat

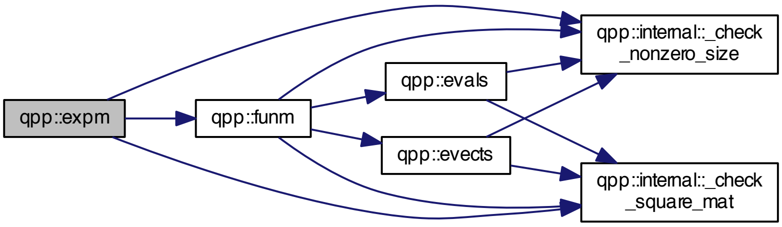
5.1.1.25 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::expandout (const Eigen::MatrixBase< Derived > & *A*, size_t *pos*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::expandout
qpp::internal::_check _nonzero_size
qpp::internal::_check_dims
qpp::internal::_check _square_mat
qpp::internal::_n2multiidx
qpp::internal::_multiidx2n

5.1.1.26 template<typename Derived > types::cmat qpp::expm (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::expm
qpp::funm
qpp::evals
qpp::evects
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat

5.1.1.27 template<typename Derived > types::cmat qpp::funm (const Eigen::MatrixBase< Derived > & *A*, types::cplx(∗)(const types::cplx &) *f*)

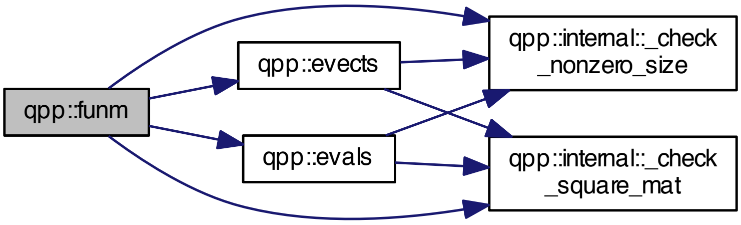
Parameters

A	input matrix
f	function pointer

Returns

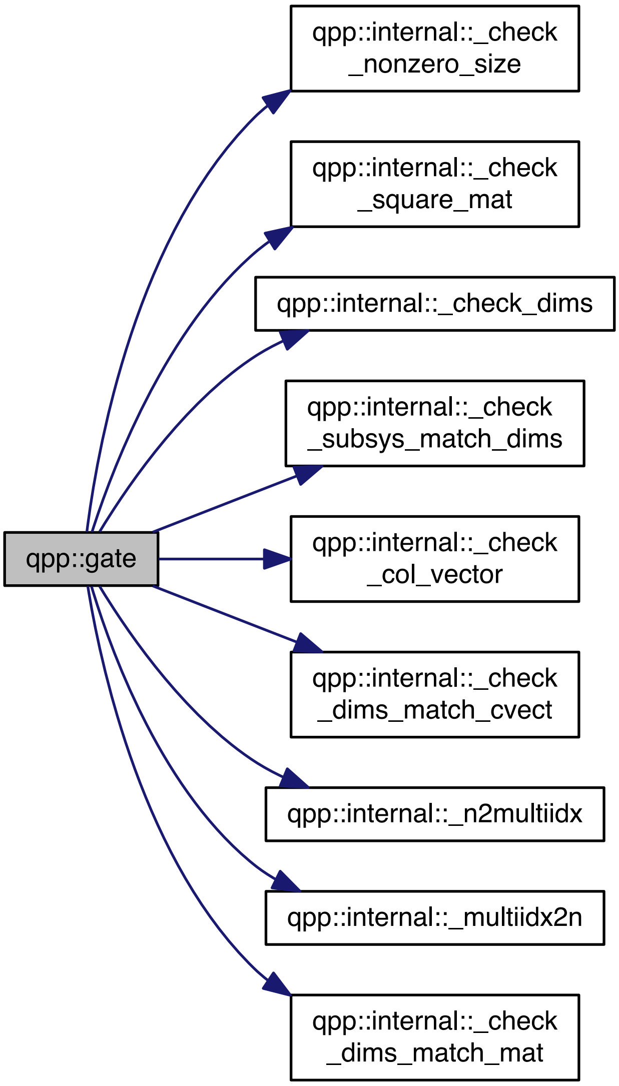
types::cmat

Here is the call graph for this function:


qpp::funm
qpp::evects
qpp::evals
qpp::internal::_check_nonzero_size
qpp::internal::_check_square_mat

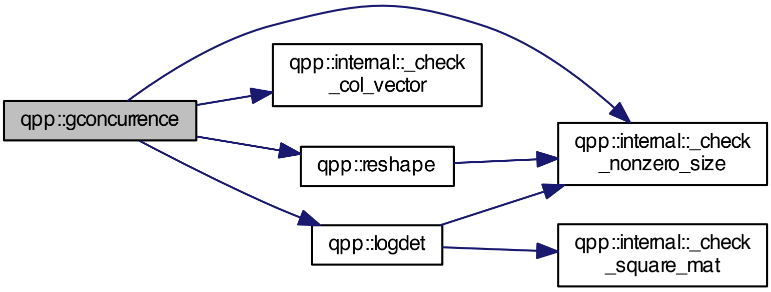
5.1.1.28 template<typename Derived1 , typename Derived2 > **types::DynMat**<typename Derived1::Scalar> qpp::gate (const Eigen::MatrixBase< Derived1 > & *state*, const Eigen::MatrixBase< Derived2 > & *A*, const std::vector< size_t > & *subsys*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::gate
qpp::internal::_check_nonzero_size
qpp::internal::_check_square_mat
qpp::internal::_check_dims
qpp::internal::_check_subsys_match_dims
qpp::internal::_check_col_vector
qpp::internal::_check_dims_match_cvect
qpp::internal::_n2multiidx
qpp::internal::_multiidx2n
qpp::internal::_check_dims_match_mat

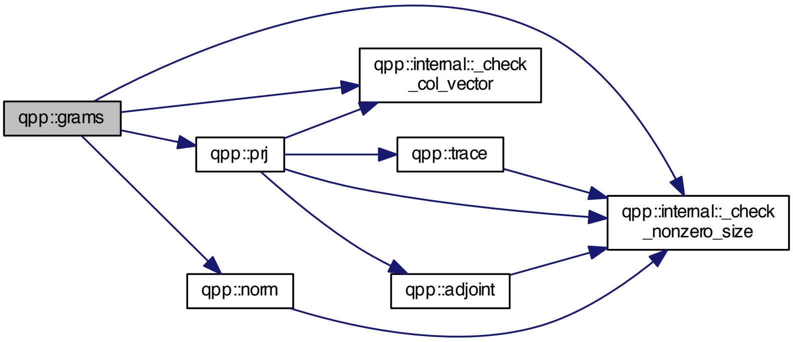
5.1.1.29 template<typename Derived > double qpp::gconcurrence (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::gconcurrence
qpp::internal::_check _col_vector
qpp::reshape
qpp::logdet
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat

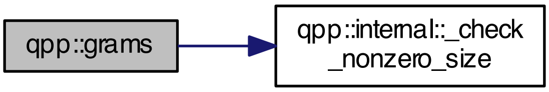
5.1.1.30 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::grams (const std::vector< types::DynMat< typename Derived::Scalar > > & *Vs*)

Here is the call graph for this function:


qpp::grams
qpp::internal::_check _col_vector
qpp::prj
qpp::trace
qpp::internal::_check _nonzero_size
qpp::norm
qpp::adjoint

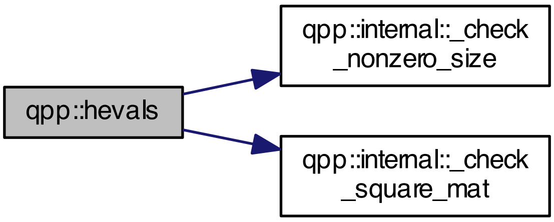
5.1.1.31 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::grams (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



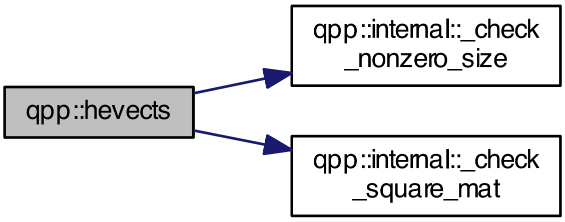
5.1.1.32 template<typename Derived > types::dmat qpp::hevals (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::hevals
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat

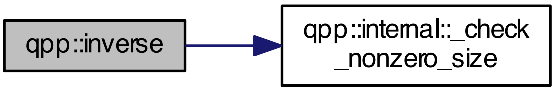
5.1.1.33 template<typename Derived > types::cmat qpp::hevects (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::hevects
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat

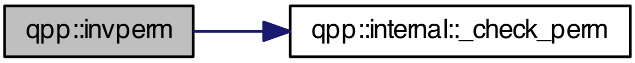
5.1.1.34 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::inverse (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



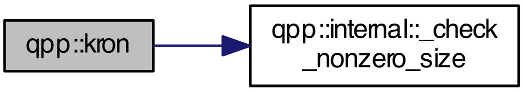
5.1.1.35 std::vector<size_t> qpp::invperm (const std::vector< size_t > & *perm*)

Here is the call graph for this function:



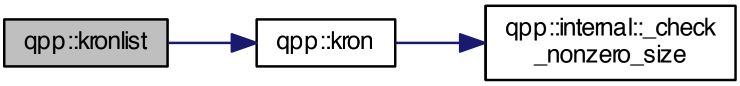
5.1.1.36 template<typename Derived1 , typename Derived2 > types::DynMat<typename Derived1::Scalar> qpp::kron (const Eigen::MatrixBase< Derived1 > & *A,* const Eigen::MatrixBase< Derived2 > & *B*)

Here is the call graph for this function:



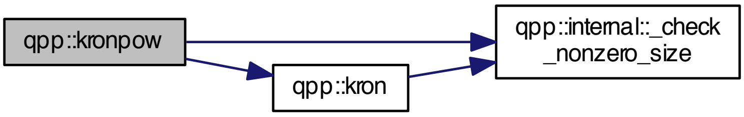
5.1.1.37 template<typename Derived > **types::DynMat**<typename Derived::Scalar> qpp::kronlist (const std::vector< types::DynMat< typename Derived::Scalar > > & *As*)

Here is the call graph for this function:



5.1.1.38 template<typename Derived > **types::DynMat**<typename Derived::Scalar> qpp::kronpow (const Eigen::MatrixBase< Derived > & *A,* size_t *n*)

Here is the call graph for this function:



5.1.1.39 template<typename Derived > **types::DynMat**<typename Derived::Scalar> qpp::load (const std::string & *fname*)

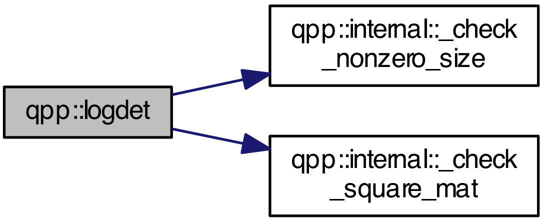
5.1.1.40 template<typename Derived > Derived qpp::loadMATLABmatrix (const std::string & *mat_file,* const std::string & *var_name*)

5.1.1.41 template<> **types::dmat** qpp::loadMATLABmatrix (const std::string & *mat_file,* const std::string & *var_name*)

5.1.1.42 template<> **types::cmat** qpp::loadMATLABmatrix (const std::string & *mat_file,* const std::string & *var_name*)

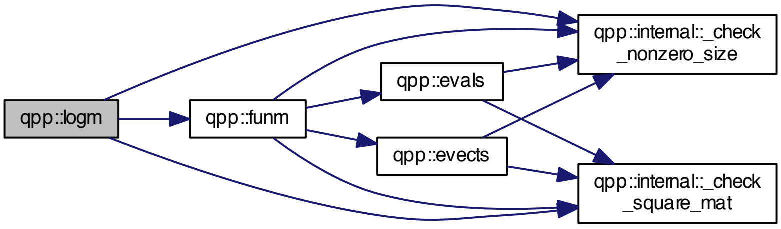
5.1.1.43 template<typename Derived > Derived::Scalar qpp::logdet (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::logdet
qpp::internal::_check_nonzero_size
qpp::internal::_check_square_mat

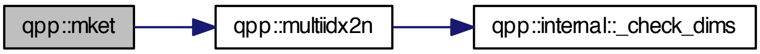
5.1.1.44 template<typename Derived > types::cmat qpp::logm (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::logm
qpp::funm
qpp::evals
qpp::evects
qpp::internal::_check_nonzero_size
qpp::internal::_check_square_mat

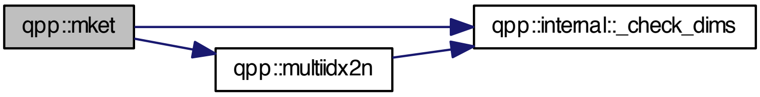
5.1.1.45 types::ket qpp::mket (const std::vector< size_t > & *mask*)

Here is the call graph for this function:



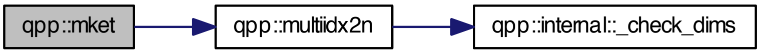
5.1.1.46 types::ket qpp::mket (const std::vector< size_t > & *mask*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:



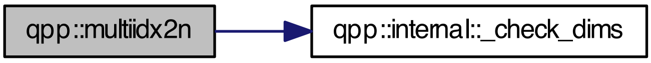
5.1.1.47 types::ket qpp::mket (const std::vector< size_t > & *mask*, size_t *d*)

Here is the call graph for this function:



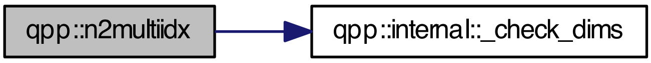
5.1.1.48 size_t qpp::multiidx2n (const std::vector< size_t > & *midx*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:



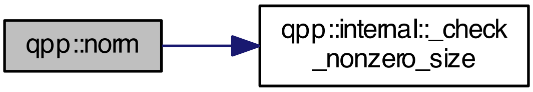
5.1.1.49 std::vector<size_t> qpp::n2multiidx (size_t *n*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:



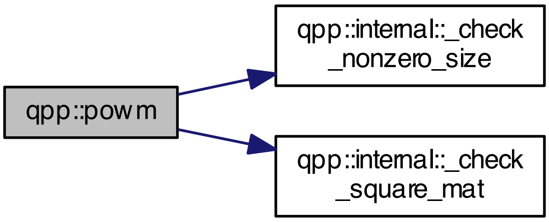
5.1.1.50 template<typename Derived > double qpp::norm (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



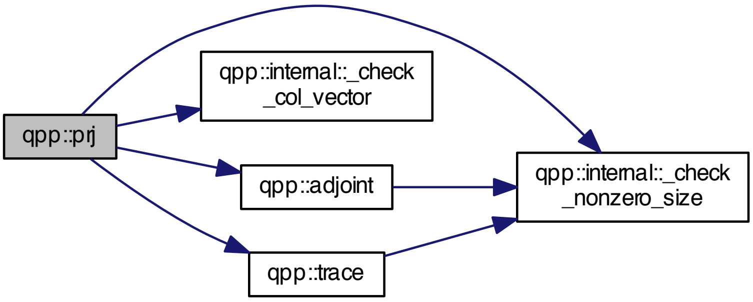
5.1.1.51 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::powm (const Eigen::MatrixBase< Derived > & *A*, size_t *n*)

Here is the call graph for this function:


qpp::powm
qpp::internal::_check_nonzero_size
qpp::internal::_check_square_mat

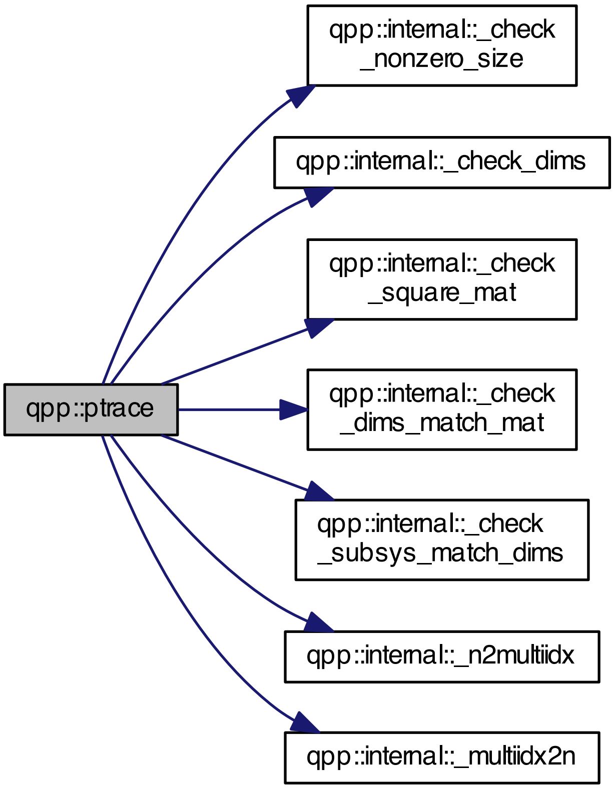
5.1.1.52 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::prj (const Eigen::MatrixBase< Derived > & *V*)

Here is the call graph for this function:


qpp::prj
qpp::internal::_check _col_vector
qpp::adjoint
qpp::trace
qpp::internal::_check _nonzero_size

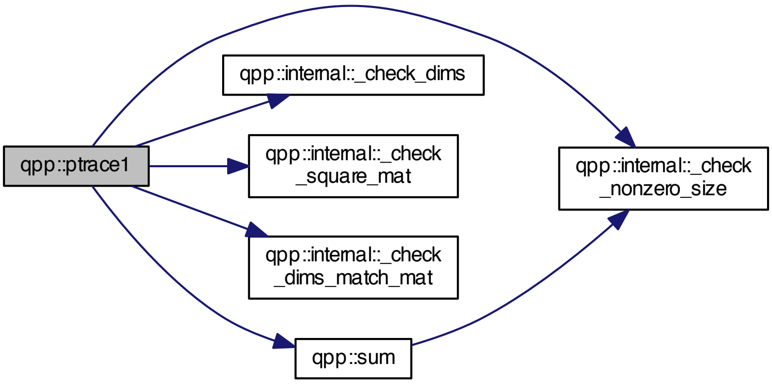
5.1.1.53 template<typename Derived > **types::DynMat**<typename Derived::Scalar> qpp::ptrace (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *subsys*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::internal::_check _nonzero_size
qpp::internal::_check_dims
qpp::internal::_check _square_mat
qpp::ptrace
qpp::internal::_check _dims_match_mat
qpp::internal::_check _subsys_match_dims
qpp::internal::_n2multiidx
qpp::internal::_multiidx2n

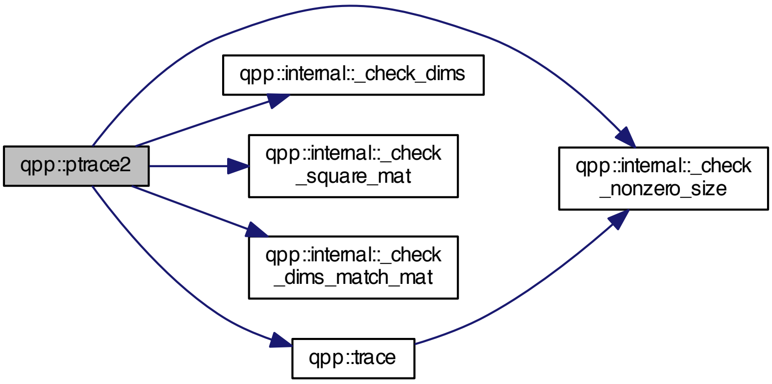
5.1.1.54 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::ptrace1 (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::ptrace1
qpp::internal::_check_dims
qpp::internal::_check_square_mat
qpp::internal::_check_dims_match_mat
qpp::sum
qpp::internal::_check_nonzero_size

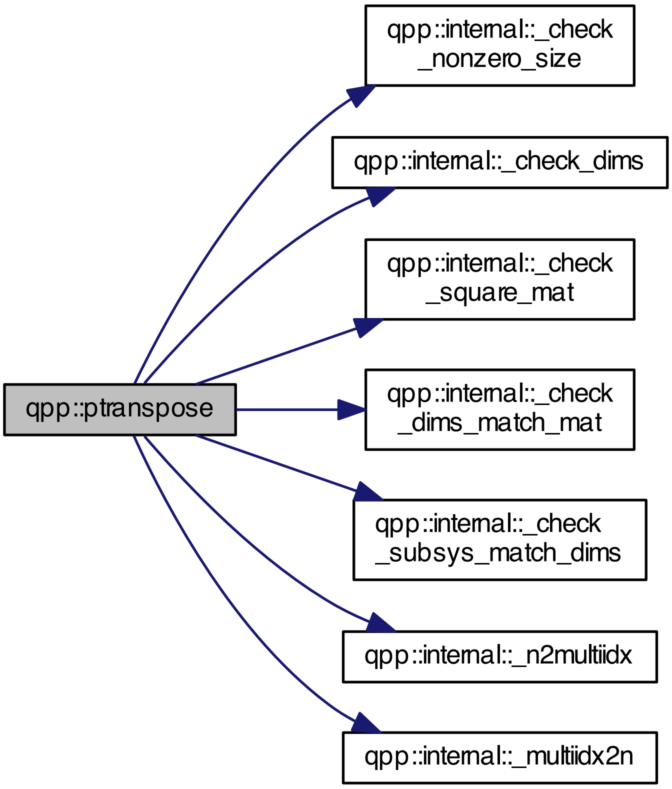
5.1.1.55 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::ptrace2 (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::ptrace2
qpp::internal::_check_dims
qpp::internal::_check_square_mat
qpp::internal::_check_dims_match_mat
qpp::trace
qpp::internal::_check_nonzero_size

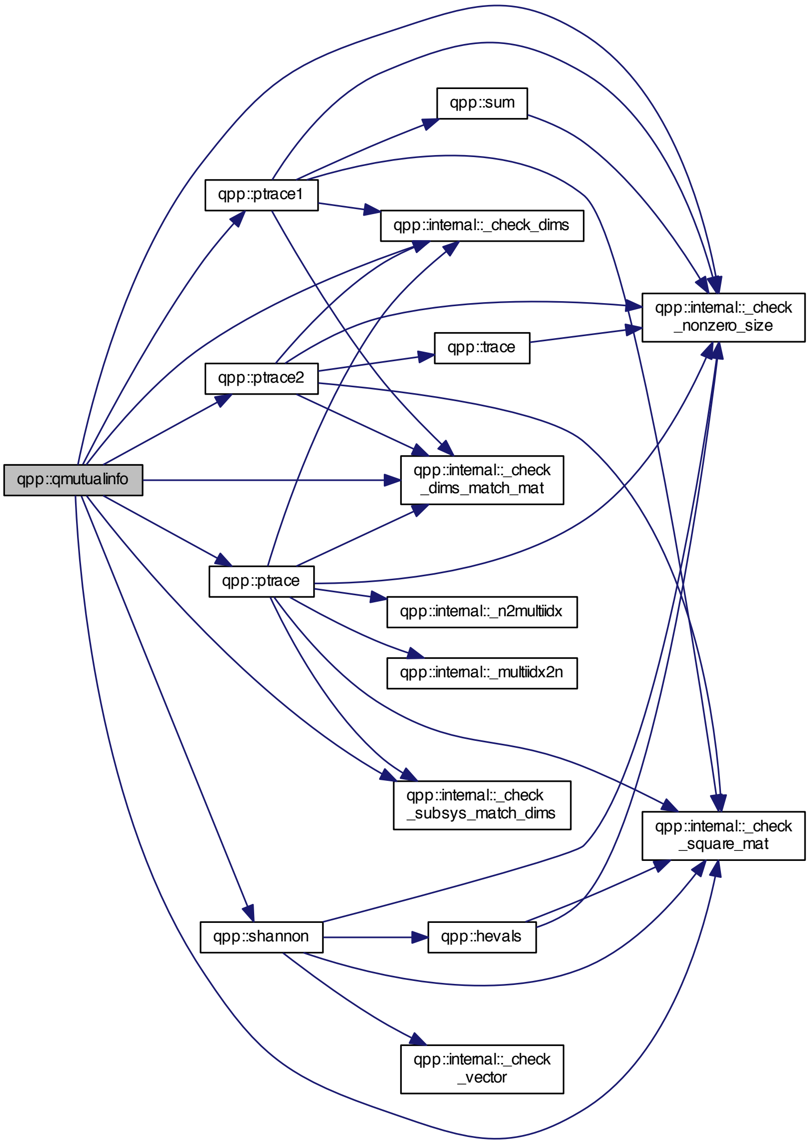
5.1.1.56 template< typename Derived > types::DynMat< typename Derived::Scalar> qpp::ptranspose (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *subsys*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::ptranspose
qpp::internal::_check_nonzero_size
qpp::internal::_check_dims
qpp::internal::_check_square_mat
qpp::internal::_check_dims_match_mat
qpp::internal::_check_subsys_match_dims
qpp::internal::_n2multiidx
qpp::internal::_multiidx2n

5.1.1.57 template< typename Derived > double qpp::qmutualinfo (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *subsys*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::qmutualinfo
qpp::sum
qpp::ptrace1
qpp::internal::_check_dims
qpp::internal::_check_nonzero_size
qpp::trace
qpp::ptrace2
qpp::internal::_check_dims_match_mat
qpp::ptrace
qpp::internal::_n2multiidx
qpp::internal::_multiidx2n
qpp::internal::_check_subsys_match_dims
qpp::internal::_check_square_mat
qpp::shannon
qpp::hevals
qpp::internal::_check_vector

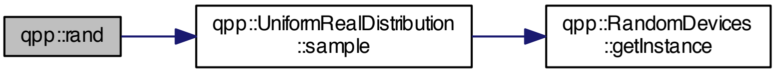
5.1.1.58 template< typename Derived > Derived qpp::rand (size_t *rows*, size_t *cols*, double *a* = 0, double *b* = 1)

5.1.1.59 template<> types::dmat qpp::rand (size_t *rows*, size_t *cols*, double *a*, double *b*)

5.1.1.60 template<> types::cmat qpp::rand (size_t *rows*, size_t *cols*, double *a*, double *b*)

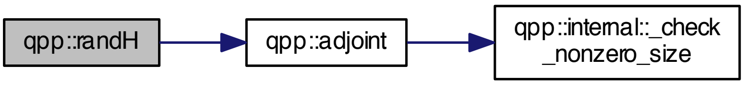
5.1.1.61 double qpp::rand (double *a* = `0`, double *b* = `1`)

Here is the call graph for this function:


qpp::rand
qpp::UniformRealDistribution ::sample
qpp::RandomDevices ::getInstance

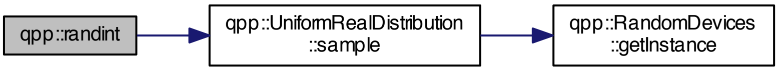
5.1.1.62 types::cmat qpp::randH (size_t *D*)

Here is the call graph for this function:



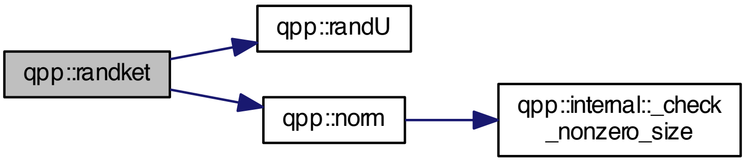
5.1.1.63 int qpp::randint (int *a*, int *b*)

Here is the call graph for this function:


qpp::randint
qpp::UniformRealDistribution ::sample
qpp::RandomDevices ::getInstance

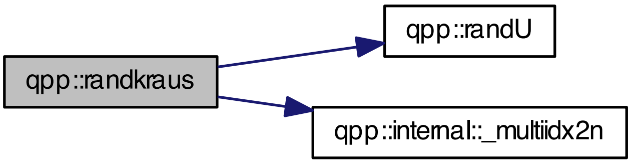
5.1.1.64 types::ket qpp::randket (size_t *D*)

Here is the call graph for this function:



5.1.1.65 std::vector< types::cmat > qpp::randkraus (size_t *n,* size_t *D*)

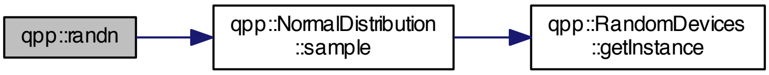
Here is the call graph for this function:



5.1.1.66 template<typename Derived > Derived qpp::randn (size_t *rows,* size_t *cols,* double *mean* = `0`, double *sigma* = `1`)

5.1.1.67 template<> types::dmat qpp::randn (size_t *rows,* size_t *cols,* double *mean,* double *sigma*)

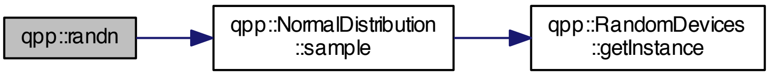
Here is the call graph for this function:



5.1.1.68 template<> types::cmat qpp::randn (size_t *rows,* size_t *cols,* double *mean,* double *sigma*)

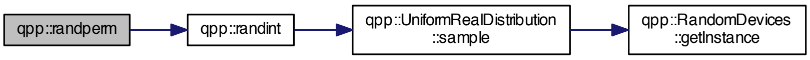
5.1.1.69 double qpp::randn (double *mean* = 0, double *sigma* = 1)

Here is the call graph for this function:


qpp::randn
qpp::NormalDistribution ::sample
qpp::RandomDevices ::getInstance

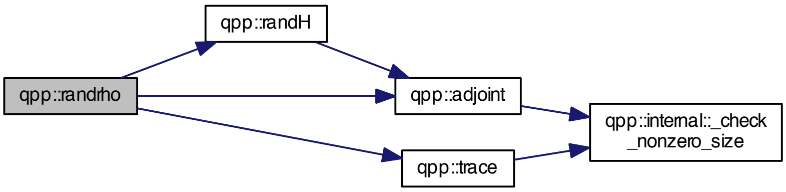
5.1.1.70 std::vector<size_t> qpp::randperm (size_t *n*)

Here is the call graph for this function:


qpp::randperm
qpp::randint
qpp::UniformRealDistribution ::sample
qpp::RandomDevices ::getInstance

5.1.1.71 types::cmat qpp::randrho (size_t *D*)

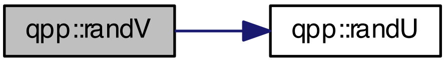
Here is the call graph for this function:



5.1.1.72 types::cmat qpp::randU (size_t *D*)

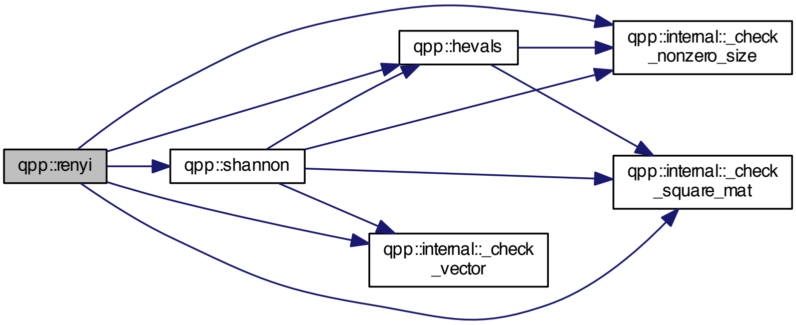
5.1.1.73 types::cmat qpp::randV (size_t *Din,* size_t *Dout*)

Here is the call graph for this function:



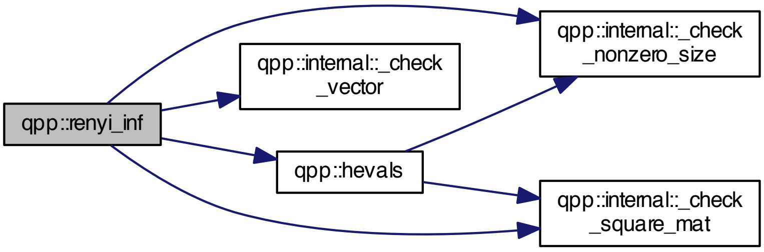
5.1.1.74 template< typename Derived > double qpp::renyi (const double *alpha,* const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::renyi
qpp::shannon
qpp::hevals
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat
qpp::internal::_check _vector

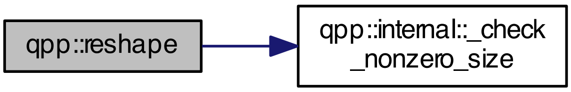
5.1.1.75 template< typename Derived > double qpp::renyi_inf (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::renyi_inf
qpp::internal::_check _vector
qpp::hevals
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat

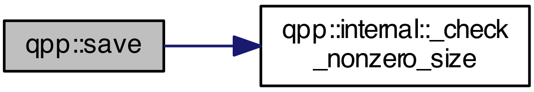
5.1.1.76 template< typename Derived > **types::DynMat**< typename Derived::Scalar> qpp::reshape (const Eigen::MatrixBase< Derived > & *A*, size_t *rows*, size_t *cols*)

Here is the call graph for this function:



5.1.1.77 template< typename Derived > void qpp::save (const Eigen::MatrixBase< Derived > & *A*, const std::string & *fname*)

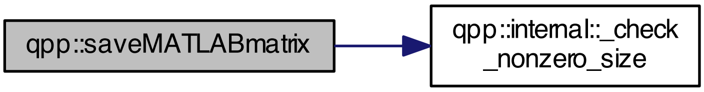
Here is the call graph for this function:



5.1.1.78 template< typename Derived > void qpp::saveMATLABmatrix (const Eigen::MatrixBase< Derived > & *A*, const std::string & *mat_file*, const std::string & *var_name*, const std::string & *mode*)

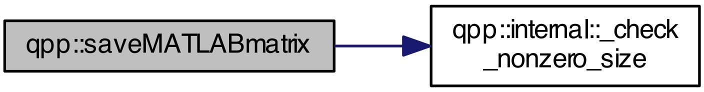
5.1.1.79 template<> void qpp::saveMATLABmatrix (const Eigen::MatrixBase< typename types::dmat > & *A*, const std::string & *mat_file*, const std::string & *var_name*, const std::string & *mode*)

Here is the call graph for this function:



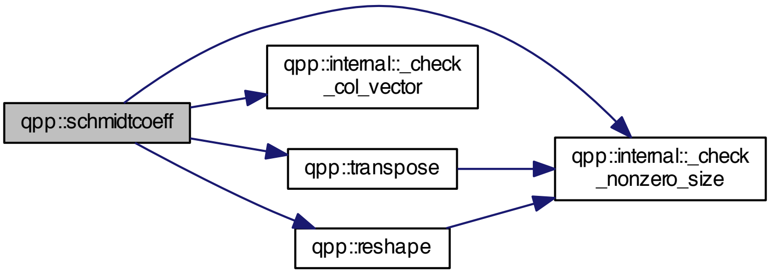
5.1.1.80 template< > void qpp::saveMATLABmatrix (const Eigen::MatrixBase< typename types::cmat > & *A*, const std::string & *mat_file*, const std::string & *var_name*, const std::string & *mode*)

Here is the call graph for this function:



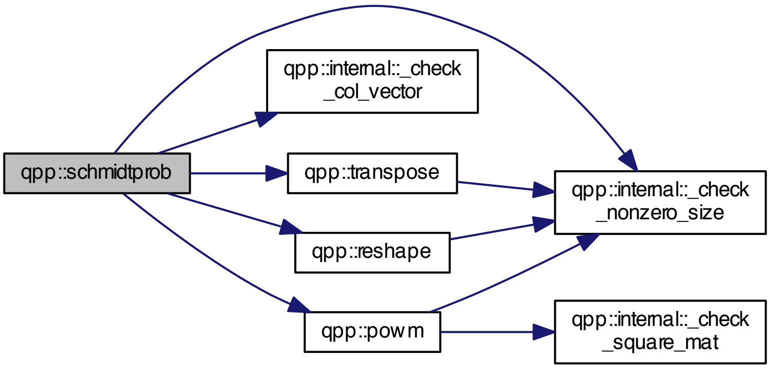
5.1.1.81 template<typename Derived > types::cmat qpp::schmidtcoeff (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::schmidtcoeff
qpp::internal::_check _col_vector
qpp::transpose
qpp::reshape
qpp::internal::_check _nonzero_size

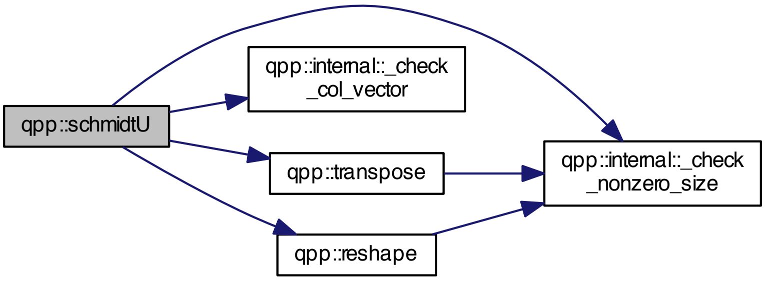
5.1.1.82 template<typename Derived > types::cmat qpp::schmidtprob (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:



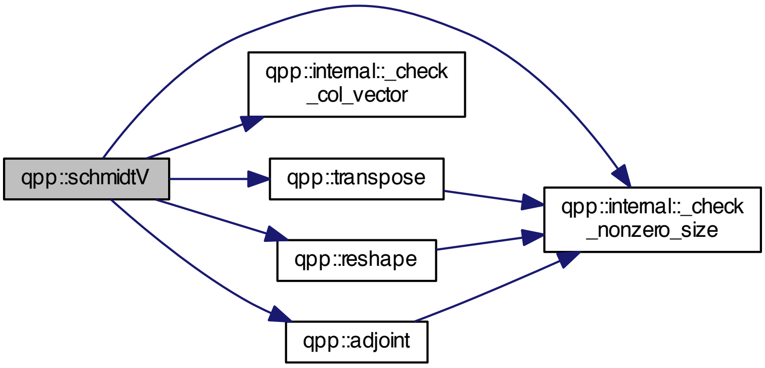
5.1.1.83 template<typename Derived > types::cmat qpp::schmidtU (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:



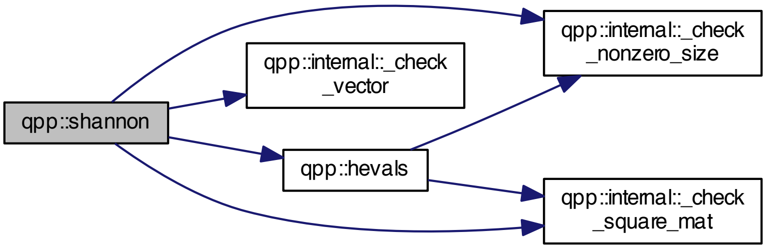
5.1.1.84 template<typename Derived > types::cmat qpp::schmidtV (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::schmidtV
qpp::internal::_check_col_vector
qpp::transpose
qpp::reshape
qpp::adjoint
qpp::internal::_check_nonzero_size

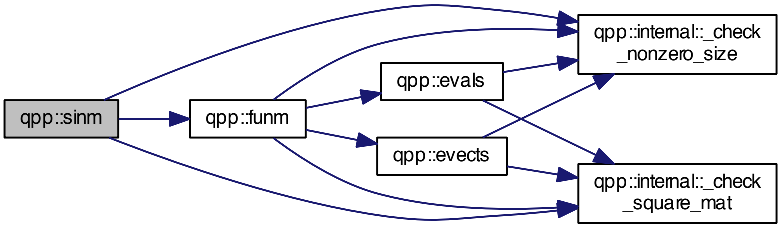
5.1.1.85 template<typename Derived > double qpp::shannon (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::shannon
qpp::internal::_check_vector
qpp::hevals
qpp::internal::_check_nonzero_size
qpp::internal::_check_square_mat

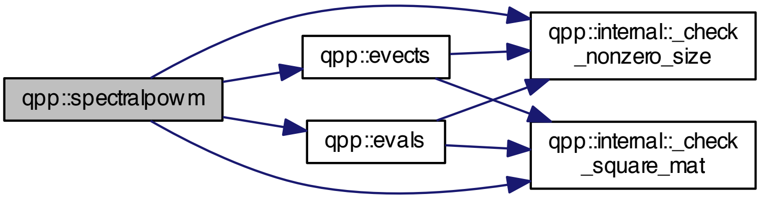
5.1.1.86 template<typename Derived > types::cmat qpp::sinm (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::sinm
qpp::funm
qpp::evals
qpp::evects
qpp::internal::_check_nonzero_size
qpp::internal::_check_square_mat

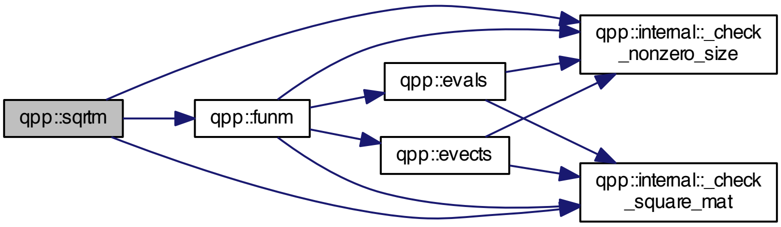
5.1.1.87 template<typename Derived > types::cmat qpp::spectralpowm (const Eigen::MatrixBase< Derived > & *A*, const types::cplx *z*)

Here is the call graph for this function:


qpp::spectralpowm
qpp::evects
qpp::evals
qpp::internal::_check_nonzero_size
qpp::internal::_check_square_mat

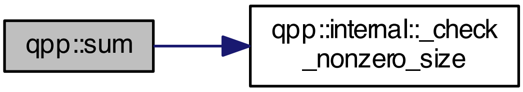
5.1.1.88 template<typename Derived > types::cmat qpp::sqrtm (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:


qpp::sqrtm
qpp::funm
qpp::evals
qpp::evects
qpp::internal::_check_nonzero_size
qpp::internal::_check_square_mat

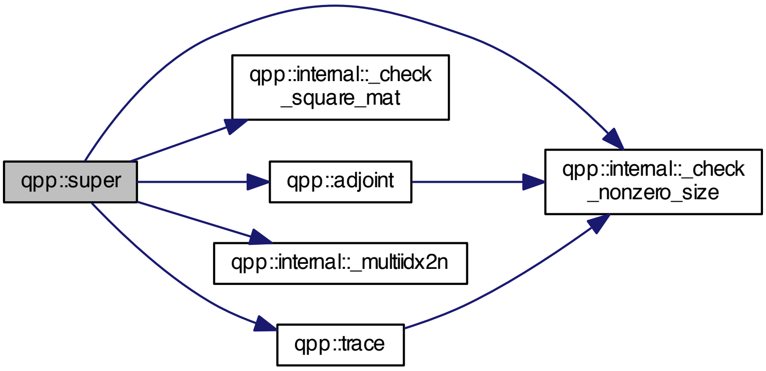
5.1.1.89 template<typename Derived > Derived::Scalar qpp::sum (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



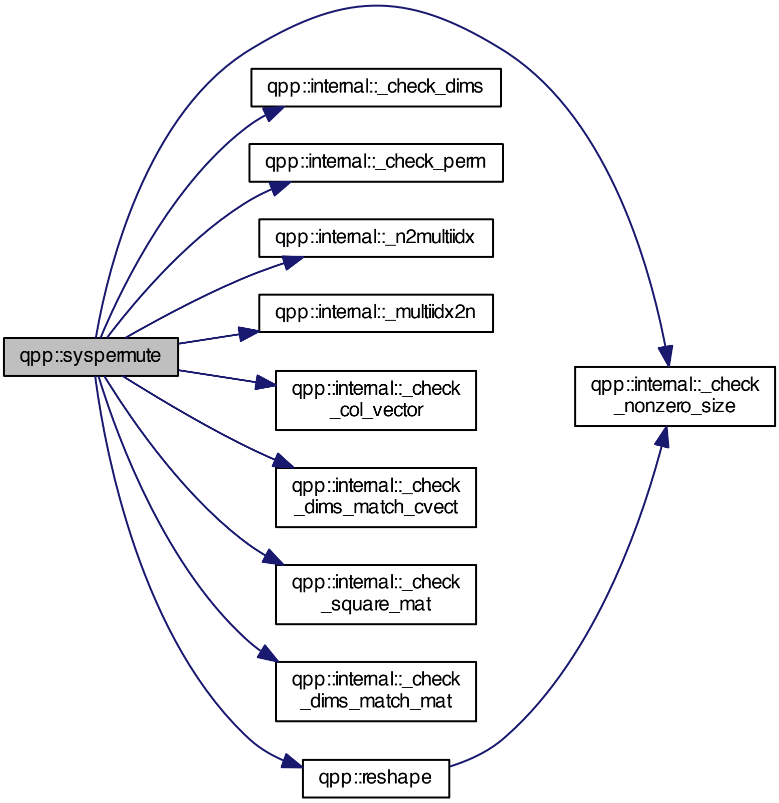
5.1.1.90 types::cmat qpp::super (const std::vector< types::cmat > & *Ks*)

Here is the call graph for this function:


qpp::super
qpp::internal::_check_square_mat
qpp::adjoint
qpp::internal::_multiidx2n
qpp::trace
qpp::internal::_check_nonzero_size

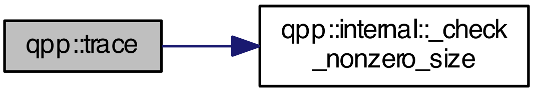
5.1.1.91 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::syspermute (const Eigen::MatrixBase< Derived > & *A*, const std::vector< size_t > & *perm*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:


qpp::syspermute
qpp::internal::_check_dims
qpp::internal::_check_perm
qpp::internal::_n2multiidx
qpp::internal::_multiidx2n
qpp::internal::_check _col_vector
qpp::internal::_check _dims_match_cvect
qpp::internal::_check _square_mat
qpp::internal::_check _dims_match_mat
qpp::reshape
qpp::internal::_check _nonzero_size

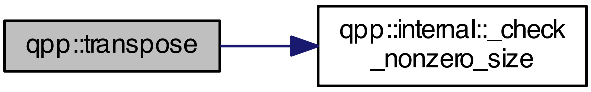
5.1.1.92 template<typename Derived > Derived::Scalar qpp::trace (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



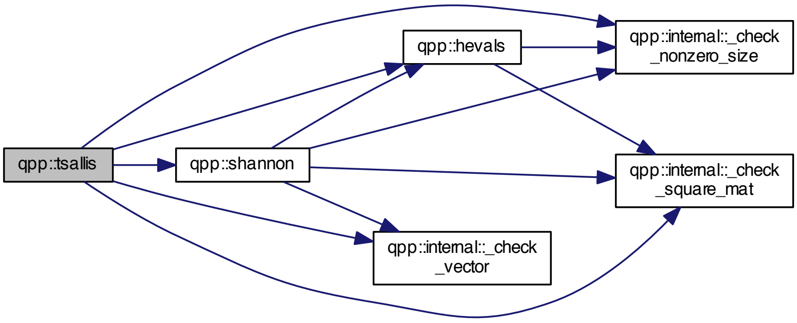
5.1.1.93 template<typename Derived > types::DynMat<typename Derived::Scalar> qpp::transpose (const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



5.1.1.94 template<typename Derived > double qpp::tsallis (const double *alpha,* const Eigen::MatrixBase< Derived > & *A*)

Here is the call graph for this function:



5.1.2 Variable Documentation

5.1.2.1 const Gates& qpp::gt = Gates::getInstance()

5.1.2.2 RandomDevices& qpp::rdevs = RandomDevices::getInstance()

5.1.2.3 const States& qpp::st = States::getInstance()

5.2 qpp::ct Namespace Reference

Functions

- std::complex< double > omega (size_t D)

Variables

- const double chop = 1e-10

- const double eps = 1e-12
- const size_t maxn = 64
- const std::complex< double > ii = { 0, 1 }
- const double pi = 3.141592653589793238462643383279502884
- const double ee = 2.718281828459045235360287471352662497

5.2.1 Function Documentation

5.2.1.1 std::complex<double> qpp::ct::omega (size_t *D*)

5.2.2 Variable Documentation

5.2.2.1 const double qpp::ct::chop = 1e-10

5.2.2.2 const double qpp::ct::ee = 2.718281828459045235360287471352662497

5.2.2.3 const double qpp::ct::eps = 1e-12

5.2.2.4 const std::complex<double> qpp::ct::ii = { 0, 1 }

5.2.2.5 const size_t qpp::ct::maxn = 64

5.2.2.6 const double qpp::ct::pi = 3.141592653589793238462643383279502884

5.3 qpp::internal Namespace Reference

Functions

- void _n2multiidx (size_t n, size_t numdims, const size_t ∗dims, size_t ∗result)
- size_t _multiidx2n (const size_t ∗midx, size_t numdims, const size_t ∗dims)
- template<typename Derived >
  bool _check_square_mat (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  bool _check_vector (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  bool _check_row_vector (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  bool _check_col_vector (const Eigen::MatrixBase< Derived > &A)
- template<typename T >
  bool _check_nonzero_size (const T &x)
- bool _check_dims (const std::vector< size_t > &dims)
- template<typename Derived >
  bool _check_dims_match_mat (const std::vector< size_t > &dims, const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  bool _check_dims_match_cvect (const std::vector< size_t > &dims, const Eigen::MatrixBase< Derived > &V)
- template<typename Derived >
  bool _check_dims_match_rvect (const std::vector< size_t > &dims, const Eigen::MatrixBase< Derived > &V)
- bool _check_eq_dims (const std::vector< size_t > &dims, size_t dim)
- bool _check_subsys_match_dims (const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- bool _check_perm (const std::vector< size_t > &perm)

5.3.1 Function Documentation

5.3.1.1 template<typename Derived > bool qpp::internal::_check_col_vector (const Eigen::MatrixBase< Derived > & *A*)

5.3.1.2 bool qpp::internal::_check_dims (const std::vector< size_t > & *dims*)

5.3.1.3 template<typename Derived > bool qpp::internal::_check_dims_match_cvect (const std::vector< size_t > & *dims,* const Eigen::MatrixBase< Derived > & *V*)

5.3.1.4 template<typename Derived > bool qpp::internal::_check_dims_match_mat (const std::vector< size_t > & *dims,* const Eigen::MatrixBase< Derived > & *A*)

5.3.1.5 template<typename Derived > bool qpp::internal::_check_dims_match_rvect (const std::vector< size_t > & *dims,* const Eigen::MatrixBase< Derived > & *V*)

5.3.1.6 bool qpp::internal::_check_eq_dims (const std::vector< size_t > & *dims,* size_t *dim*)

5.3.1.7 template<typename T > bool qpp::internal::_check_nonzero_size (const T & *x*)

5.3.1.8 bool qpp::internal::_check_perm (const std::vector< size_t > & *perm*)

5.3.1.9 template<typename Derived > bool qpp::internal::_check_row_vector (const Eigen::MatrixBase< Derived > & *A*)

5.3.1.10 template<typename Derived > bool qpp::internal::_check_square_mat (const Eigen::MatrixBase< Derived > & *A*)

5.3.1.11 bool qpp::internal::_check_subsys_match_dims (const std::vector< size_t > & *subsys,* const std::vector< size_t > & *dims*)

5.3.1.12 template<typename Derived > bool qpp::internal::_check_vector (const Eigen::MatrixBase< Derived > & *A*)

5.3.1.13 size_t qpp::internal::_multiidx2n (const size_t ∗ *midx,* size_t *numdims,* const size_t ∗ *dims*)

5.3.1.14 void qpp::internal::_n2multiidx (size_t *n,* size_t *numdims,* const size_t ∗ *dims,* size_t ∗ *result*)

5.4 qpp::types Namespace Reference

Typedefs

- typedef std::complex< double > cplx
- typedef Eigen::MatrixXcd cmat
- typedef Eigen::MatrixXd dmat
- typedef Eigen::Matrix< cplx,
  Eigen::Dynamic, 1 > ket
- typedef Eigen::Matrix< cplx,
  1, Eigen::Dynamic > bra
- template<typename Scalar >
  using DynMat = Eigen::Matrix< Scalar, Eigen::Dynamic, Eigen::Dynamic >

5.4.1 Typedef Documentation

5.4.1.1 typedef Eigen::Matrix<cplx, 1, Eigen::Dynamic> qpp::types::bra

5.4.1.2 typedef Eigen::MatrixXcd qpp::types::cmat

5.4.1.3 typedef std::complex<double> qpp::types::cplx

5.4.1.4 typedef Eigen::MatrixXd qpp::types::dmat

5.4.1.5 template<typename Scalar > using qpp::types::DynMat = typedef Eigen::Matrix<Scalar, Eigen::Dynamic, Eigen::Dynamic>

5.4.1.6 typedef Eigen::Matrix<cplx, Eigen::Dynamic, 1> qpp::types::ket

Chapter 6

Class Documentation

6.1 qpp::DiscreteDistribution Class Reference

```
#include <stat.h>
```

Public Member Functions

- template< typename InputIterator >
  DiscreteDistribution (InputIterator first, InputIterator last)
- DiscreteDistribution (std::initializer_list< double > weights)
- DiscreteDistribution (std::vector< double > weights)
- size_t sample ()
- std::vector< double > probabilities ()

Protected Attributes

- std::discrete_distribution
  < size_t > _d

6.1.1 Constructor & Destructor Documentation

6.1.1.1 template< typename InputIterator > qpp::DiscreteDistribution::DiscreteDistribution (InputIterator *first,* InputIterator *last*) `[inline]`

6.1.1.2 qpp::DiscreteDistribution::DiscreteDistribution (std::initializer_list< double > *weights*) `[inline]`

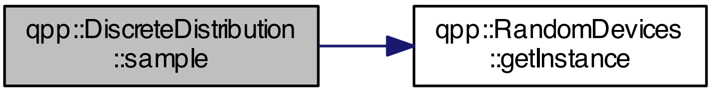
6.1.1.3 qpp::DiscreteDistribution::DiscreteDistribution (std::vector< double > *weights*) `[inline]`

6.1.2 Member Function Documentation

6.1.2.1 std::vector<double> qpp::DiscreteDistribution::probabilities ( ) `[inline]`

6.1.2.2 size_t qpp::DiscreteDistribution::sample ( ) [inline]

Here is the call graph for this function:


qpp::DiscreteDistribution ::sample
qpp::RandomDevices ::getInstance

6.1.3 Member Data Documentation

6.1.3.1 std::discrete_distribution< size_t > qpp::DiscreteDistribution::_d [protected]

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

- include/classes/stat.h

6.2 qpp::DiscreteDistributionAbsSquare Class Reference

```
#include <stat.h>
```

Public Member Functions

- template<typename InputIterator >
  DiscreteDistributionAbsSquare (InputIterator first, InputIterator last)
- DiscreteDistributionAbsSquare (std::initializer_list< types::cplx > amplitudes)
- DiscreteDistributionAbsSquare (std::vector< types::cplx > amplitudes)
- DiscreteDistributionAbsSquare (const types::cmat &V)
- size_t sample ()
- std::vector< double > probabilities ()

Protected Member Functions

- template<typename InputIterator >
  std::vector< double > cplx2weights (InputIterator first, InputIterator last)

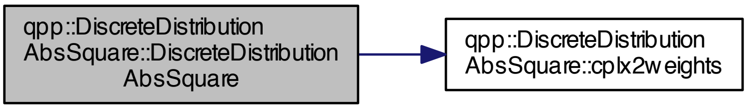
Protected Attributes

- std::discrete_distribution
  < size_t > _d

6.2.1 Constructor & Destructor Documentation

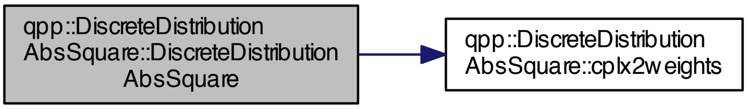
6.2.1.1 template<typename InputIterator > qpp::DiscreteDistributionAbsSquare::DiscreteDistributionAbsSquare (InputIterator *first*, InputIterator *last*) [inline]

Here is the call graph for this function:


qpp::DiscreteDistribution AbsSquare::DiscreteDistribution AbsSquare
qpp::DiscreteDistribution AbsSquare::cplx2weights

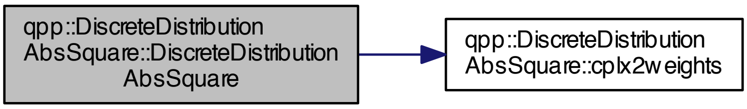
6.2.1.2 qpp::DiscreteDistributionAbsSquare::DiscreteDistributionAbsSquare (std::initializer_list< types::cplx > *amplitudes*) [inline]

Here is the call graph for this function:


qpp::DiscreteDistribution AbsSquare::DiscreteDistribution AbsSquare
qpp::DiscreteDistribution AbsSquare::cplx2weights

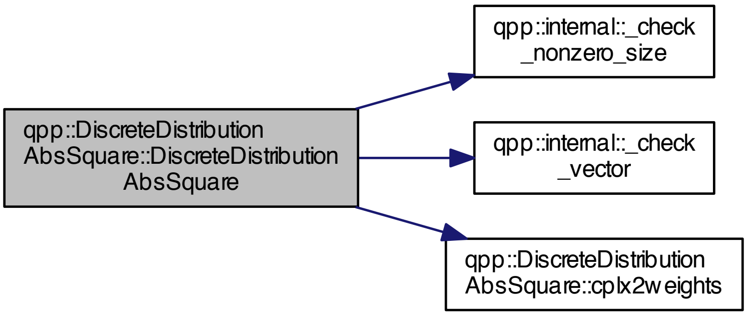
6.2.1.3 qpp::DiscreteDistributionAbsSquare::DiscreteDistributionAbsSquare (std::vector< types::cplx > *amplitudes*) [inline]

Here is the call graph for this function:


qpp::DiscreteDistribution AbsSquare::DiscreteDistribution AbsSquare
qpp::DiscreteDistribution AbsSquare::cplx2weights

6.2.1.4 qpp::DiscreteDistributionAbsSquare::DiscreteDistributionAbsSquare (const types::cmat & *V*) [inline]

Here is the call graph for this function:


qpp::DiscreteDistribution AbsSquare::DiscreteDistribution AbsSquare
qpp::internal::_check _nonzero_size
qpp::internal::_check _vector
qpp::DiscreteDistribution AbsSquare::cplx2weights

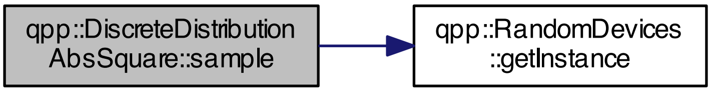
6.2.2 Member Function Documentation

6.2.2.1 template<typename InputIterator > std::vector<double> qpp::DiscreteDistributionAbsSquare::cplx2weights (InputIterator *first,* InputIterator *last*) [inline], [protected]

6.2.2.2 std::vector<double> qpp::DiscreteDistributionAbsSquare::probabilities ( ) [inline]

6.2.2.3 size_t qpp::DiscreteDistributionAbsSquare::sample ( ) [inline]

Here is the call graph for this function:


qpp::DiscreteDistribution AbsSquare::sample
qpp::RandomDevices ::getInstance

6.2.3 Member Data Documentation

6.2.3.1 std::discrete_distribution<size_t> qpp::DiscreteDistributionAbsSquare::_d [protected]

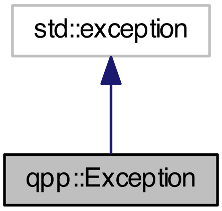
The documentation for this class was generated from the following file:

- include/classes/stat.h

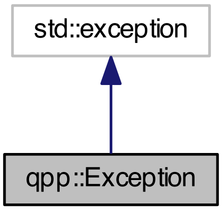
6.3 qpp::Exception Class Reference

```
#include <exception.h>
```

Inheritance diagram for qpp::Exception:



Collaboration diagram for qpp::Exception:



Public Types

- enum Type {
  Type::UNKNOWN_EXCEPTION = 1, Type::ZERO_SIZE, Type::MATRIX_NOT_SQUARE, Type::MATRIX_NOT_CVECTOR,
  Type::MATRIX_NOT_RVECTOR, Type::MATRIX_NOT_VECTOR, Type::MATRIX_NOT_SQUARE_OR_CVECTOR, Type::MATRIX_NOT_SQUARE_OR_RVECTOR,
  Type::MATRIX_NOT_SQUARE_OR_VECTOR, Type::DIMS_INVALID, Type::DIMS_NOT_EQUAL, Type::DIMS_MISMATCH_MATRIX,
  Type::DIMS_MISMATCH_CVECTOR, Type::DIMS_MISMATCH_RVECTOR, Type::DIMS_MISMATCH_VECTOR, Type::SUBSYS_MISMATCH_DIMS,
  Type::PERM_INVALID, Type::NOT_QUBIT_GATE, Type::NOT_QUBIT_SUBSYS, Type::NOT_BIPARTITE,
  Type::OUT_OF_RANGE, Type::UNDEFINED_TYPE, Type::TYPE_MISMATCH, Type::CUSTOM_EXCEPTION }

Public Member Functions

- Exception (const std::string &where, const Type &type)
- Exception (const std::string &where, const std::string &custom)
- virtual const char ∗ what () const noexceptoverride
- virtual ∼Exception () noexcept

Private Member Functions

- std::string _construct_exception_msg ()

Private Attributes

- std::string _where
- std::string _msg
- Type _type
- std::string _custom

6.3.1 Member Enumeration Documentation

6.3.1.1 enum qpp::Exception::Type [strong]

Enumerator

UNKNOWN_EXCEPTION

ZERO_SIZE

MATRIX_NOT_SQUARE

MATRIX_NOT_CVECTOR

MATRIX_NOT_RVECTOR

MATRIX_NOT_VECTOR

MATRIX_NOT_SQUARE_OR_CVECTOR

MATRIX_NOT_SQUARE_OR_RVECTOR

MATRIX_NOT_SQUARE_OR_VECTOR

DIMS_INVALID

DIMS_NOT_EQUAL

DIMS_MISMATCH_MATRIX

DIMS_MISMATCH_CVECTOR

DIMS_MISMATCH_RVECTOR

DIMS_MISMATCH_VECTOR

SUBSYS_MISMATCH_DIMS

PERM_INVALID

NOT_QUBIT_GATE

NOT_QUBIT_SUBSYS

NOT_BIPARTITE

OUT_OF_RANGE

UNDEFINED_TYPE

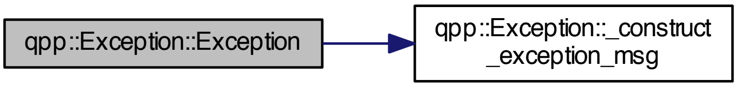
TYPE_MISMATCH

CUSTOM_EXCEPTION

6.3.2 Constructor & Destructor Documentation

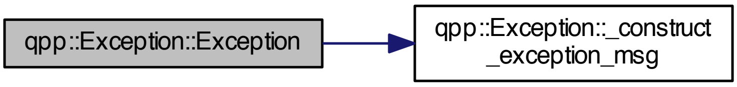
6.3.2.1 qpp::Exception::Exception (const std::string & *where*, const Type & *type*) [inline]

Here is the call graph for this function:


qpp::Exception::Exception
qpp::Exception::_construct _exception_msg

6.3.2.2 qpp::Exception::Exception (const std::string & *where*, const std::string & *custom*) [inline]

Here is the call graph for this function:


qpp::Exception::Exception
qpp::Exception::_construct _exception_msg

6.3.2.3 virtual qpp::Exception::∼Exception ( ) [inline], [virtual], [noexcept]

6.3.3 Member Function Documentation

6.3.3.1 std::string qpp::Exception::_construct_exception_msg ( ) [inline], [private]

6.3.3.2 virtual const char∗ qpp::Exception::what ( ) const [inline], [override], [virtual], [noexcept]

6.3.4 Member Data Documentation

6.3.4.1 std::string qpp::Exception::_custom [private]

6.3.4.2 std::string qpp::Exception::_msg [private]

6.3.4.3 Type qpp::Exception::_type [private]

6.3.4.4 std::string qpp::Exception::_where [private]

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

- include/classes/exception.h

6.4 qpp::Gates Class Reference

```
#include <gates.h>
```

Public Member Functions

- Gates (const Gates &)=delete
- Gates & operator= (const Gates &)=delete
- virtual ∼Gates ()=default
- types::cmat Rtheta (double theta) const
- types::cmat Id (size_t D) const
- types::cmat Zd (size_t D) const
- types::cmat Fd (size_t D) const
- types::cmat Xd (size_t D) const
- types::cmat CTRL (const types::cmat &A, const std::vector< size_t > &ctrl, const std::vector< size_t > &subsys, size_t n, size_t d=2) const

Static Public Member Functions

- static const Gates & getInstance ()

Public Attributes

- types::cmat Id2
- types::cmat H
- types::cmat X
- types::cmat Y
- types::cmat Z
- types::cmat S
- types::cmat T
- types::cmat CNOTab
- types::cmat CZ
- types::cmat CNOTba
- types::cmat SWAP
- types::cmat TOF
- types::cmat FRED

Private Member Functions

- Gates ()

6.4.1 Constructor & Destructor Documentation

6.4.1.1 qpp::Gates::Gates ( ) [inline], [private]

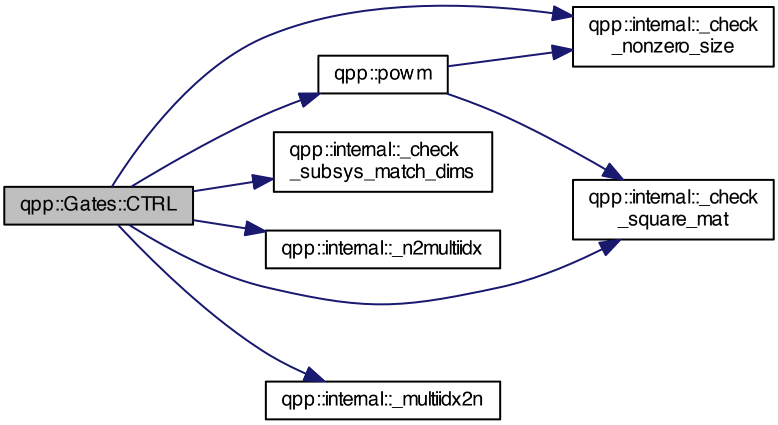
6.4.1.2 qpp::Gates::Gates (const Gates &) [delete]

6.4.1.3 virtual qpp::Gates::∼Gates ( ) [virtual], [default]

6.4.2 Member Function Documentation

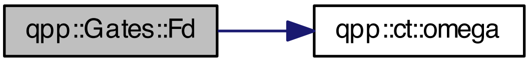
6.4.2.1 types::cmat qpp::Gates::CTRL (const types::cmat & *A*, const std::vector< size_t > & *ctrl*, const std::vector< size_t > & *subsys*, size_t *n*, size_t *d* = 2) const [inline]

Here is the call graph for this function:



6.4.2.2 types::cmat qpp::Gates::Fd (size_t *D*) const [inline]

Here is the call graph for this function:



6.4.2.3 static const Gates& qpp::Gates::getInstance ( ) [inline], [static]

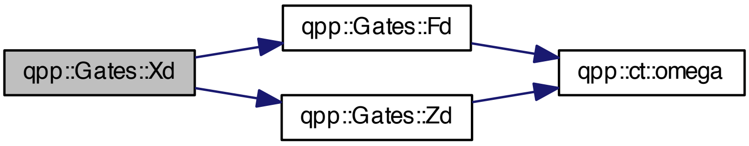
6.4.2.4 types::cmat qpp::Gates::Id (size_t *D*) const [inline]

6.4.2.5 Gates& qpp::Gates::operator= (const Gates &) [delete]

6.4.2.6 types::cmat qpp::Gates::Rtheta (double *theta*) const [inline]

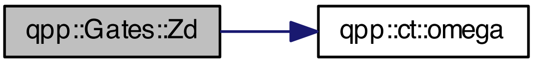
6.4.2.7 types::cmat qpp::Gates::Xd (size_t *D*) const [inline]

Here is the call graph for this function:



6.4.2.8 types::cmat qpp::Gates::Zd (size_t *D*) const [inline]

Here is the call graph for this function:



6.4.3 Member Data Documentation

6.4.3.1 types::cmat qpp::Gates::CNOTab

6.4.3.2 types::cmat qpp::Gates::CNOTba

6.4.3.3 types::cmat qpp::Gates::CZ

6.4.3.4 types::cmat qpp::Gates::FRED

6.4.3.5 types::cmat qpp::Gates::H

6.4.3.6 types::cmat qpp::Gates::Id2

6.4.3.7 types::cmat qpp::Gates::S

6.4.3.8 types::cmat qpp::Gates::SWAP

6.4.3.9 types::cmat qpp::Gates::T

6.4.3.10 types::cmat qpp::Gates::TOF

6.4.3.11 types::cmat qpp::Gates::X

6.4.3.12 types::cmat qpp::Gates::Y

6.4.3.13 types::cmat qpp::Gates::Z

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

- include/classes/gates.h

6.5 qpp::NormalDistribution Class Reference

```
#include <stat.h>
```

Public Member Functions

- NormalDistribution (double mean=0, double sigma=1)
- double sample ()

Protected Attributes

- std::normal_distribution _d

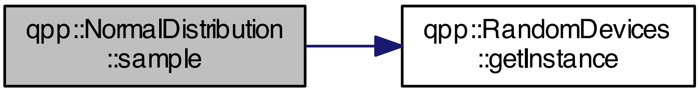
6.5.1 Constructor & Destructor Documentation

6.5.1.1 qpp::NormalDistribution::NormalDistribution (double *mean* = 0, double *sigma* = 1) [inline]

6.5.2 Member Function Documentation

6.5.2.1 double qpp::NormalDistribution::sample ( ) [inline]

Here is the call graph for this function:


qpp::NormalDistribution ::sample
qpp::RandomDevices ::getInstance

6.5.3 Member Data Documentation

6.5.3.1 std::normal_distribution qpp::NormalDistribution::_d [protected]

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

- include/classes/stat.h

6.6 qpp::Qudit Class Reference

`#include <qudit.h>`

Public Member Functions

- Qudit (const types::cmat &rho=States::getInstance().pz0)
- size_t measure (const types::cmat &U, bool destructive=false)
- size_t measure (bool destructive=false)
- types::cmat getRho () const
- size_t getD () const
- virtual ∼Qudit ()=default

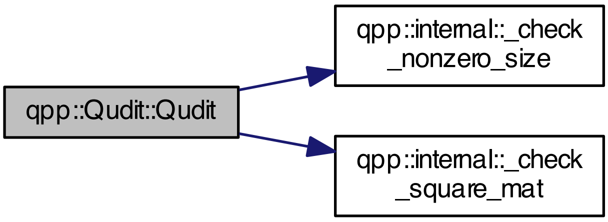
Private Attributes

- types::cmat _rho
- size_t _D

6.6.1 Constructor & Destructor Documentation

6.6.1.1 qpp::Qudit::Qudit (const types::cmat & *rho* = States::getInstance().pz0) [inline]

Here is the call graph for this function:


qpp::Qudit::Qudit
qpp::internal::_check _nonzero_size
qpp::internal::_check _square_mat

6.6.1.2 virtual qpp::Qudit::∼Qudit ( ) [virtual], [default]

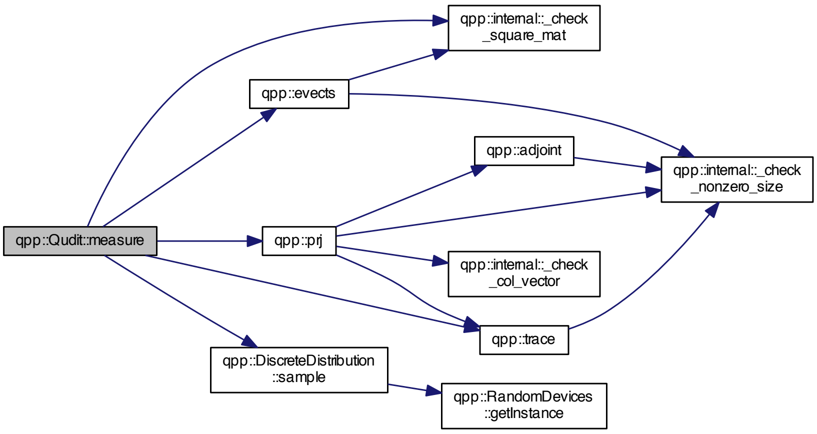
6.6.2 Member Function Documentation

6.6.2.1 size_t qpp::Qudit::getD ( ) const [inline]

6.6.2.2 types::cmat qpp::Qudit::getRho ( ) const [inline]

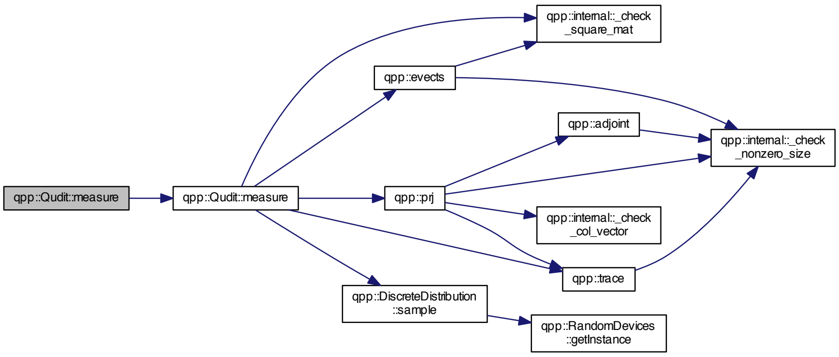
6.6.2.3 size_t qpp::Qudit::measure (const types::cmat & *U*, bool *destructive* = false) [inline]

Here is the call graph for this function:


qpp::internal::_check _square_mat
qpp::evects
qpp::adjoint
qpp::internal::_check _nonzero_size
qpp::Qudit::measure
qpp::prj
qpp::internal::_check _col_vector
qpp::trace
qpp::DiscreteDistribution ::sample
qpp::RandomDevices ::getInstance

6.6.2.4 size_t qpp::Qudit::measure (bool *destructive* = false) [inline]

Here is the call graph for this function:


qpp::internal::_check _square_mat
qpp::evects
qpp::adjoint
qpp::internal::_check _nonzero_size
qpp::Qudit::measure
qpp::Qudit::measure
qpp::prj
qpp::internal::_check _col_vector
qpp::trace
qpp::DiscreteDistribution ::sample
qpp::RandomDevices ::getInstance

6.6.3 Member Data Documentation

6.6.3.1 size_t qpp::Qudit::_D [private]

6.6.3.2 types::cmat qpp::Qudit::_rho [private]

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

- include/classes/qudit.h

6.7 qpp::RandomDevices Class Reference

```
#include <randevs.h>
```

Public Member Functions

- RandomDevices (const RandomDevices &)=delete
- RandomDevices & operator= (const RandomDevices &)=delete
- virtual ∼RandomDevices ()=default

Static Public Member Functions

- static RandomDevices & getInstance ()

Public Attributes

- std::random_device _rd
- std::mt19937 _rng

Private Member Functions

- RandomDevices ()

6.7.1 Constructor & Destructor Documentation

6.7.1.1 qpp::RandomDevices::RandomDevices ( ) [inline], [private]

6.7.1.2 qpp::RandomDevices::RandomDevices (const RandomDevices &) [delete]

6.7.1.3 virtual qpp::RandomDevices::∼RandomDevices ( ) [virtual], [default]

6.7.2 Member Function Documentation

6.7.2.1 static RandomDevices& qpp::RandomDevices::getInstance ( ) [inline], [static]

6.7.2.2 RandomDevices& qpp::RandomDevices::operator= (const RandomDevices &) [delete]

6.7.3 Member Data Documentation

6.7.3.1 std::random_device qpp::RandomDevices::_rd

6.7.3.2 std::mt19937 qpp::RandomDevices::_rng

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

- include/classes/randevs.h

6.8 qpp::States Class Reference

```
#include <states.h>
```

Public Member Functions

- States (const States &)=delete
- States & operator= (const States &)=delete
- virtual ∼States ()=default

Static Public Member Functions

- static const States & getInstance ()

Public Attributes

- types::ket x0
- types::ket x1
- types::ket y0
- types::ket y1
- types::ket z0
- types::ket z1
- types::cmat px0
- types::cmat px1
- types::cmat py0
- types::cmat py1
- types::cmat pz0
- types::cmat pz1
- types::ket b00
- types::ket b01
- types::ket b10
- types::ket b11
- types::cmat pb00
- types::cmat pb01
- types::cmat pb10
- types::cmat pb11
- types::ket GHZ
- types::ket W
- types::cmat pGHZ
- types::cmat pW

Private Member Functions

- States ()

6.8.1 Constructor & Destructor Documentation

6.8.1.1 qpp::States::States ( ) [inline], [private]

6.8.1.2 qpp::States::States (const States &) [delete]

6.8.1.3 virtual qpp::States::∼States ( ) [virtual], [default]

6.8.2 Member Function Documentation

6.8.2.1 static const States& qpp::States::getInstance ( ) [inline], [static]

6.8.2.2 States& qpp::States::operator= (const States &) [delete]

6.8.3 Member Data Documentation

6.8.3.1 types::ket qpp::States::b00

6.8.3.2 types::ket qpp::States::b01

6.8.3.3 types::ket qpp::States::b10

6.8.3.4 types::ket qpp::States::b11

6.8.3.5 types::ket qpp::States::GHZ

6.8.3.6 types::cmat qpp::States::pb00

6.8.3.7 types::cmat qpp::States::pb01

6.8.3.8 types::cmat qpp::States::pb10

6.8.3.9 types::cmat qpp::States::pb11

6.8.3.10 types::cmat qpp::States::pGHZ

6.8.3.11 types::cmat qpp::States::pW

6.8.3.12 types::cmat qpp::States::px0

6.8.3.13 types::cmat qpp::States::px1

6.8.3.14 types::cmat qpp::States::py0

6.8.3.15 types::cmat qpp::States::py1

6.8.3.16 types::cmat qpp::States::pz0

6.8.3.17 types::cmat qpp::States::pz1

6.8.3.18 types::ket qpp::States::W

6.8.3.19 types::ket qpp::States::x0

6.8.3.20 types::ket qpp::States::x1

6.8.3.21 types::ket qpp::States::y0

6.8.3.22 types::ket qpp::States::y1

6.8.3.23 types::ket qpp::States::z0

6.8.3.24 types::ket qpp::States::z1

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

- include/classes/states.h

6.9 qpp::Timer Class Reference

```
#include <timer.h>
```

Public Member Functions

- Timer ()
- void tic ()
- void toc ()
- double seconds () const
- virtual ∼Timer ()=default

Protected Attributes

- std::chrono::high_resolution_clock::time_point _start
- std::chrono::high_resolution_clock::time_point _end

Friends

- std::ostream & operator<< (std::ostream &os, const Timer &rhs)

6.9.1 Constructor & Destructor Documentation

6.9.1.1 qpp::Timer::Timer ( ) [inline]

6.9.1.2 virtual qpp::Timer::∼Timer ( ) [virtual], [default]

6.9.2 Member Function Documentation

6.9.2.1 double qpp::Timer::seconds ( ) const [inline]

6.9.2.2 void qpp::Timer::tic ( ) [inline]

6.9.2.3 void qpp::Timer::toc ( ) [inline]

6.9.3 Friends And Related Function Documentation

6.9.3.1 std::ostream& operator<< (std::ostream & *os*, const Timer & *rhs*) [friend]

6.9.4 Member Data Documentation

6.9.4.1 std::chrono::high_resolution_clock::time_point qpp::Timer::_end [protected]

6.9.4.2 std::chrono::high_resolution_clock::time_point qpp::Timer::_start [protected]

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

- include/classes/timer.h

6.10 qpp::UniformRealDistribution Class Reference

```
#include <stat.h>
```

Public Member Functions

- UniformRealDistribution (double a=0, double b=1)
- double sample ()

Protected Attributes

- std::uniform_real_distribution _d

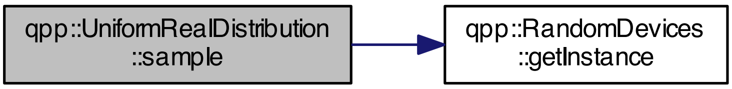
6.10.1 Constructor & Destructor Documentation

6.10.1.1 qpp::UniformRealDistribution::UniformRealDistribution (double *a* = 0, double *b* = 1) [inline]

6.10.2 Member Function Documentation

6.10.2.1 double qpp::UniformRealDistribution::sample ( ) [inline]

Here is the call graph for this function:



6.10.3 Member Data Documentation

6.10.3.1 std::uniform_real_distribution qpp::UniformRealDistribution::_d [protected]

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

- include/classes/stat.h

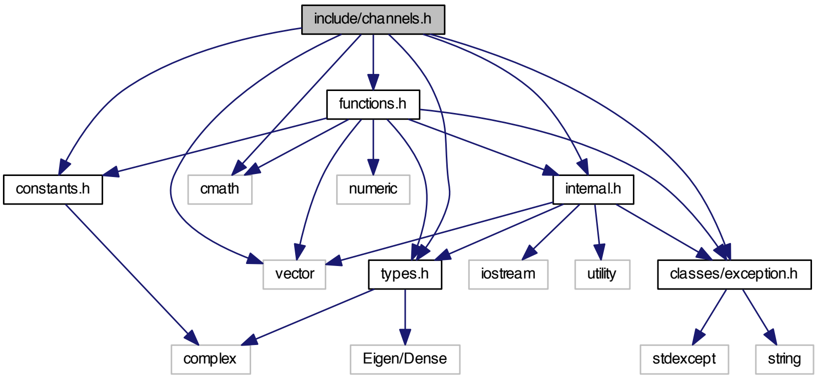
Chapter 7

File Documentation

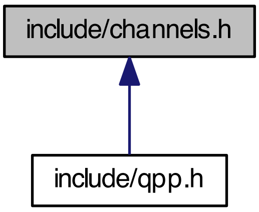
7.1 include/channels.h File Reference

```
#include <cmath>
#include <vector>
#include "constants.h"
#include "functions.h"
#include "internal.h"
#include "types.h"
#include "classes/exception.h"
```

Include dependency graph for channels.h:



This graph shows which files directly or indirectly include this file:



Namespaces

- qpp

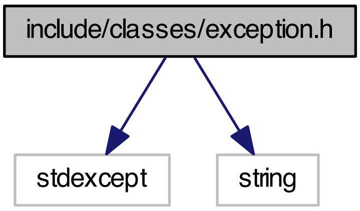
Functions

- template<typename Derived >
  types::cmat qpp::channel (const Eigen::MatrixBase< Derived > &rho, const std::vector< types::cmat > &Ks)
- types::cmat qpp::super (const std::vector< types::cmat > &Ks)
- types::cmat qpp::choi (const std::vector< types::cmat > &Ks)
- std::vector< types::cmat > qpp::choi2kraus (const types::cmat &A)
- template<typename Derived >
  types::cmat qpp::channel (const Eigen::MatrixBase< Derived > &rho, const std::vector< types::cmat > &Ks, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)

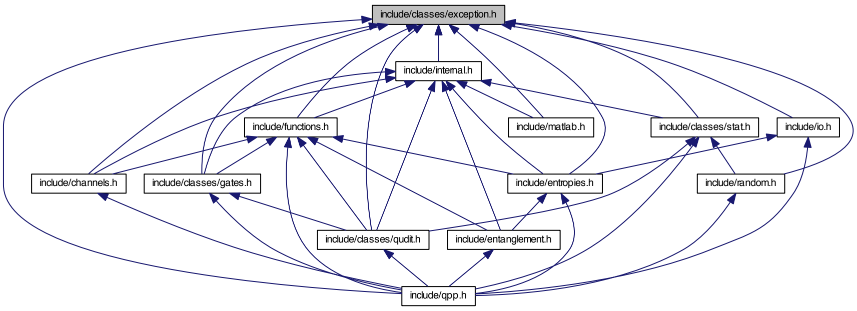
7.2 include/classes/exception.h File Reference

```
#include <stdexcept>
#include <string>
```

Include dependency graph for exception.h:



This graph shows which files directly or indirectly include this file:



Classes

- class qpp::Exception

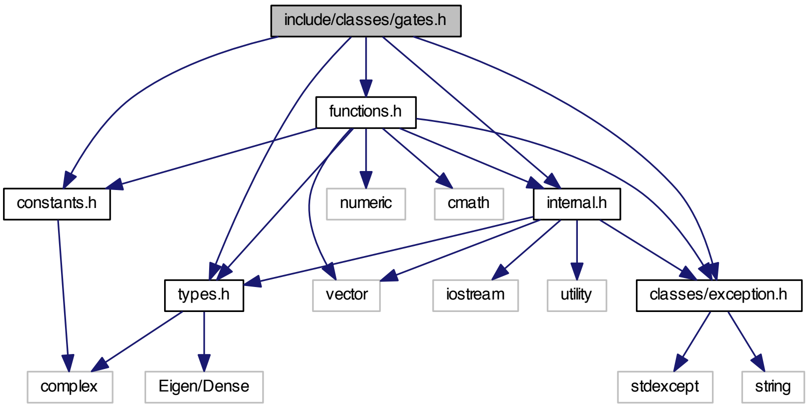
Namespaces

- qpp

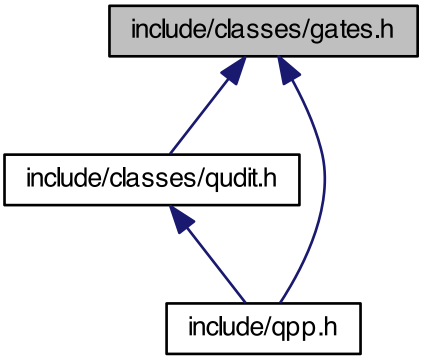
7.3 include/classes/gates.h File Reference

```
#include "constants.h"
#include "functions.h"
#include "exception.h"
#include "internal.h"
#include "types.h"
```

Include dependency graph for gates.h:



This graph shows which files directly or indirectly include this file:



Classes

- class qpp::Gates

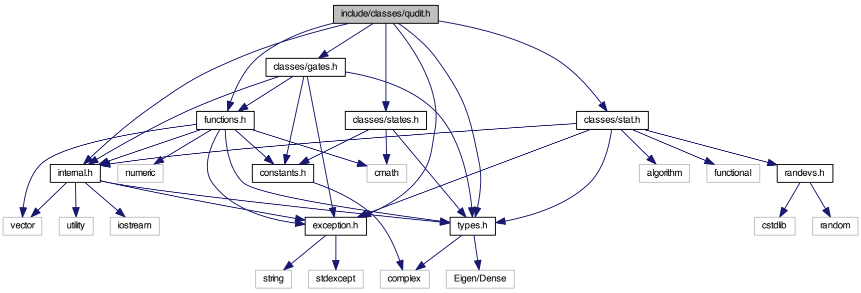
Namespaces

- qpp

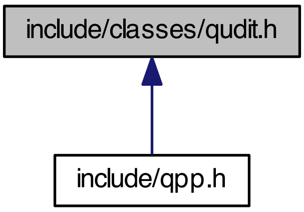
7.4 include/classes/qudit.h File Reference

```
#include "exception.h"
#include "functions.h"
#include "internal.h"
#include "types.h"
#include "classes/gates.h"
#include "classes/stat.h"
#include "classes/states.h"
```

Include dependency graph for qudit.h:



This graph shows which files directly or indirectly include this file:



Classes

- class qpp::Qudit

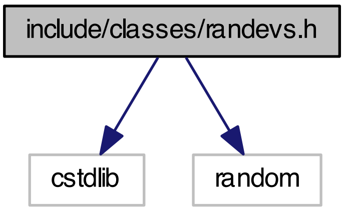
Namespaces

- qpp

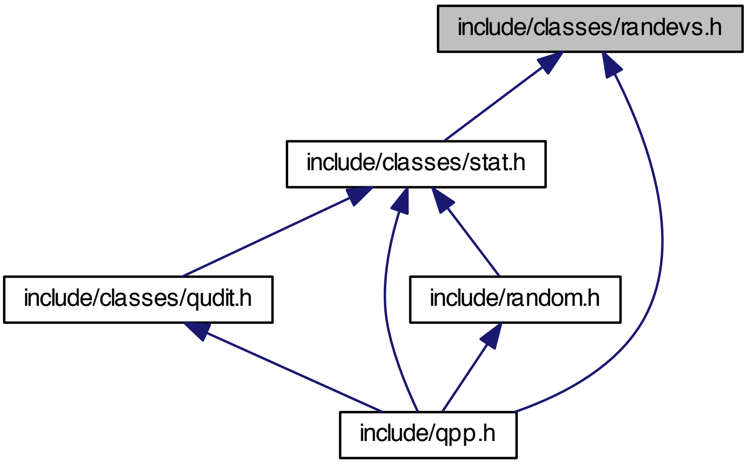
7.5 include/classes/randevs.h File Reference

```
#include <cstdlib>
#include <random>
```

Include dependency graph for randevs.h:



This graph shows which files directly or indirectly include this file:



Classes

- class qpp::RandomDevices

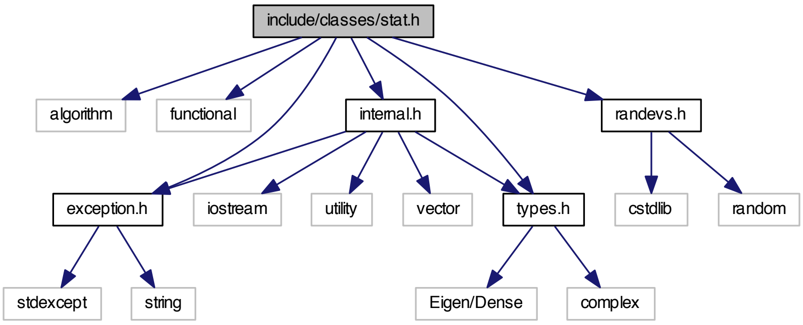
Namespaces

- qpp

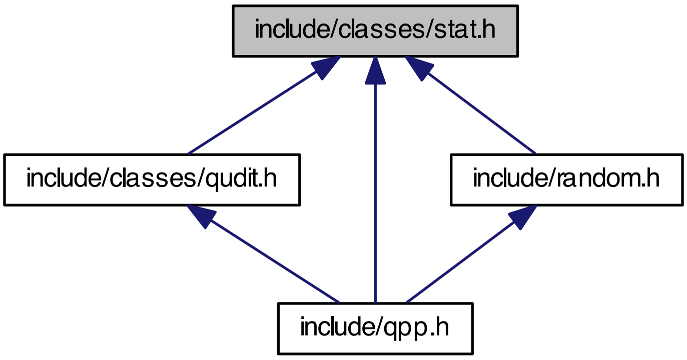
7.6 include/classes/stat.h File Reference

```
#include <algorithm>
#include <functional>
#include "exception.h"
#include "internal.h"
#include "randevs.h"
#include "types.h"
```

Include dependency graph for stat.h:



This graph shows which files directly or indirectly include this file:



Classes

- class qpp::NormalDistribution
- class qpp::UniformRealDistribution
- class qpp::DiscreteDistribution
- class qpp::DiscreteDistributionAbsSquare

Namespaces

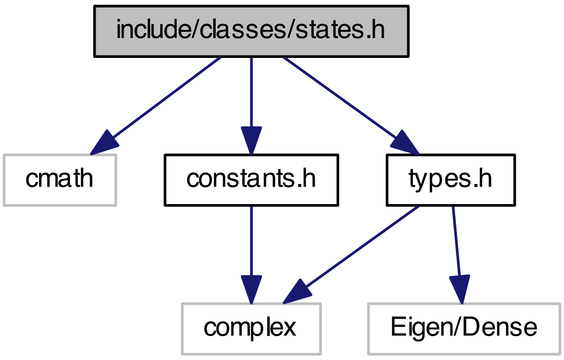
- qpp

7.7 include/classes/states.h File Reference

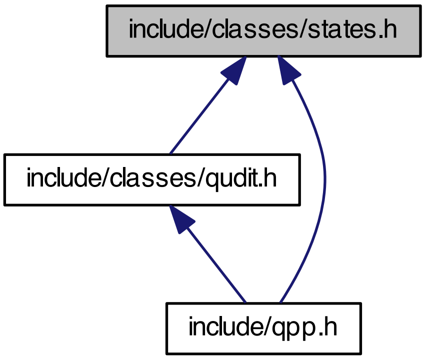
```
#include <cmath>
```

```
#include "constants.h"
#include "types.h"
```

Include dependency graph for states.h:



This graph shows which files directly or indirectly include this file:



Classes

- class qpp::States

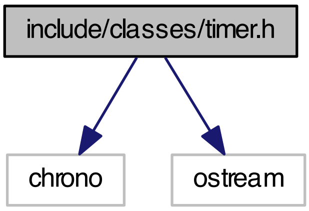
Namespaces

- qpp

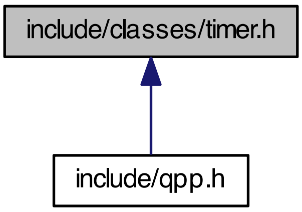
7.8 include/classes/timer.h File Reference

```
#include <chrono>
#include <ostream>
```

Include dependency graph for timer.h:



This graph shows which files directly or indirectly include this file:



Classes

- class qpp::Timer

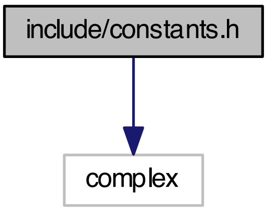
Namespaces

- qpp

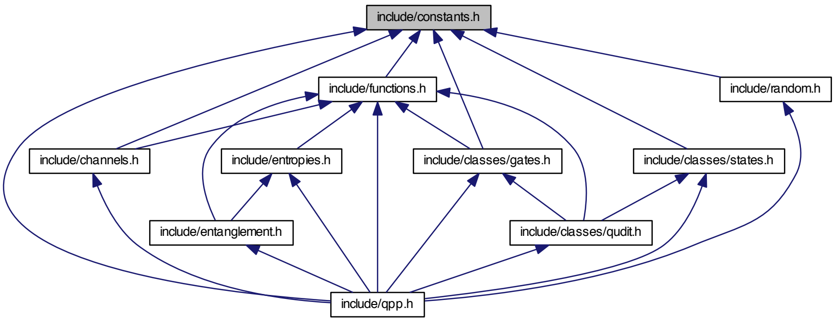
7.9 include/constants.h File Reference

```
#include <complex>
```

Include dependency graph for constants.h:



This graph shows which files directly or indirectly include this file:



Namespaces

- qpp
- qpp::ct

Functions

- std::complex< double > qpp::ct::omega (size_t D)

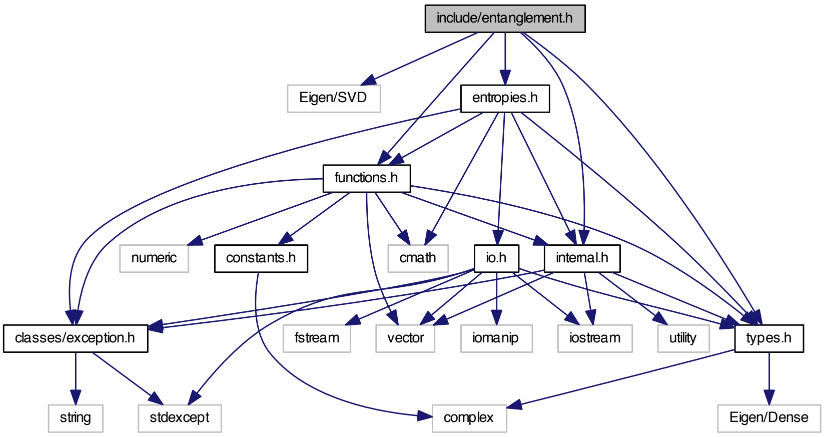
Variables

- const double qpp::ct::chop = 1e-10
- const double qpp::ct::eps = 1e-12
- const size_t qpp::ct::maxn = 64
- const std::complex< double > qpp::ct::ii = { 0, 1 }
- const double qpp::ct::pi = 3.141592653589793238462643383279502884
- const double qpp::ct::ee = 2.718281828459045235360287471352662497

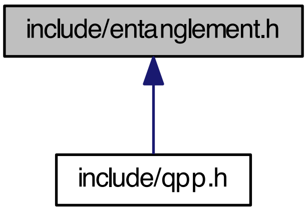
7.10 include/entanglement.h File Reference

```
#include <Eigen/SVD>
#include "entropies.h"
#include "functions.h"
#include "internal.h"
#include "types.h"
```

Include dependency graph for entanglement.h:



This graph shows which files directly or indirectly include this file:



Namespaces

- qpp

Functions

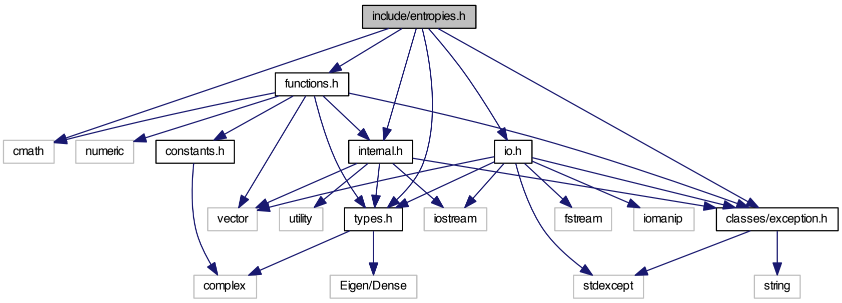
- template<typename Derived >
  types::cmat qpp::schmidtcoeff (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  types::cmat qpp::schmidtU (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)

- template<typename Derived >
  types::cmat qpp::schmidtV (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  types::cmat qpp::schmidtprob (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  double qpp::entanglement (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  double qpp::gconcurrence (const Eigen::MatrixBase< Derived > &A)

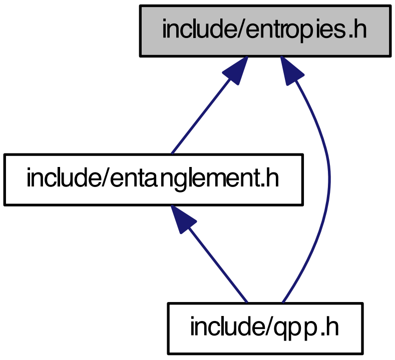
7.11 include/entropies.h File Reference

```
#include <cmath>
#include "functions.h"
#include "internal.h"
#include "types.h"
#include "classes/exception.h"
#include "io.h"
```

Include dependency graph for entropies.h:



This graph shows which files directly or indirectly include this file:



Namespaces

- qpp

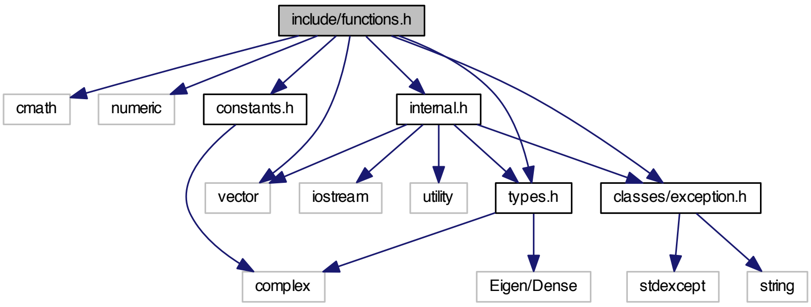
Functions

- template<typename Derived >
  double qpp::shannon (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double qpp::renyi (const double alpha, const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double qpp::renyi_inf (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double qpp::tsallis (const double alpha, const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double qpp::qmutualinfo (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)

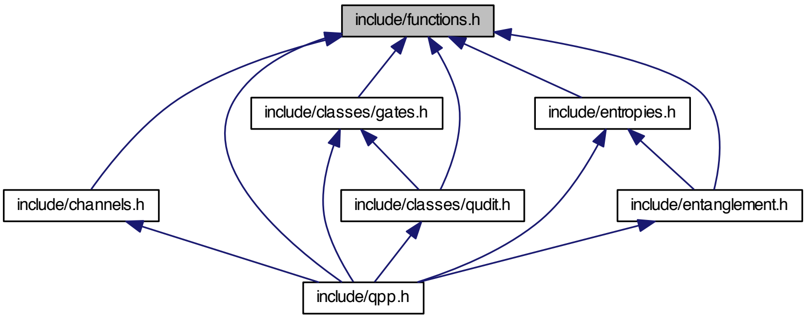
7.12 include/functions.h File Reference

```
#include <cmath>
#include <numeric>
#include <vector>
#include "constants.h"
#include "internal.h"
#include "types.h"
#include "classes/exception.h"
```

Include dependency graph for functions.h:



This graph shows which files directly or indirectly include this file:



Namespaces

- qpp

Functions

- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::transpose (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::conjugate (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::adjoint (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::inverse (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  Derived::Scalar qpp::trace (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  Derived::Scalar qpp::det (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  Derived::Scalar qpp::logdet (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  Derived::Scalar qpp::sum (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  double qpp::norm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::evals (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::evects (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::dmat qpp::hevals (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::hevects (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::funm (const Eigen::MatrixBase< Derived > &A, types::cplx(∗f)(const types::cplx &))

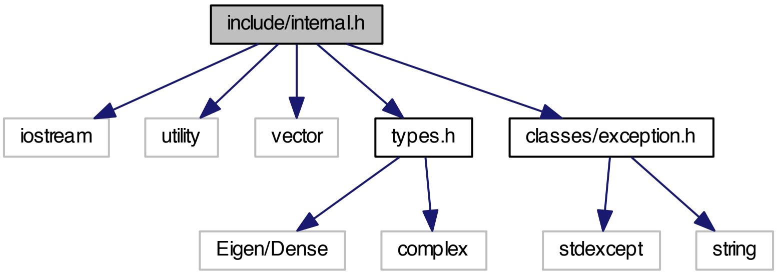
- template<typename Derived >
  types::cmat qpp::sqrtm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::absm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::expm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::logm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::sinm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::cosm (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  types::cmat qpp::spectralpowm (const Eigen::MatrixBase< Derived > &A, const types::cplx z)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::powm (const Eigen::MatrixBase< Derived > &A, size_t n)
- template<typename OutputScalar , typename Derived >
  types::DynMat< OutputScalar > qpp::cwise (const Eigen::MatrixBase< Derived > &A, OutputScalar(∗f)(const typename Derived::Scalar &))
- template<typename Derived1 , typename Derived2 >
  types::DynMat< typename
  Derived1::Scalar > qpp::kron (const Eigen::MatrixBase< Derived1 > &A, const Eigen::MatrixBase< Derived2 > &B)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::kronlist (const std::vector< types::DynMat< typename Derived::Scalar > > &As)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::kronpow (const Eigen::MatrixBase< Derived > &A, size_t n)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::reshape (const Eigen::MatrixBase< Derived > &A, size_t rows, size_t cols)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::syspermute (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &perm, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::ptrace1 (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::ptrace2 (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::ptrace (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::ptranspose (const Eigen::MatrixBase< Derived > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Derived1 , typename Derived2 >
  types::DynMat< typename
  Derived1::Scalar > qpp::comm (const Eigen::MatrixBase< Derived1 > &A, const Eigen::MatrixBase< Derived2 > &B)

- template<typename Derived1 , typename Derived2 >
  types::DynMat< typename Derived1::Scalar > qpp::anticomm (const Eigen::MatrixBase< Derived1 > &A, const Eigen::MatrixBase< Derived2 > &B)
- template<typename Derived >
  types::DynMat< typename Derived::Scalar > qpp::prj (const Eigen::MatrixBase< Derived > &V)
- template<typename Derived >
  types::DynMat< typename Derived::Scalar > qpp::expandout (const Eigen::MatrixBase< Derived > &A, size_t pos, const std::vector< size_t > &dims)
- template<typename Derived1 , typename Derived2 >
  types::DynMat< typename Derived1::Scalar > qpp::gate (const Eigen::MatrixBase< Derived1 > &state, const Eigen::MatrixBase< Derived2 > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Derived >
  types::DynMat< typename Derived::Scalar > qpp::grams (const std::vector< types::DynMat< typename Derived::Scalar > > &Vs)
- template<typename Derived >
  types::DynMat< typename Derived::Scalar > qpp::grams (const Eigen::MatrixBase< Derived > &A)
- std::vector< size_t > qpp::n2multiidx (size_t n, const std::vector< size_t > &dims)
- size_t qpp::multiidx2n (const std::vector< size_t > &midx, const std::vector< size_t > &dims)
- types::ket qpp::mket (const std::vector< size_t > &mask)
- types::ket qpp::mket (const std::vector< size_t > &mask, const std::vector< size_t > &dims)
- types::ket qpp::mket (const std::vector< size_t > &mask, size_t d)
- std::vector< size_t > qpp::invperm (const std::vector< size_t > &perm)
- std::vector< size_t > qpp::compperm (const std::vector< size_t > &perm, const std::vector< size_t > &sigma)

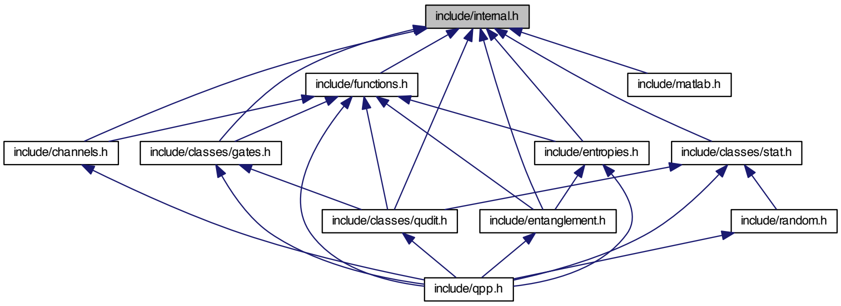
7.13 include/internal.h File Reference

```
#include <iostream>
#include <utility>
#include <vector>
#include "types.h"
#include "classes/exception.h"
```

Include dependency graph for internal.h:



This graph shows which files directly or indirectly include this file:



Namespaces

- qpp
- qpp::internal

Functions

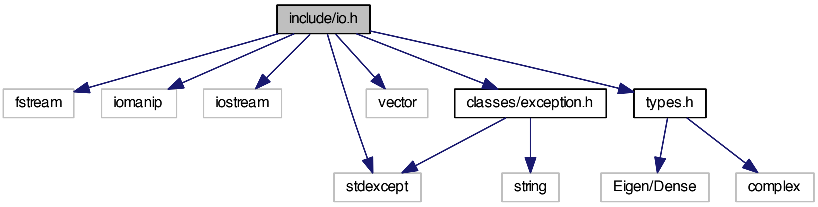
- void qpp::internal::_n2multiidx (size_t n, size_t numdims, const size_t ∗dims, size_t ∗result)
- size_t qpp::internal::_multiidx2n (const size_t ∗midx, size_t numdims, const size_t ∗dims)
- template<typename Derived >
  bool qpp::internal::_check_square_mat (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  bool qpp::internal::_check_vector (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  bool qpp::internal::_check_row_vector (const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  bool qpp::internal::_check_col_vector (const Eigen::MatrixBase< Derived > &A)
- template<typename T >
  bool qpp::internal::_check_nonzero_size (const T &x)
- bool qpp::internal::_check_dims (const std::vector< size_t > &dims)
- template<typename Derived >
  bool qpp::internal::_check_dims_match_mat (const std::vector< size_t > &dims, const Eigen::MatrixBase< Derived > &A)
- template<typename Derived >
  bool qpp::internal::_check_dims_match_cvect (const std::vector< size_t > &dims, const Eigen::MatrixBase< Derived > &V)
- template<typename Derived >
  bool qpp::internal::_check_dims_match_rvect (const std::vector< size_t > &dims, const Eigen::MatrixBase< Derived > &V)
- bool qpp::internal::_check_eq_dims (const std::vector< size_t > &dims, size_t dim)
- bool qpp::internal::_check_subsys_match_dims (const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- bool qpp::internal::_check_perm (const std::vector< size_t > &perm)

7.14 include/io.h File Reference

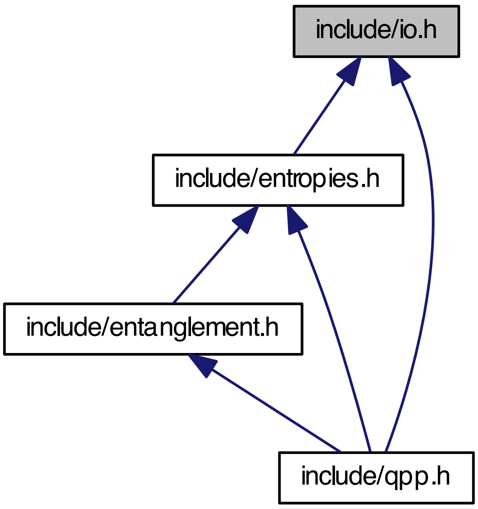
```
#include <fstream>
```

```
#include <iomanip>
#include <iostream>
#include <stdexcept>
#include <vector>
#include "types.h"
#include "classes/exception.h"
```

Include dependency graph for io.h:



This graph shows which files directly or indirectly include this file:



Namespaces

- qpp

Functions

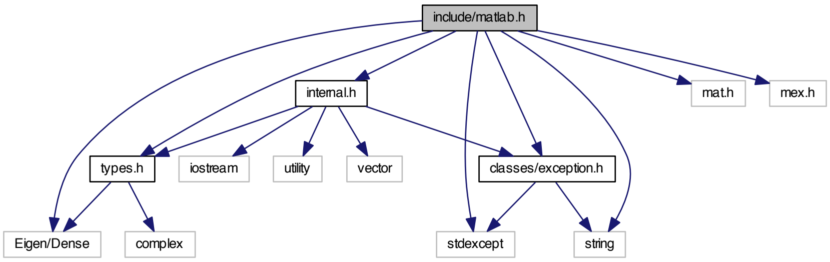
- template<typename T >
  void qpp::disp (const T &x, const std::string &separator, const std::string &start="[", const std::string &end="]", std::ostream &os=std::cout)

- template<typename T >
  void qpp::displn (const T &x, const std::string &separator, const std::string &start="[", const std::string &end="]", std::ostream &os=std::cout)
- template<typename T >
  void qpp::disp (const T ∗x, const size_t n, const std::string &separator, const std::string &start="[", const std::string &end="]", std::ostream &os=std::cout)
- template<typename T >
  void qpp::displn (const T ∗x, const size_t n, const std::string &separator, const std::string &start="[", const std::string &end="]", std::ostream &os=std::cout)
- template<typename Derived >
  void qpp::disp (const Eigen::MatrixBase< Derived > &A, double chop=ct::chop, std::ostream &os=std::cout)
- template<typename Derived >
  void qpp::displn (const Eigen::MatrixBase< Derived > &A, double chop=ct::chop, std::ostream &os=std::cout)
- void qpp::disp (const types::cplx c, double chop=ct::chop, std::ostream &os=std::cout)
- void qpp::displn (const types::cplx c, double chop=ct::chop, std::ostream &os=std::cout)
- template<typename Derived >
  void qpp::save (const Eigen::MatrixBase< Derived > &A, const std::string &fname)
- template<typename Derived >
  types::DynMat< typename
  Derived::Scalar > qpp::load (const std::string &fname)

7.15 include/matlab.h File Reference

```
#include <Eigen/Dense>
#include <stdexcept>
#include <string>
#include "internal.h"
#include "types.h"
#include "classes/exception.h"
#include "mat.h"
#include "mex.h"
```

Include dependency graph for matlab.h:



Namespaces

- qpp

Functions

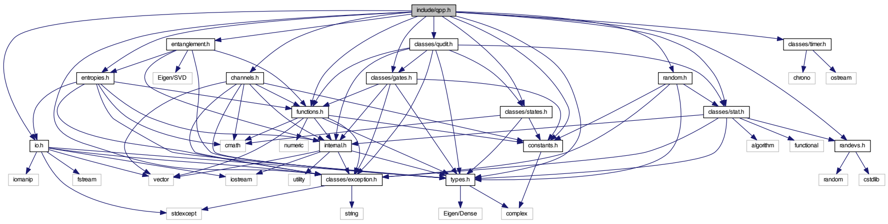
- template<typename Derived >
  Derived qpp::loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)

- template<>
  types::dmat qpp::loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<>
  types::cmat qpp::loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<typename Derived >
  void qpp::saveMATLABmatrix (const Eigen::MatrixBase< Derived > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- template<>
  void qpp::saveMATLABmatrix (const Eigen::MatrixBase< typename types::dmat > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- template<>
  void qpp::saveMATLABmatrix (const Eigen::MatrixBase< typename types::cmat > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)

7.16 include/qpp.h File Reference

```
#include "channels.h"
#include "constants.h"
#include "entanglement.h"
#include "entropies.h"
#include "functions.h"
#include "io.h"
#include "random.h"
#include "types.h"
#include "classes/exception.h"
#include "classes/gates.h"
#include "classes/qudit.h"
#include "classes/randevs.h"
#include "classes/stat.h"
#include "classes/states.h"
#include "classes/timer.h"
```

Include dependency graph for qpp.h:



Namespaces

- qpp

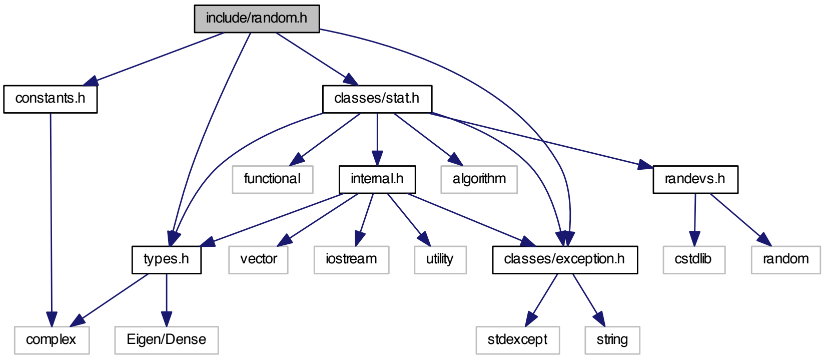
Variables

- RandomDevices & qpp::rdevs = RandomDevices::getInstance()
- const Gates & qpp::gt = Gates::getInstance()
- const States & qpp::st = States::getInstance()

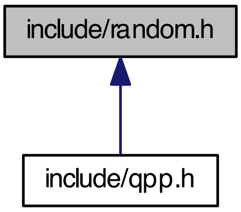
7.17 include/random.h File Reference

```
#include "constants.h"
#include "types.h"
#include "classes/exception.h"
#include "classes/stat.h"
```

Include dependency graph for random.h:



This graph shows which files directly or indirectly include this file:



Namespaces

- qpp

Functions

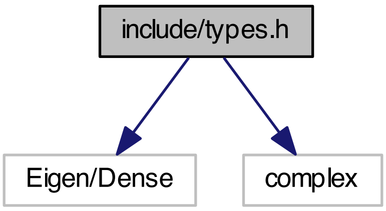
- template<typename Derived >
  Derived qpp::rand (size_t rows, size_t cols, double a=0, double b=1)
- template<>
  types::dmat qpp::rand (size_t rows, size_t cols, double a, double b)
- template<>
  types::cmat qpp::rand (size_t rows, size_t cols, double a, double b)
- double qpp::rand (double a=0, double b=1)
- int qpp::randint (int a, int b)

- template<typename Derived >
  Derived qpp::randn (size_t rows, size_t cols, double mean=0, double sigma=1)
- template<>
  types::dmat qpp::randn (size_t rows, size_t cols, double mean, double sigma)
- template<>
  types::cmat qpp::randn (size_t rows, size_t cols, double mean, double sigma)
- double qpp::randn (double mean=0, double sigma=1)
- types::cmat qpp::randU (size_t D)
- types::cmat qpp::randV (size_t Din, size_t Dout)
- std::vector< types::cmat > qpp::randkraus (size_t n, size_t D)
- types::cmat qpp::randH (size_t D)
- types::ket qpp::randket (size_t D)
- types::cmat qpp::randrho (size_t D)
- std::vector< size_t > qpp::randperm (size_t n)

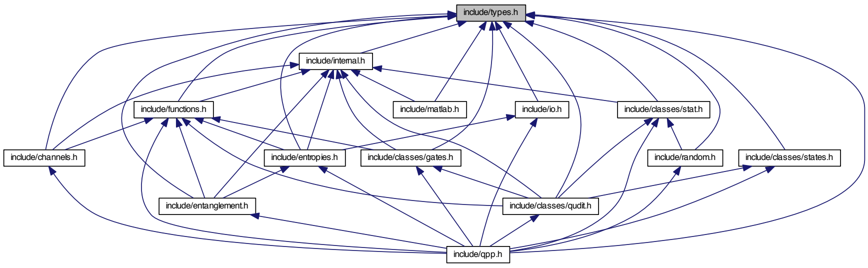
7.18 include/types.h File Reference

```
#include <Eigen/Dense>
#include <complex>
```

Include dependency graph for types.h:



This graph shows which files directly or indirectly include this file:



Namespaces

- qpp
- qpp::types

Typedefs

- typedef std::complex< double > qpp::types::cplx
- typedef Eigen::MatrixXcd qpp::types::cmat
- typedef Eigen::MatrixXd qpp::types::dmat
- typedef Eigen::Matrix< cplx,
  Eigen::Dynamic, 1 > qpp::types::ket
- typedef Eigen::Matrix< cplx,
  1, Eigen::Dynamic > qpp::types::bra
- template<typename Scalar >
  using qpp::types::DynMat = Eigen::Matrix< Scalar, Eigen::Dynamic, Eigen::Dynamic >