qpp

0.1

Generated by Doxygen 1.8.5

Sat Apr 5 2014 03:01:55

Contents

1 Namespace Index **1**

1.1 Namespace List 1

2 Hierarchical Index **3**

2.1 Class Hierarchy 3

3 Class Index **5**

3.1 Class List 5

4 File Index **7**

4.1 File List 7

5 Namespace Documentation **9**

5.1 qpp Namespace Reference 9

5.1.1 Function Documentation 12

5.1.1.1 _init 12

5.1.1.2 absm 12

5.1.1.3 adjoint 12

5.1.1.4 anticomm 13

5.1.1.5 comm 13

5.1.1.6 conjugate 13

5.1.1.7 cosm 14

5.1.1.8 disp 14

5.1.1.9 disp 14

5.1.1.10 disp 14

5.1.1.11 disp 14

5.1.1.12 displn 15

5.1.1.13 displn 15

5.1.1.14 displn 15

5.1.1.15 displn 16

5.1.1.16 dya 16

5.1.1.17 evals 16

5.1.1.18 evects 17

5.1.1.19 expandout . . . 17
5.1.1.20 expm . . . 18
5.1.1.21 fun . . . 18
5.1.1.22 funm . . . 18
5.1.1.23 hevals . . . 19
5.1.1.24 hevects . . . 20
5.1.1.25 kron . . . 20
5.1.1.26 kronlist . . . 20
5.1.1.27 kronpow . . . 21
5.1.1.28 load . . . 21
5.1.1.29 loadMATLABmatrix . . . 21
5.1.1.30 loadMATLABmatrix . . . 21
5.1.1.31 loadMATLABmatrix . . . 21
5.1.1.32 logm . . . 21
5.1.1.33 norm . . . 22
5.1.1.34 powm . . . 22
5.1.1.35 proj . . . 22
5.1.1.36 ptrace . . . 23
5.1.1.37 ptrace2 . . . 23
5.1.1.38 ptranspose . . . 24
5.1.1.39 rand . . . 24
5.1.1.40 rand . . . 24
5.1.1.41 rand . . . 24
5.1.1.42 rand . . . 24
5.1.1.43 randH . . . 25
5.1.1.44 randket . . . 25
5.1.1.45 randn . . . 25
5.1.1.46 randn . . . 25
5.1.1.47 randn . . . 26
5.1.1.48 randn . . . 26
5.1.1.49 randrho . . . 26
5.1.1.50 randU . . . 26
5.1.1.51 renyi . . . 27
5.1.1.52 renyi_inf . . . 27
5.1.1.53 reshape . . . 27
5.1.1.54 save . . . 28
5.1.1.55 saveMATLABmatrix . . . 28
5.1.1.56 saveMATLABmatrix . . . 28
5.1.1.57 saveMATLABmatrix . . . 28
5.1.1.58 shannon . . . 29

5.1.1.59 sinm . . . 29
5.1.1.60 spectralpowm . . . 29
5.1.1.61 sqrtm . . . 30
5.1.1.62 sum . . . 30
5.1.1.63 syspermute . . . 31
5.1.1.64 trace . . . 31
5.1.1.65 transpose . . . 32
5.2 qpp::ct Namespace Reference . . . 32
5.2.1 Function Documentation . . . 32
5.2.1.1 omega . . . 32
5.2.2 Variable Documentation . . . 32
5.2.2.1 chop . . . 32
5.2.2.2 ee . . . 32
5.2.2.3 ii . . . 32
5.2.2.4 pi . . . 32
5.3 qpp::gt Namespace Reference . . . 32
5.3.1 Function Documentation . . . 33
5.3.1.1 _init_gates . . . 33
5.3.1.2 CTRL . . . 33
5.3.1.3 Fd . . . 34
5.3.1.4 Id . . . 34
5.3.1.5 Rtheta . . . 34
5.3.1.6 TOF . . . 34
5.3.1.7 Xd . . . 34
5.3.1.8 Zd . . . 34
5.3.2 Variable Documentation . . . 34
5.3.2.1 CNOT . . . 35
5.3.2.2 CP . . . 35
5.3.2.3 H . . . 35
5.3.2.4 Id2 . . . 35
5.3.2.5 S . . . 35
5.3.2.6 T . . . 35
5.3.2.7 TOF . . . 35
5.3.2.8 X . . . 35
5.3.2.9 Y . . . 35
5.3.2.10 Z . . . 35
5.4 qpp::internal Namespace Reference . . . 35
5.4.1 Function Documentation . . . 35
5.4.1.1 _check_col_vector . . . 35
5.4.1.2 _check_dims . . . 36

5.4.1.3 _check_dims_match_mat . . . 36
5.4.1.4 _check_eq_dims . . . 36
5.4.1.5 _check_nonzero_size . . . 36
5.4.1.6 _check_perm . . . 36
5.4.1.7 _check_row_vector . . . 36
5.4.1.8 _check_square_mat . . . 36
5.4.1.9 _check_subsys . . . 36
5.4.1.10 _check_vector . . . 36
5.4.1.11 _multiidx2n . . . 36
5.4.1.12 _n2multiidx . . . 36
5.4.1.13 _ptranspose_worker . . . 36
5.4.1.14 _syspermute_worker . . . 37
5.5 qpp::stat Namespace Reference . . . 37
5.5.1 Variable Documentation . . . 37
5.5.1.1 _rd . . . 37
5.5.1.2 _rng . . . 37
5.6 qpp::types Namespace Reference . . . 37
5.6.1 Typedef Documentation . . . 38
5.6.1.1 cmat . . . 38
5.6.1.2 cplx . . . 38
5.6.1.3 dmat . . . 38
5.6.1.4 DynMat . . . 38
5.6.1.5 Expression2DynMat . . . 38
5.6.1.6 fmat . . . 38
5.6.1.7 imat . . . 38

6 Class Documentation **39**

6.1 qpp::stat::DiscreteDistribution Class Reference . . . 39
6.1.1 Constructor & Destructor Documentation . . . 39
6.1.1.1 DiscreteDistribution . . . 39
6.1.1.2 DiscreteDistribution . . . 39
6.1.1.3 DiscreteDistribution . . . 39
6.1.2 Member Function Documentation . . . 39
6.1.2.1 probabilities . . . 39
6.1.2.2 sample . . . 39
6.1.3 Member Data Documentation . . . 39
6.1.3.1 _d . . . 39
6.2 qpp::stat::DiscreteDistributionFromComplex Class Reference . . . 40
6.2.1 Constructor & Destructor Documentation . . . 40
6.2.1.1 DiscreteDistributionFromComplex . . . 40

6.2.1.2 DiscreteDistributionFromComplex . . . 41
6.2.1.3 DiscreteDistributionFromComplex . . . 41
6.2.1.4 DiscreteDistributionFromComplex . . . 41
6.2.2 Member Function Documentation . . . 41
6.2.2.1 cplx2amplitudes . . . 42
6.2.2.2 probabilities . . . 42
6.2.2.3 sample . . . 42
6.2.3 Member Data Documentation . . . 42
6.2.3.1 _d . . . 42
6.3 qpp::Exception Class Reference . . . 42
6.3.1 Member Enumeration Documentation . . . 43
6.3.1.1 Type . . . 43
6.3.2 Constructor & Destructor Documentation . . . 44
6.3.2.1 Exception . . . 44
6.3.2.2 Exception . . . 44
6.3.2.3 ∼Exception . . . 44
6.3.3 Member Function Documentation . . . 44
6.3.3.1 _construct_exception_msg . . . 44
6.3.3.2 what . . . 44
6.3.4 Member Data Documentation . . . 44
6.3.4.1 _custom . . . 44
6.3.4.2 _msg . . . 44
6.3.4.3 _type . . . 44
6.3.4.4 _where . . . 44
6.4 qpp::stat::NormalDistribution Class Reference . . . 45
6.4.1 Constructor & Destructor Documentation . . . 45
6.4.1.1 NormalDistribution . . . 45
6.4.2 Member Function Documentation . . . 45
6.4.2.1 sample . . . 45
6.4.3 Member Data Documentation . . . 45
6.4.3.1 _d . . . 45
6.5 qpp::Timer Class Reference . . . 45
6.5.1 Constructor & Destructor Documentation . . . 46
6.5.1.1 Timer . . . 46
6.5.1.2 ∼Timer . . . 46
6.5.2 Member Function Documentation . . . 46
6.5.2.1 seconds . . . 46
6.5.2.2 tic . . . 46
6.5.2.3 toc . . . 46
6.5.3 Friends And Related Function Documentation . . . 46

6.5.3.1 operator<< . . . 46
6.5.4 Member Data Documentation . . . 46
6.5.4.1 _end . . . 46
6.5.4.2 _start . . . 46
6.6 qpp::stat::UniformRealDistribution Class Reference . . . 46
6.6.1 Constructor & Destructor Documentation . . . 46
6.6.1.1 UniformRealDistribution . . . 46
6.6.2 Member Function Documentation . . . 46
6.6.2.1 sample . . . 46
6.6.3 Member Data Documentation . . . 46
6.6.3.1 _d . . . 47

7 File Documentation **49**

7.1 include/constants.h File Reference . . . 49
7.2 include/entropies.h File Reference . . . 50
7.3 include/exception.h File Reference . . . 52
7.4 include/functions.h File Reference . . . 53
7.5 include/gates.h File Reference . . . 55
7.6 include/internal.h File Reference . . . 57
7.7 include/io.h File Reference . . . 58
7.8 include/matlab.h File Reference . . . 59
7.9 include/qpp.h File Reference . . . 60
7.10 include/random.h File Reference . . . 61
7.11 include/stat.h File Reference . . . 63
7.12 include/timer.h File Reference . . . 64
7.13 include/types.h File Reference . . . 65
7.14 src/main.cpp File Reference . . . 67
7.14.1 Function Documentation . . . 67
7.14.1.1 main . . . 67

Chapter 1

Namespace Index

1.1 Namespace List

Here is a list of all namespaces with brief descriptions:

qpp 9
qpp::ct 32
qpp::gt 32
qpp::internal 35
qpp::stat 37
qpp::types 37

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

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

qpp::stat::DiscreteDistribution 39
qpp::stat::DiscreteDistributionFromComplex 40
exception
    qpp::Exception 42
qpp::stat::NormalDistribution 45
qpp::Timer 45
qpp::stat::UniformRealDistribution 46

Chapter 3

Class Index

3.1 Class List

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

qpp::stat::DiscreteDistribution 39
qpp::stat::DiscreteDistributionFromComplex 40
qpp::Exception 42
qpp::stat::NormalDistribution 45
qpp::Timer 45
qpp::stat::UniformRealDistribution 46

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

include/constants.h . . . 49
include/entropies.h . . . 50
include/exception.h . . . 52
include/functions.h . . . 53
include/gates.h . . . 55
include/internal.h . . . 57
include/io.h . . . 58
include/matlab.h . . . 59
include/qpp.h . . . 60
include/random.h . . . 61
include/stat.h . . . 63
include/timer.h . . . 64
include/types.h . . . 65
src/main.cpp . . . 67

Chapter 5

Namespace Documentation

5.1 qpp Namespace Reference

Namespaces

- ct
- gt
- internal
- stat
- types

Classes

- class Exception
- class Timer

Functions

- template<typename Scalar >
  double shannon (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  double renyi (const double alpha, const types::DynMat< Scalar > &A)
- template<typename Scalar >
  double renyi_inf (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::DynMat< Scalar > transpose (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::DynMat< Scalar > conjugate (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::DynMat< Scalar > adjoint (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  Scalar trace (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  Scalar sum (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  double norm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat evals (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat evects (const types::DynMat< Scalar > &A)

- template<typename Scalar >
  types::cmat hevals (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat hevects (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat funm (const types::DynMat< Scalar > &A, types::cplx(*f)(const types::cplx &))
- template<typename Scalar >
  types::cmat absm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat expm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat logm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat sqrtm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat sinm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat cosm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat spectralpowm (const types::DynMat< Scalar > &A, const types::cplx z)
- template<typename Scalar >
  types::DynMat< Scalar > powm (const types::DynMat< Scalar > &A, size_t n)
- template<typename InputScalar , typename OutputScalar >
  types::DynMat< OutputScalar > fun (const types::DynMat< InputScalar > &A, OutputScalar(*f)(const InputScalar &))
- template<typename Scalar >
  types::DynMat< Scalar > kron (const types::DynMat< Scalar > &A, const types::DynMat< Scalar > &B)
- template<typename Scalar >
  types::DynMat< Scalar > kronlist (const std::vector< types::DynMat< Scalar >> &list)
- template<typename Scalar >
  types::DynMat< Scalar > kronpow (const types::DynMat< Scalar > &A, size_t n)
- template<typename Scalar >
  types::DynMat< Scalar > reshape (const types::DynMat< Scalar > &A, size_t rows, size_t cols)
- template<typename Scalar >
  types::DynMat< Scalar > syspermute (const types::DynMat< Scalar > &A, const std::vector< size_t > perm, const std::vector< size_t > &dims)
- template<typename Scalar >
  types::DynMat< Scalar > ptrace2 (const types::DynMat< Scalar > &A, const std::vector< size_t > dims)
- template<typename Scalar >
  types::DynMat< Scalar > ptrace (const types::DynMat< Scalar > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Scalar >
  types::DynMat< Scalar > ptranspose (const types::DynMat< Scalar > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Scalar >
  types::DynMat< Scalar > comm (const types::DynMat< Scalar > &A, const types::DynMat< Scalar > &B)
- template<typename Scalar >
  types::DynMat< Scalar > anticomm (const types::DynMat< Scalar > &A, const types::DynMat< Scalar > &B)
- template<typename Scalar >
  types::DynMat< Scalar > proj (const types::DynMat< Scalar > &V)
- template<typename Scalar >
  types::DynMat< Scalar > dya (const types::DynMat< Scalar > &V)
- template<typename Scalar >
  types::DynMat< Scalar > expandout (const types::DynMat< Scalar > &A, size_t pos, const std::vector< size_t > &dims)

- template<typename T >
  void disp (const T &x, const std::string &separator=" ", std::ostream &os=std::cout)
- template<typename T >
  void displn (const T &x, const std::string &separator=" ", std::ostream &os=std::cout)
- template<typename T >
  void disp (const T *x, const size_t n, const std::string &separator=" ", std::ostream &os=std::cout)
- template<typename T >
  void displn (const T *x, const size_t n, const std::string &separator=" ", std::ostream &os=std::cout)
- template<typename Scalar >
  void disp (const types::DynMat< Scalar > &A, double chop=ct::chop, std::ostream &os=std::cout)
- template<typename Scalar >
  void displn (const types::DynMat< Scalar > &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 Scalar >
  void save (const types::DynMat< Scalar > &A, const std::string &fname)
- template<typename Scalar >
  types::DynMat< Scalar > load (const std::string &fname)
- template<typename Scalar >
  types::DynMat< Scalar > loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<>
  types::DynMat< double > loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<>
  types::DynMat< types::cplx > loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<typename Scalar >
  void saveMATLABmatrix (const types::DynMat< Scalar > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- template<>
  void saveMATLABmatrix (const types::DynMat< double > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- template<>
  void saveMATLABmatrix (const types::DynMat< types::cplx > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- int _init ()
- template<typename Scalar >
  types::DynMat< Scalar > rand (size_t rows, size_t cols, double a=0, double b=1)
- template<>
  types::DynMat< double > rand (size_t rows, size_t cols, double a, double b)
- template<>
  types::DynMat< types::cplx > rand (size_t rows, size_t cols, double a, double b)
- double rand (double a=0, double b=1)
- template<typename Scalar >
  types::DynMat< Scalar > randn (size_t rows, size_t cols, double mean=0, double sigma=1)
- template<>
  types::DynMat< double > randn (size_t rows, size_t cols, double mean, double sigma)
- template<>
  types::DynMat< types::cplx > 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 randH (size_t D)
- types::cmat randket (size_t D)
- types::cmat randrho (size_t D)

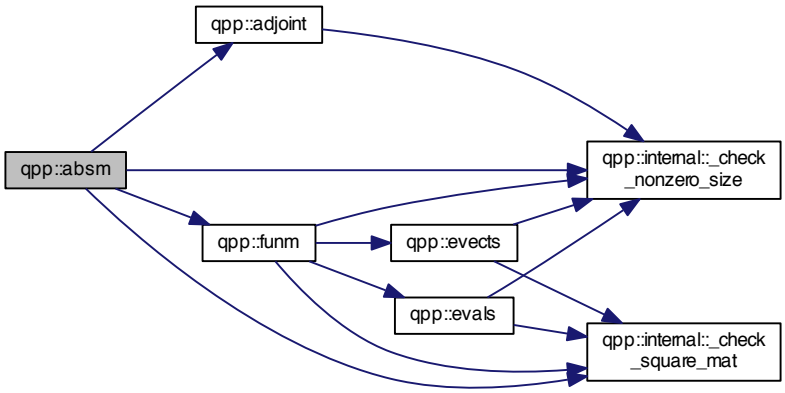
5.1.1 Function Documentation

5.1.1.1 int qpp::_init ( )

Here is the call graph for this function:

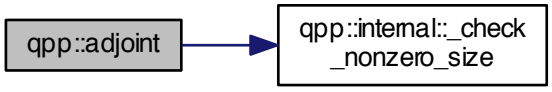
5.1.1.2 template<typename Scalar > types::cmat qpp::absm (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



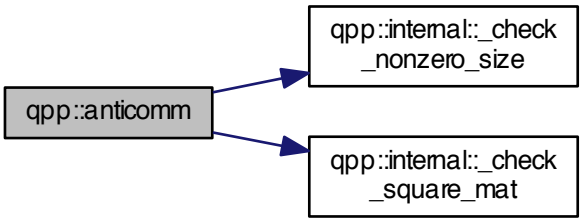
5.1.1.3 template<typename Scalar > types::DynMat<Scalar> qpp::adjoint (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



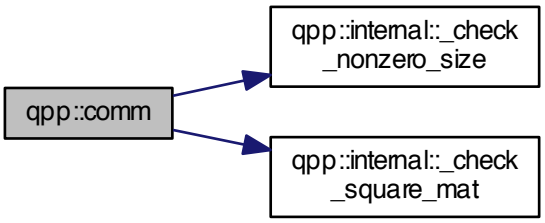
5.1.1.4 template<typename Scalar > types::DynMat<Scalar> qpp::anticomm (const types::DynMat< Scalar > & *A*, const types::DynMat< Scalar > & *B*)

Here is the call graph for this function:



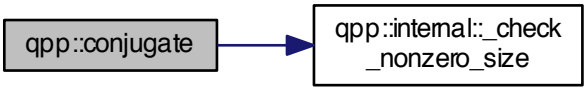
5.1.1.5 template<typename Scalar > types::DynMat<Scalar> qpp::comm (const types::DynMat< Scalar > & *A*, const types::DynMat< Scalar > & *B*)

Here is the call graph for this function:



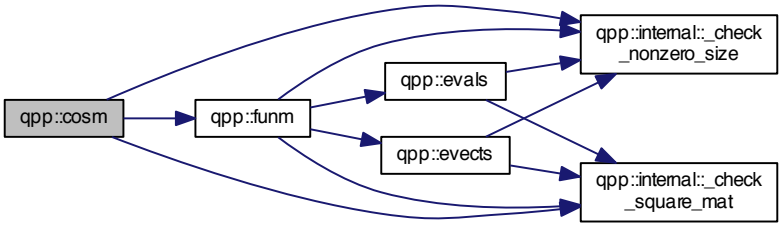
5.1.1.6 template<typename Scalar > types::DynMat<Scalar> qpp::conjugate (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



5.1.1.7 template<typename Scalar > types::cmat qpp::cosm (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



5.1.1.8 template<typename T > void qpp::disp (const T & *x*, const std::string & *separator* = " ", std::ostream & *os* = std::cout)

5.1.1.9 template<typename T > void qpp::disp (const T * *x*, const size_t *n*, const std::string & *separator* = " ", std::ostream & *os* = std::cout)

5.1.1.10 template<typename Scalar > void qpp::disp (const types::DynMat< Scalar > & *A*, double *chop* = ct::chop, std::ostream & *os* = std::cout)

5.1.1.11 void qpp::disp (const types::cplx *c*, double *chop* = ct::chop, std::ostream & *os* = std::cout) [inline]

Here is the call graph for this function:

5.1.1.12 template<typename T > void qpp::displn (const T & *x*, const std::string & *separator* = " ", std::ostream & *os* = std::cout)

Here is the call graph for this function:

5.1.1.13 template<typename T > void qpp::displn (const T * *x*, const size_t *n*, const std::string & *separator* = " ", std::ostream & *os* = std::cout)

Here is the call graph for this function:

5.1.1.14 template<typename Scalar > void qpp::displn (const types::DynMat< Scalar > & *A*, double *chop* = ct::chop, std::ostream & *os* = std::cout)

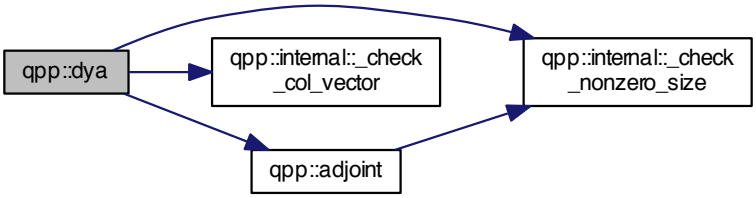
Here is the call graph for this function:

5.1.1.15 void qpp::displn (const types::cplx *c*, double *chop* = `ct::chop`, std::ostream & *os* = `std::cout`) [inline]

Here is the call graph for this function:

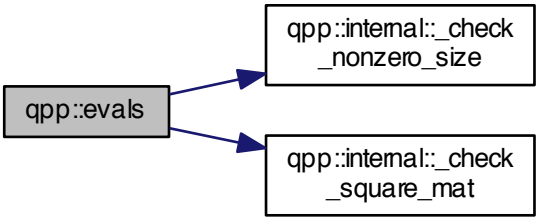
5.1.1.16 template<typename Scalar > types::DynMat<Scalar> qpp::dya (const types::DynMat< Scalar > & *V*)

Here is the call graph for this function:



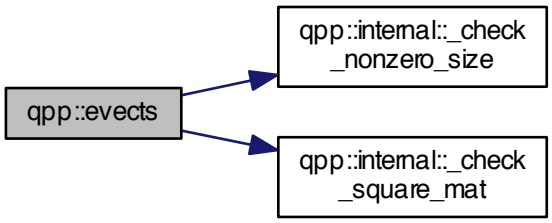
5.1.1.17 template<typename Scalar > types::cmat qpp::evals (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



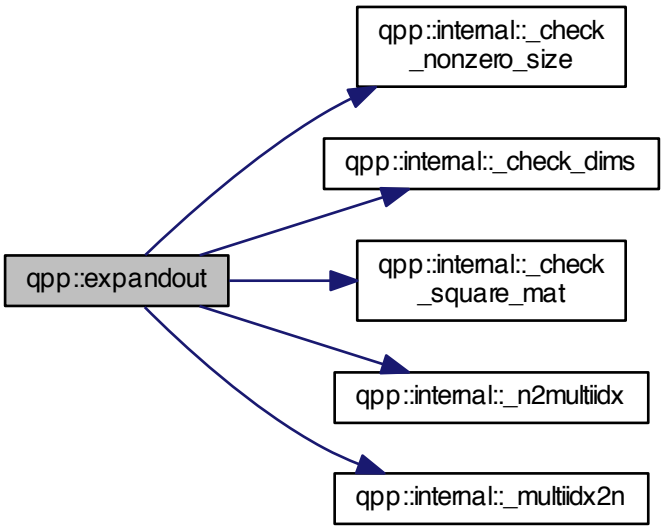
5.1.1.18 template<typename Scalar > types::cmat qpp::evects (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



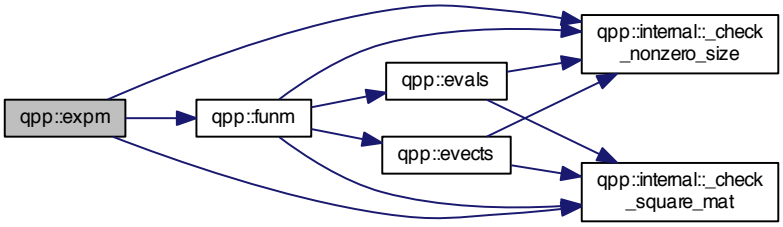
5.1.1.19 template<typename Scalar > types::DynMat<Scalar> qpp::expandout (const types::DynMat< Scalar > & *A*, size_t *pos*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:



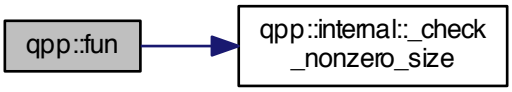
5.1.1.20 template<typename Scalar > types::cmat qpp::expm (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



5.1.1.21 template<typename InputScalar , typename OutputScalar > types::DynMat<OutputScalar> qpp::fun (const types::DynMat< InputScalar > & *A*, OutputScalar(*)(const InputScalar &) *f*)

Here is the call graph for this function:



5.1.1.22 template<typename Scalar > types::cmat qpp::funm (const types::DynMat< Scalar > & *A*, types::cplx(*)(const types::cplx &) *f*)

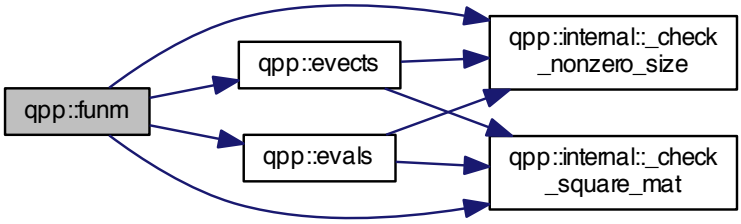
Parameters

A	input matrix
f	function pointer

Returns

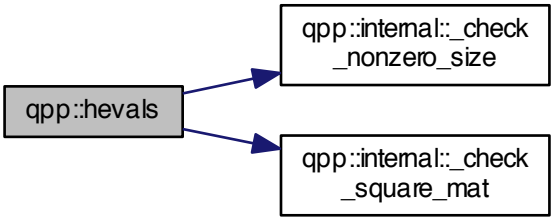
types::cmat

Here is the call graph for this function:



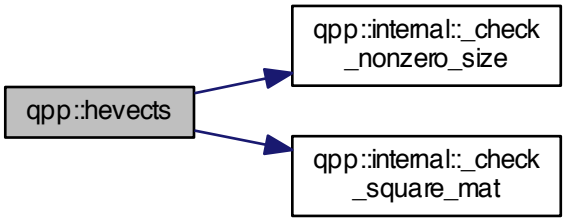
5.1.1.23 template<typename Scalar > types::cmat qpp::hevals (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



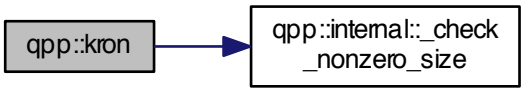
5.1.1.24 template<typename Scalar > types::cmat qpp::hevects (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



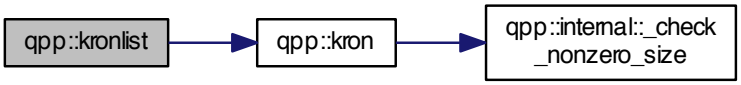
5.1.1.25 template<typename Scalar > types::DynMat<Scalar> qpp::kron (const types::DynMat< Scalar > & *A*, const types::DynMat< Scalar > & *B*)

Here is the call graph for this function:



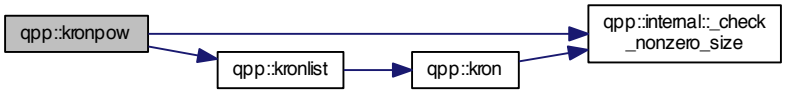
5.1.1.26 template<typename Scalar > types::DynMat<Scalar> qpp::kronlist (const std::vector< types::DynMat< Scalar >> & *list*)

Here is the call graph for this function:



5.1.1.27 template<typename Scalar > types::DynMat<Scalar> qpp::kronpow (const types::DynMat< Scalar > & *A*, size_t *n*)

Here is the call graph for this function:



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

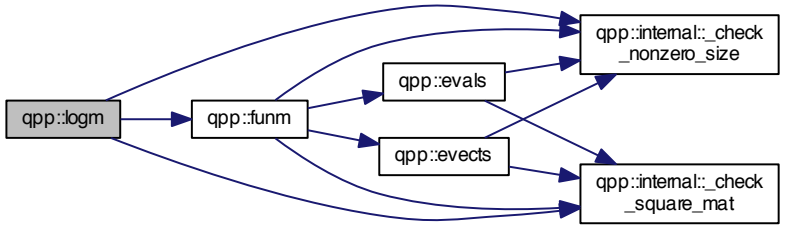
5.1.1.29 template<typename Scalar > types::DynMat<Scalar> qpp::loadMATLABmatrix (const std::string & *mat_file*, const std::string & *var_name*)

5.1.1.30 template<> types::DynMat<double> qpp::loadMATLABmatrix (const std::string & *mat_file*, const std::string & *var_name*) [inline]

5.1.1.31 template<> types::DynMat<types::cplx> qpp::loadMATLABmatrix (const std::string & *mat_file*, const std::string & *var_name*) [inline]

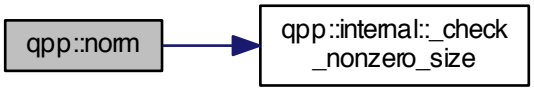
5.1.1.32 template<typename Scalar > types::cmat qpp::logm (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



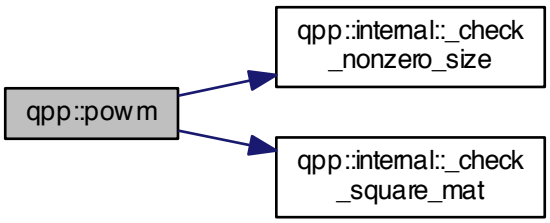
5.1.1.33 template<typename Scalar > double qpp::norm (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



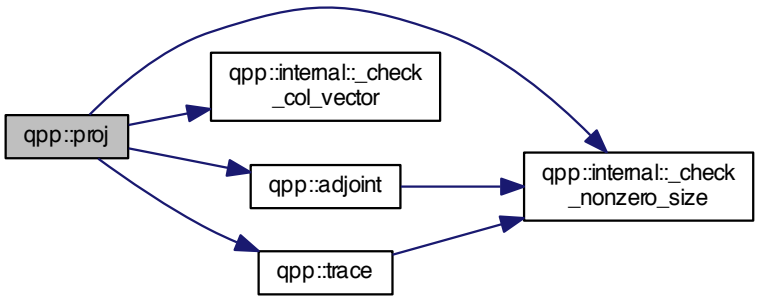
5.1.1.34 template<typename Scalar > types::DynMat<Scalar> qpp::powm (const types::DynMat< Scalar > & *A*, size_t *n*)

Here is the call graph for this function:



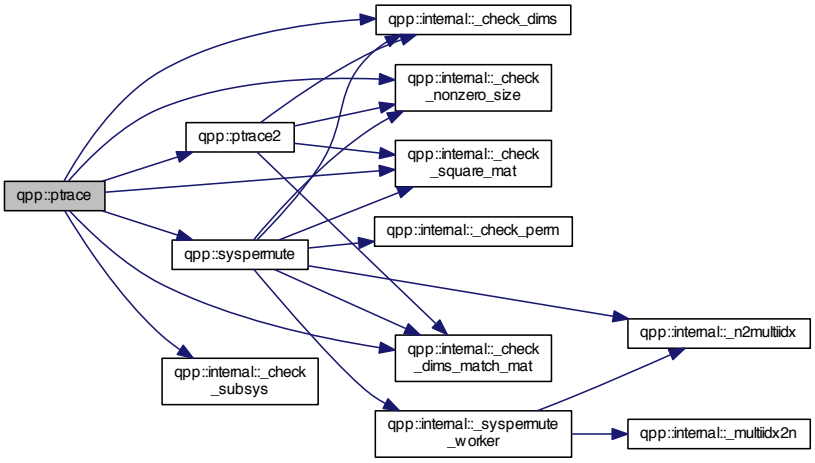
5.1.1.35 template<typename Scalar > types::DynMat<Scalar> qpp::proj (const types::DynMat< Scalar > & *V*)

Here is the call graph for this function:



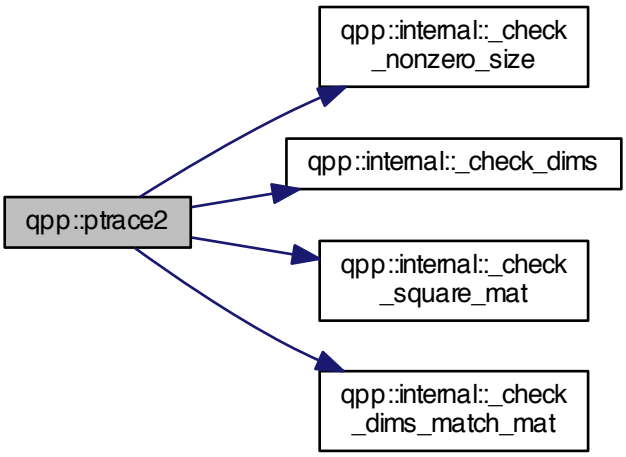
5.1.1.36 template<typename Scalar > types::DynMat<Scalar> qpp::ptrace (const types::DynMat< Scalar > & *A*, const std::vector< size_t > & *subsys*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:



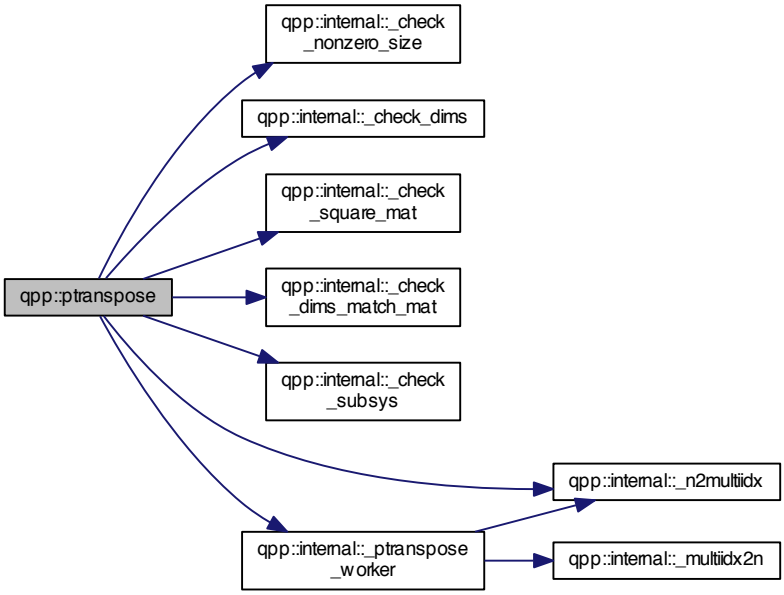
5.1.1.37 template<typename Scalar > types::DynMat<Scalar> qpp::ptrace2 (const types::DynMat< Scalar > & *A*, const std::vector< size_t > *dims*)

Here is the call graph for this function:



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

Here is the call graph for this function:



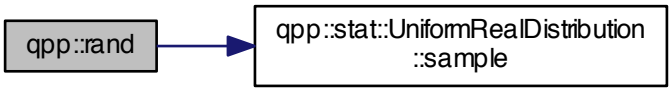
5.1.1.39 template<typename Scalar > types::DynMat<Scalar> qpp::rand (size_t *rows*, size_t *cols*, double *a* = 0, double *b* = 1) [inline]

5.1.1.40 template<> types::DynMat<double> qpp::rand (size_t *rows*, size_t *cols*, double *a*, double *b*) [inline]

5.1.1.41 template<> types::DynMat<types::cplx> qpp::rand (size_t *rows*, size_t *cols*, double *a*, double *b*) [inline]

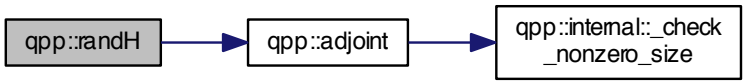
5.1.1.42 double qpp::rand (double *a* = 0, double *b* = 1) [inline]

Here is the call graph for this function:



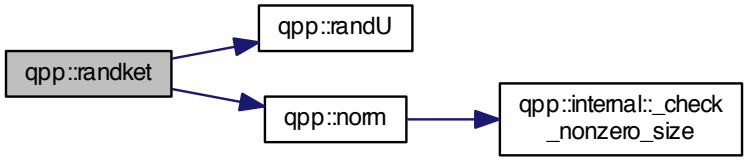
5.1.1.43 types::cmat qpp::randH (size_t *D*) [inline]

Here is the call graph for this function:



5.1.1.44 types::cmat qpp::randket (size_t *D*) [inline]

Here is the call graph for this function:



5.1.1.45 template<typename Scalar > types::DynMat<Scalar> qpp::randn (size_t *rows*, size_t *cols*, double *mean* = 0, double *sigma* = 1) [inline]

5.1.1.46 template<> types::DynMat<double> qpp::randn (size_t *rows*, size_t *cols*, double *mean*, double *sigma*) [inline]

Here is the call graph for this function:

5.1.1.47 template<> types::DynMat<types::cplx> qpp::randn (size_t *rows*, size_t *cols*, double *mean*, double *sigma*) [inline]

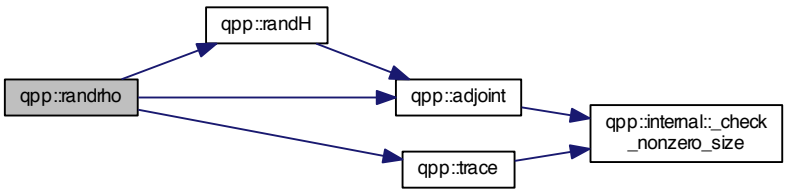
Here is the call graph for this function:

5.1.1.48 double qpp::randn (double *mean* = 0, double *sigma* = 1) [inline]

Here is the call graph for this function:

5.1.1.49 types::cmat qpp::randrho (size_t *D*) [inline]

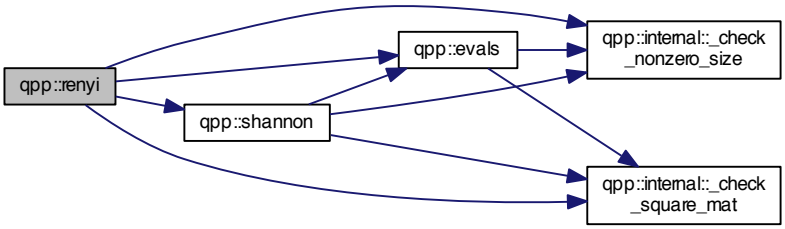
Here is the call graph for this function:



5.1.1.50 types::cmat qpp::randU (size_t *D*) [inline]

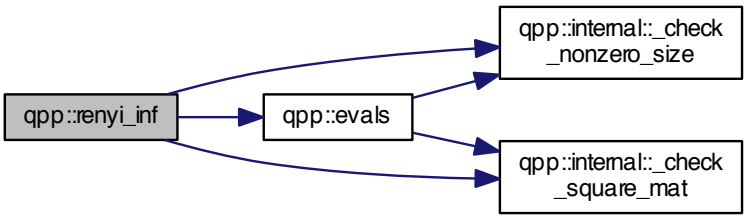
5.1.1.51 template<typename Scalar > double qpp::renyi (const double *alpha,* const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



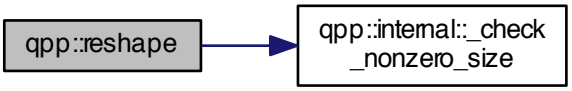
5.1.1.52 template<typename Scalar > double qpp::renyi_inf (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



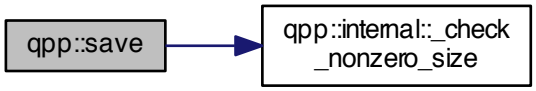
5.1.1.53 template<typename Scalar > types::DynMat<Scalar> qpp::reshape (const types::DynMat< Scalar > & *A,* size_t *rows,* size_t *cols*)

Here is the call graph for this function:



5.1.1.54 template<typename Scalar > void qpp::save (const types::DynMat< Scalar > & *A*, const std::string & *fname*)

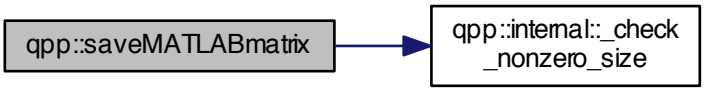
Here is the call graph for this function:



5.1.1.55 template<typename Scalar > void qpp::saveMATLABmatrix (const types::DynMat< Scalar > & *A*, const std::string & *mat_file*, const std::string & *var_name*, const std::string & *mode*)

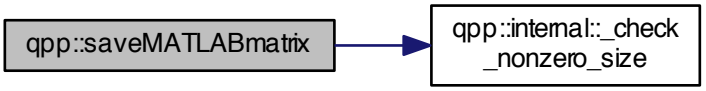
5.1.1.56 template<> void qpp::saveMATLABmatrix (const types::DynMat< double > & *A*, const std::string & *mat_file*, const std::string & *var_name*, const std::string & *mode*)

Here is the call graph for this function:



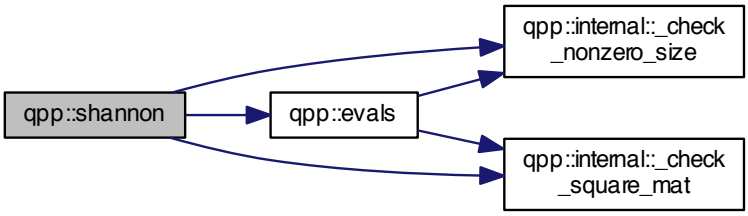
5.1.1.57 template<> void qpp::saveMATLABmatrix (const types::DynMat< types::cplx > & *A*, const std::string & *mat_file*, const std::string & *var_name*, const std::string & *mode*)

Here is the call graph for this function:



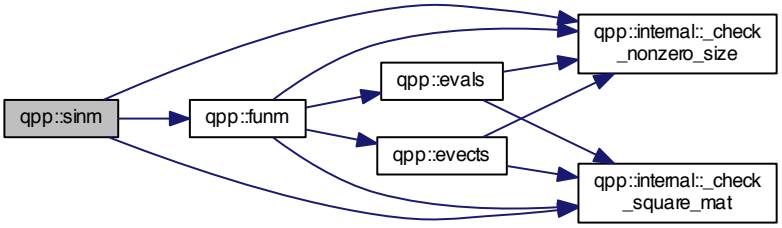
5.1.1.58 template<typename Scalar > double qpp::shannon (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



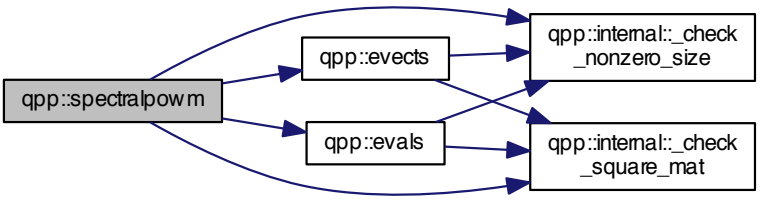
5.1.1.59 template<typename Scalar > types::cmat qpp::sinm (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



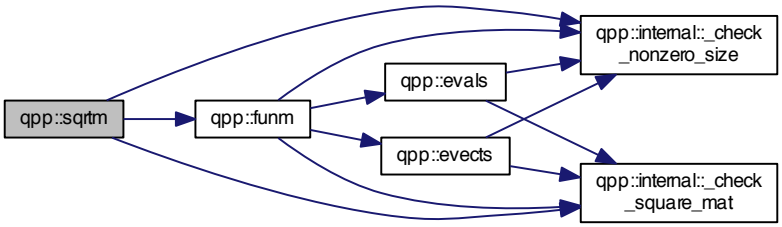
5.1.1.60 template<typename Scalar > types::cmat qpp::spectralpowm (const types::DynMat< Scalar > & *A*, const types::cplx *z*)

Here is the call graph for this function:



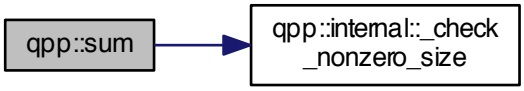
5.1.1.61 template<typename Scalar > types::cmat qpp::sqrtm (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



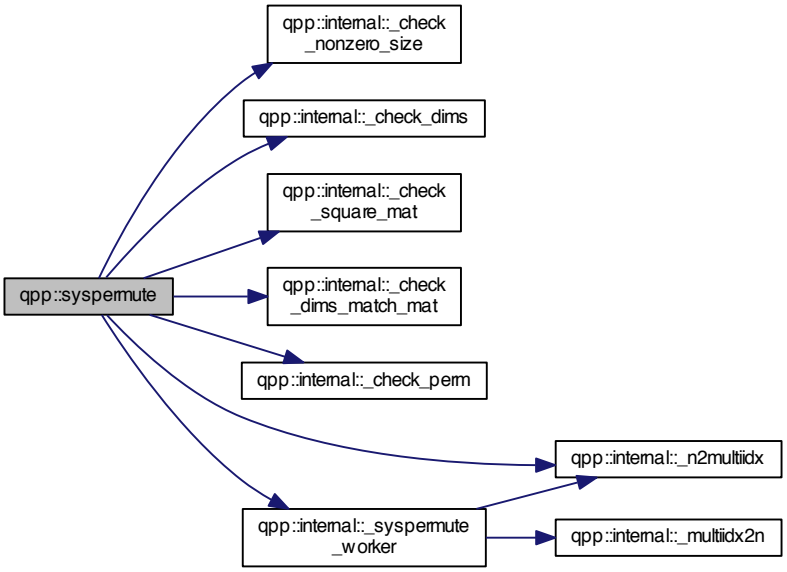
5.1.1.62 template<typename Scalar > Scalar qpp::sum (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



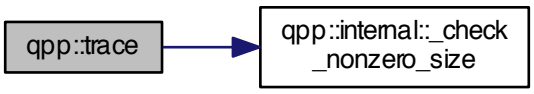
5.1.1.63 template<typename Scalar > types::DynMat<Scalar> qpp::syspermute (const types::DynMat< Scalar > & *A*, const std::vector< size_t > *perm*, const std::vector< size_t > & *dims*)

Here is the call graph for this function:



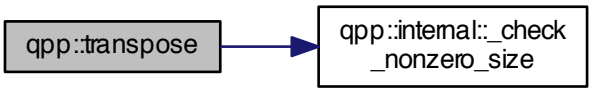
5.1.1.64 template<typename Scalar > Scalar qpp::trace (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



5.1.1.65 template<typename Scalar > types::DynMat<Scalar> qpp::transpose (const types::DynMat< Scalar > & *A*)

Here is the call graph for this function:



5.2 qpp::ct Namespace Reference

Functions

- types::cplx omega (size_t D)

Variables

- const double chop = 1e-10
- const types::cplx ii = { 0, 1 }
- const double pi = 3.14159265358979323846264338327950288 4
- const double ee = 2.71828182845904523536028747135266249 7

5.2.1 Function Documentation

5.2.1.1 types::cplx qpp::ct::omega (size_t *D*) [inline]

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 = 2.71828182845904523536028747135266249 7

5.2.2.3 const types::cplx qpp::ct::ii = { 0, 1 }

5.2.2.4 const double qpp::ct::pi = 3.14159265358979323846264338327950288 4

5.3 qpp::gt Namespace Reference

Functions

- void _init_gates ()
- types::cmat Rtheta (double theta)
- types::cmat Id (size_t D)
- types::cmat Zd (size_t D)
- types::cmat Fd (size_t D)
- types::cmat Xd (size_t D)

- types::cmat CTRL (const types::cmat &A, const std::vector< size_t > &ctrl, const std::vector< size_t > &gate, size_t n, size_t D=2)
- types::cmat TOF (8, 8)

Variables

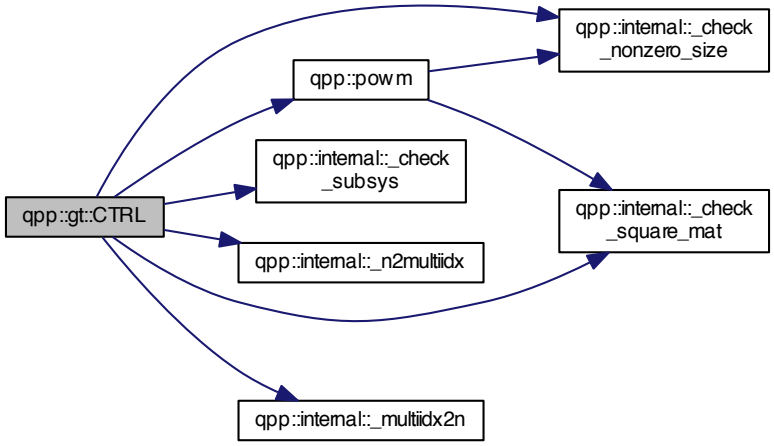
- types::cmat H
- types::cmat Id2
- types::cmat X
- types::cmat Y
- types::cmat Z
- types::cmat S
- types::cmat T
- types::cmat CNOT
- types::cmat CP
- types::cmat TOF

5.3.1 Function Documentation

5.3.1.1 void qpp::gt::_init_gates ( ) [inline]

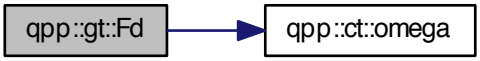
5.3.1.2 types::cmat qpp::gt::CTRL (const types::cmat & *A*, const std::vector< size_t > & *ctrl*, const std::vector< size_t > & *gate*, size_t *n*, size_t *D* = 2) [inline]

Here is the call graph for this function:



5.3.1.3 types::cmat qpp::gt::Fd (size_t *D*) [inline]

Here is the call graph for this function:



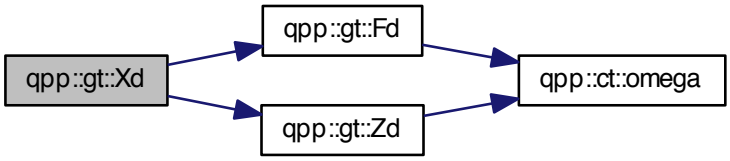
5.3.1.4 types::cmat qpp::gt::Id (size_t *D*) [inline]

5.3.1.5 types::cmat qpp::gt::Rtheta (double *theta*) [inline]

5.3.1.6 types::cmat qpp::gt::TOF (8 , 8)

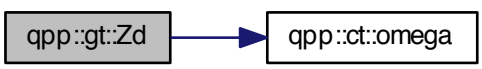
5.3.1.7 types::cmat qpp::gt::Xd (size_t *D*) [inline]

Here is the call graph for this function:



5.3.1.8 types::cmat qpp::gt::Zd (size_t *D*) [inline]

Here is the call graph for this function:



5.3.2 Variable Documentation

5.3.2.1 types::cmat qpp::gt::CNOT

5.3.2.2 types::cmat qpp::gt::CP

5.3.2.3 types::cmat qpp::gt::H

5.3.2.4 types::cmat qpp::gt::Id2

5.3.2.5 types::cmat qpp::gt::S

5.3.2.6 types::cmat qpp::gt::T

5.3.2.7 types::cmat qpp::gt::TOF

5.3.2.8 types::cmat qpp::gt::X

5.3.2.9 types::cmat qpp::gt::Y

5.3.2.10 types::cmat qpp::gt::Z

5.4 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 Scalar >
  bool _check_square_mat (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  bool _check_vector (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  bool _check_row_vector (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  bool _check_col_vector (const types::DynMat< Scalar > &A)
- template<typename T >
  bool _check_nonzero_size (const T &x)
- bool _check_dims (const std::vector< size_t > &dims)
- template<typename Scalar >
  bool _check_dims_match_mat (const std::vector< size_t > &dims, const types::DynMat< Scalar > &A)
- bool _check_eq_dims (const std::vector< size_t > &dims, size_t dim)
- bool _check_subsys (const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- bool _check_perm (const std::vector< size_t > &perm, const std::vector< size_t > &dims)
- template<typename Scalar >
  void _syspermute_worker (const size_t *midxcol, size_t numdims, const size_t *cdims, const size_t *cperm, size_t i, size_t j, size_t &iperm, size_t &jperm, const types::DynMat< Scalar > &A, types::DynMat< Scalar > &result)
- template<typename Scalar >
  void _ptranspose_worker (const size_t *midxcol, size_t numdims, size_t numsubsys, const size_t *cdims, const size_t *csubsys, size_t i, size_t j, size_t &iperm, size_t &jperm, const types::DynMat< Scalar > &A, types::DynMat< Scalar > &result)

5.4.1 Function Documentation

5.4.1.1 template<typename Scalar > bool qpp::internal::_check_col_vector (const types::DynMat< Scalar > & *A*)

5.4.1.2 bool qpp::internal::_check_dims (const std::vector< size_t > & *dims*) [inline]

5.4.1.3 template<typename Scalar > bool qpp::internal::_check_dims_match_mat (const std::vector< size_t > & *dims*, const types::DynMat< Scalar > & *A*)

5.4.1.4 bool qpp::internal::_check_eq_dims (const std::vector< size_t > & *dims*, size_t *dim*) [inline]

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

5.4.1.6 bool qpp::internal::_check_perm (const std::vector< size_t > & *perm*, const std::vector< size_t > & *dims*) [inline]

5.4.1.7 template<typename Scalar > bool qpp::internal::_check_row_vector (const types::DynMat< Scalar > & *A*)

5.4.1.8 template<typename Scalar > bool qpp::internal::_check_square_mat (const types::DynMat< Scalar > & *A*)

5.4.1.9 bool qpp::internal::_check_subsys (const std::vector< size_t > & *subsys*, const std::vector< size_t > & *dims*) [inline]

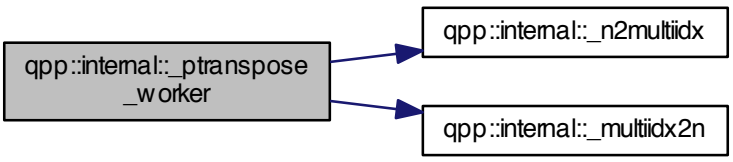
5.4.1.10 template<typename Scalar > bool qpp::internal::_check_vector (const types::DynMat< Scalar > & *A*)

5.4.1.11 size_t qpp::internal::_multiidx2n (const size_t * *midx*, size_t *numdims*, const size_t * *dims*) [inline]

5.4.1.12 void qpp::internal::_n2multiidx (size_t *n*, size_t *numdims*, const size_t * *dims*, size_t * *result*) [inline]

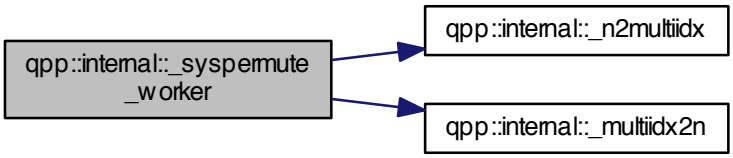
5.4.1.13 template<typename Scalar > void qpp::internal::_ptranspose_worker (const size_t * *midxcol*, size_t *numdims*, size_t *numsubsys*, const size_t * *cdims*, const size_t * *csubsys*, size_t *i*, size_t *j*, size_t & *iperm*, size_t & *jperm*, const types::DynMat< Scalar > & *A*, types::DynMat< Scalar > & *result*) [inline]

Here is the call graph for this function:



5.4.1.14 template<typename Scalar > void qpp::internal::_syspermute_worker (const size_t * *midxcol*, size_t *numdims*, const size_t * *cdims*, const size_t * *cperm*, size_t *i*, size_t *j*, size_t & *iperm*, size_t & *jperm*, const types::DynMat< Scalar > & *A*, types::DynMat< Scalar > & *result*) [inline]

Here is the call graph for this function:



5.5 qpp::stat Namespace Reference

Classes

- class NormalDistribution
- class UniformRealDistribution
- class DiscreteDistribution
- class DiscreteDistributionFromComplex

Variables

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

5.5.1 Variable Documentation

5.5.1.1 std::random_device qpp::stat::_rd

5.5.1.2 std::mt19937 qpp::stat::_rng

5.6 qpp::types Namespace Reference

Typedefs

- typedef std::complex< double > cplx
- typedef Eigen::MatrixXcd cmat
- typedef Eigen::MatrixXd dmat
- typedef Eigen::MatrixXf fmat
- typedef Eigen::MatrixXi imat
- template<typename Expression >
  using Expression2DynMat = Eigen::Matrix< typename Expression::Scalar, Eigen::Dynamic, Eigen::Dynamic >
- template<typename Scalar >
  using DynMat = Eigen::Matrix< Scalar, Eigen::Dynamic, Eigen::Dynamic >

5.6.1 Typedef Documentation

5.6.1.1 typedef Eigen::MatrixXcd qpp::types::cmat

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

5.6.1.3 typedef Eigen::MatrixXd qpp::types::dmat

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

5.6.1.5 template<typename Expression > using qpp::types::Expression2DynMat = typedef Eigen::Matrix<typename Expression::Scalar, Eigen::Dynamic, Eigen::Dynamic>

5.6.1.6 typedef Eigen::MatrixXf qpp::types::fmat

5.6.1.7 typedef Eigen::MatrixXi qpp::types::imat

Chapter 6

Class Documentation

6.1 qpp::stat::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::stat::DiscreteDistribution::DiscreteDistribution (InputIterator *first,* InputIterator *last*) [inline]

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

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

6.1.2 Member Function Documentation

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

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

6.1.3 Member Data Documentation

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

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

- include/stat.h

6.2 qpp::stat::DiscreteDistributionFromComplex Class Reference

`#include <stat.h>`

Public Member Functions

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

Protected Member Functions

- template<typename InputIterator >
  std::vector< double > cplx2amplitudes (InputIterator first, InputIterator last)

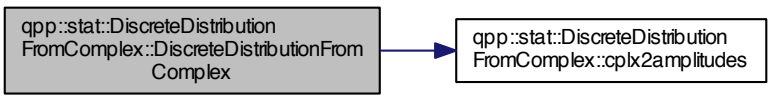
Protected Attributes

- std::discrete_distribution
  < size_t > _d

6.2.1 Constructor & Destructor Documentation

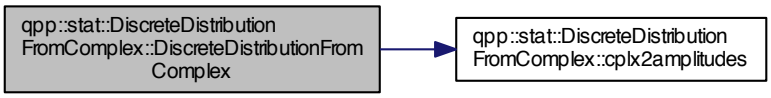
6.2.1.1 template<typename InputIterator > qpp::stat::DiscreteDistributionFromComplex::DiscreteDistributionFromComplex (InputIterator *first,* InputIterator *last*) [inline]

Here is the call graph for this function:



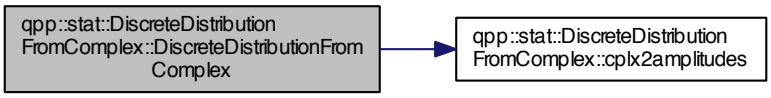
6.2.1.2 qpp::stat::DiscreteDistributionFromComplex::DiscreteDistributionFromComplex (std::initializer_list< types::cplx > *amplitudes*) [inline]

Here is the call graph for this function:



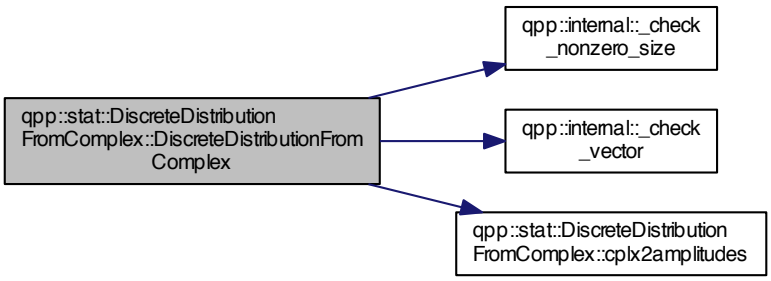
6.2.1.3 qpp::stat::DiscreteDistributionFromComplex::DiscreteDistributionFromComplex (std::vector< types::cplx > *amplitudes*) [inline]

Here is the call graph for this function:



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

Here is the call graph for this function:



6.2.2 Member Function Documentation

6.2.2.1 template<typename InputIterator > std::vector<double> qpp::stat::DiscreteDistribution-FromComplex::cplx2amplitudes (InputIterator *first*, InputIterator *last*) [inline], [protected]

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

6.2.2.3 size_t qpp::stat::DiscreteDistributionFromComplex::sample ( ) [inline]

6.2.3 Member Data Documentation

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

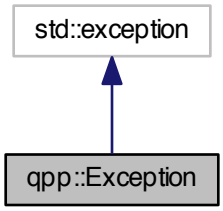
The documentation for this class was generated from the following file:

- include/stat.h

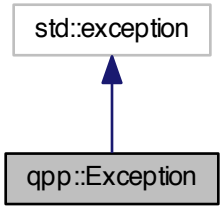
6.3 qpp::Exception Class Reference

`#include <exception.h>`

Inheritance diagram for qpp::Exception:



Collaboration diagram for qpp::Exception:



Public Types

- enum Type {
  Type::UNKNOWN_EXCEPTION = 0, Type::ZERO_SIZE, Type::MATRIX_NOT_SQUARE, Type::MATRIX_NOT_CVECTOR,
  Type::MATRIX_NOT_RVECTOR, Type::MATRIX_NOT_VECTOR, Type::DIMS_INVALID, Type::DIMS_NOT_EQUAL,
  Type::DIMS_MISMATCH_MATRIX, Type::SUBSYS_MISMATCH_DIMS, Type::PERM_MISMATCH_DIMS, Type::NOT_QUBIT_GATE,
  Type::NOT_QUBIT_SUBSYS, Type::OUT_OF_RANGE, Type::UNDEFINED_TYPE, 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

DIMS_INVALID

DIMS_NOT_EQUAL

DIMS_MISMATCH_MATRIX

SUBSYS_MISMATCH_DIMS

PERM_MISMATCH_DIMS

NOT_QUBIT_GATE

NOT_QUBIT_SUBSYS

OUT_OF_RANGE

UNDEFINED_TYPE

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:

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

Here is the call graph for this function:

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/exception.h

6.4 qpp::stat::NormalDistribution Class Reference

`#include <stat.h>`

Public Member Functions

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

Protected Attributes

- std::normal_distribution _d

6.4.1 Constructor & Destructor Documentation

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

6.4.2 Member Function Documentation

6.4.2.1 double qpp::stat::NormalDistribution::sample ( ) [inline]

6.4.3 Member Data Documentation

6.4.3.1 std::normal_distribution qpp::stat::NormalDistribution::_d [protected]

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

- include/stat.h

6.5 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)

6.5.1 Constructor & Destructor Documentation

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

6.5.1.2 virtual qpp::Timer::~Timer ( ) [virtual], [default]

6.5.2 Member Function Documentation

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

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

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

6.5.3 Friends And Related Function Documentation

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

6.5.4 Member Data Documentation

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

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

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

- include/timer.h

6.6 qpp::stat::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

6.6.1 Constructor & Destructor Documentation

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

6.6.2 Member Function Documentation

6.6.2.1 double qpp::stat::UniformRealDistribution::sample ( ) [inline]

6.6.3 Member Data Documentation

6.6.3.1 std::uniform_real_distribution qpp::stat::UniformRealDistribution::_d [protected]

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

- include/stat.h

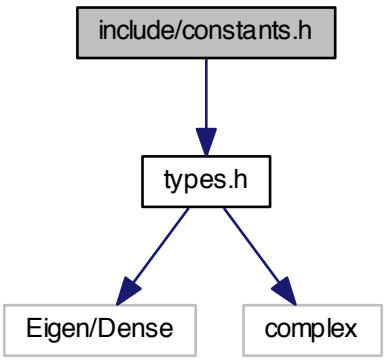
Chapter 7

File Documentation

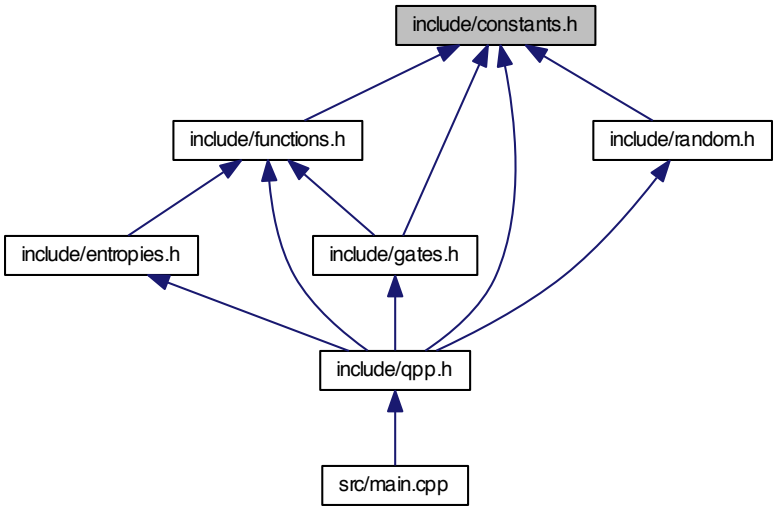
7.1 include/constants.h File Reference

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

Include dependency graph for constants.h:



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



Namespaces

- qpp
- qpp::ct

Functions

- types::cplx qpp::ct::omega (size_t D)

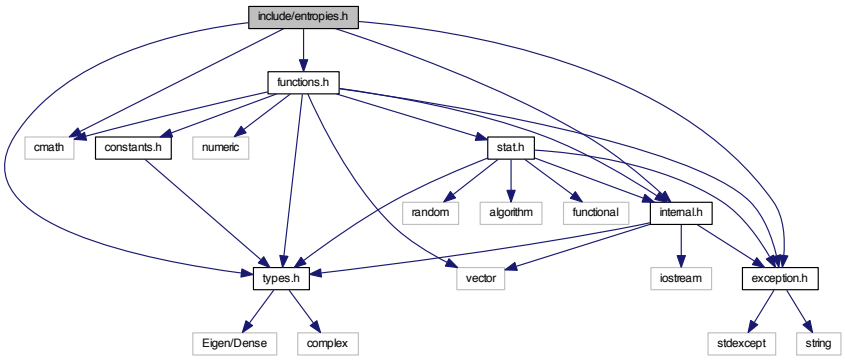
Variables

- const double qpp::ct::chop = 1e-10
- const types::cplx qpp::ct::ii = { 0, 1 }
- const double qpp::ct::pi = 3.14159265358979323846264338327950288 4
- const double qpp::ct::ee = 2.71828182845904523536028747135266249 7

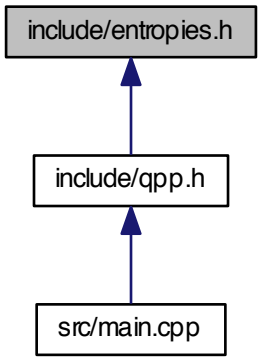
7.2 include/entropies.h File Reference

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

Include dependency graph for entropies.h:



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



Namespaces

- qpp

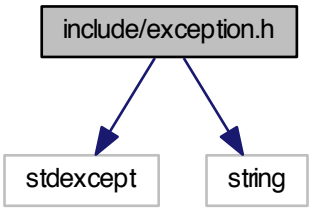
Functions

- template<typename Scalar >
  double qpp::shannon (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  double qpp::renyi (const double alpha, const types::DynMat< Scalar > &A)
- template<typename Scalar >
  double qpp::renyi_inf (const types::DynMat< Scalar > &A)

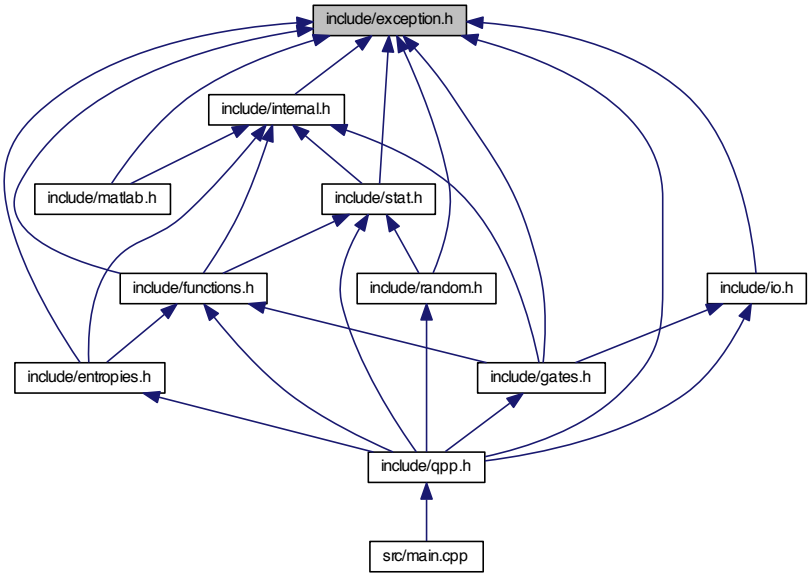
7.3 include/exception.h File Reference

```
#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

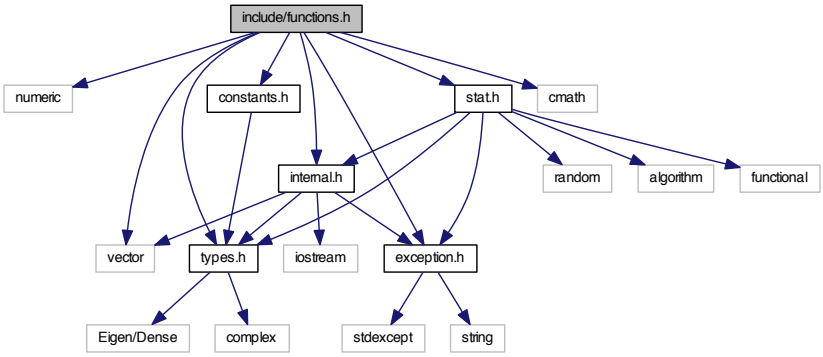
Namespaces

- qpp

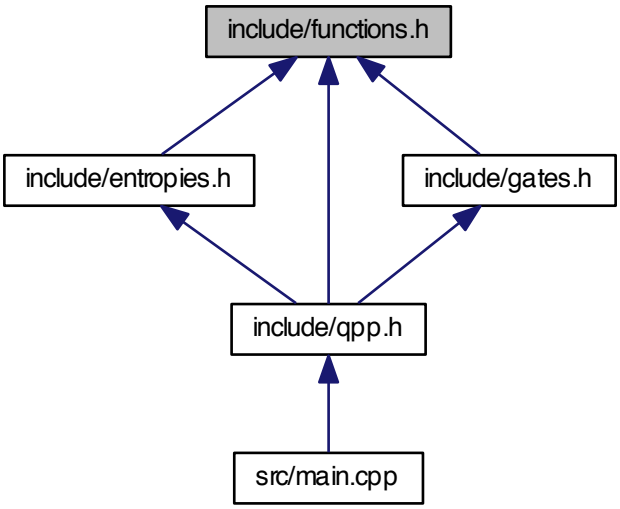
7.4 include/functions.h File Reference

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

Include dependency graph for functions.h:



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



Namespaces

- qpp

Functions

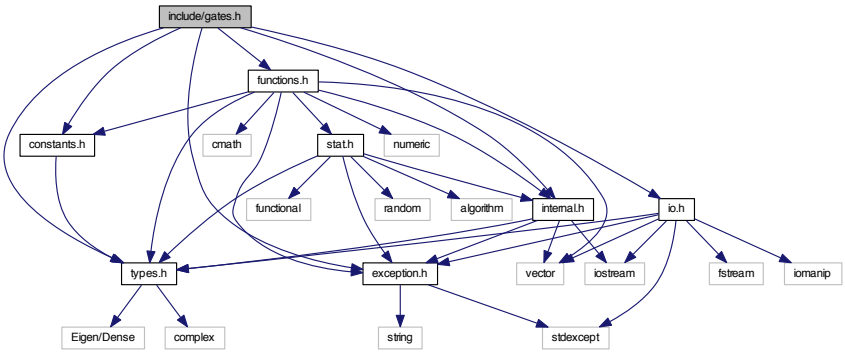
- template<typename Scalar >
  types::DynMat< Scalar > qpp::transpose (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::conjugate (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::adjoint (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  Scalar qpp::trace (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  Scalar qpp::sum (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  double qpp::norm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::evals (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::evects (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::hevals (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::hevects (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::funm (const types::DynMat< Scalar > &A, types::cplx(*f)(const types::cplx &))
- template<typename Scalar >
  types::cmat qpp::absm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::expm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::logm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::sqrtm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::sinm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::cosm (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  types::cmat qpp::spectralpowm (const types::DynMat< Scalar > &A, const types::cplx z)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::powm (const types::DynMat< Scalar > &A, size_t n)
- template<typename InputScalar , typename OutputScalar >
  types::DynMat< OutputScalar > qpp::fun (const types::DynMat< InputScalar > &A, OutputScalar(*f)(const InputScalar &))
- template<typename Scalar >
  types::DynMat< Scalar > qpp::kron (const types::DynMat< Scalar > &A, const types::DynMat< Scalar > &B)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::kronlist (const std::vector< types::DynMat< Scalar >> &list)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::kronpow (const types::DynMat< Scalar > &A, size_t n)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::reshape (const types::DynMat< Scalar > &A, size_t rows, size_t cols)

- template<typename Scalar >
  types::DynMat< Scalar > qpp::syspermute (const types::DynMat< Scalar > &A, const std::vector< size_t > perm, const std::vector< size_t > &dims)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::ptrace2 (const types::DynMat< Scalar > &A, const std::vector< size_t > dims)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::ptrace (const types::DynMat< Scalar > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::ptranspose (const types::DynMat< Scalar > &A, const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::comm (const types::DynMat< Scalar > &A, const types::DynMat< Scalar > &B)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::anticomm (const types::DynMat< Scalar > &A, const types::DynMat< Scalar > &B)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::proj (const types::DynMat< Scalar > &V)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::dya (const types::DynMat< Scalar > &V)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::expandout (const types::DynMat< Scalar > &A, size_t pos, const std::vector< size_t > &dims)

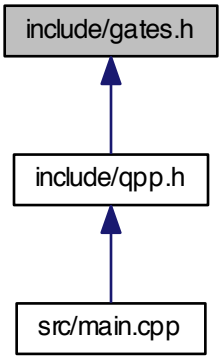
7.5 include/gates.h File Reference

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

Include dependency graph for gates.h:



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



Namespaces

- qpp
- qpp::gt

Functions

- void qpp::gt::_init_gates ()
- types::cmat qpp::gt::Rtheta (double theta)
- types::cmat qpp::gt::Id (size_t D)
- types::cmat qpp::gt::Zd (size_t D)
- types::cmat qpp::gt::Fd (size_t D)
- types::cmat qpp::gt::Xd (size_t D)
- types::cmat qpp::gt::CTRL (const types::cmat &A, const std::vector< size_t > &ctrl, const std::vector< size_t > &gate, size_t n, size_t D=2)

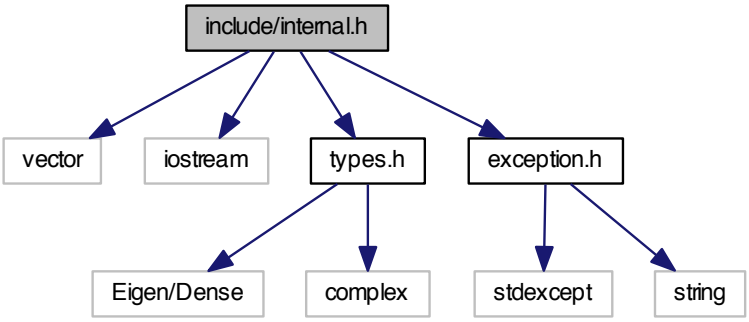
Variables

- types::cmat qpp::gt::H
- types::cmat qpp::gt::Id2
- types::cmat qpp::gt::X
- types::cmat qpp::gt::Y
- types::cmat qpp::gt::Z
- types::cmat qpp::gt::S
- types::cmat qpp::gt::T
- types::cmat qpp::gt::CNOT
- types::cmat qpp::gt::CP
- types::cmat qpp::gt::TOF

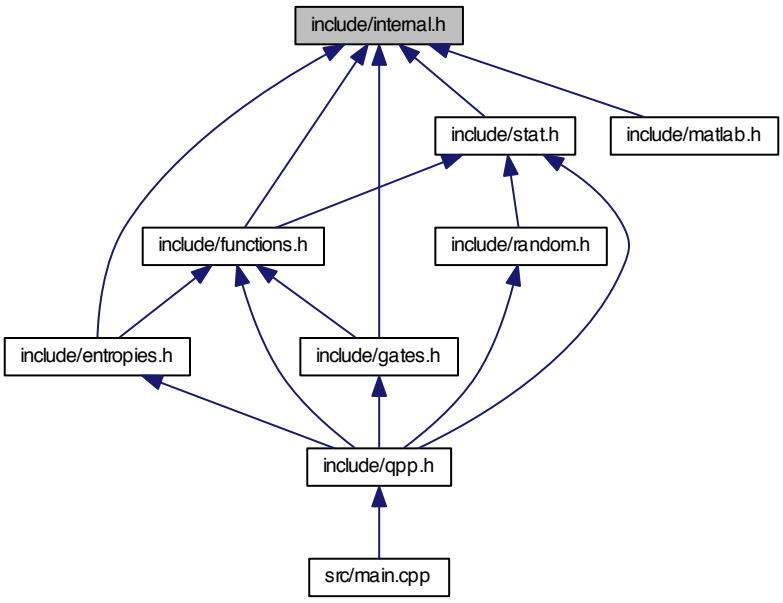
7.6 include/internal.h File Reference

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

Include dependency graph for internal.h:



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



Namespaces

- qpp
- qpp::internal

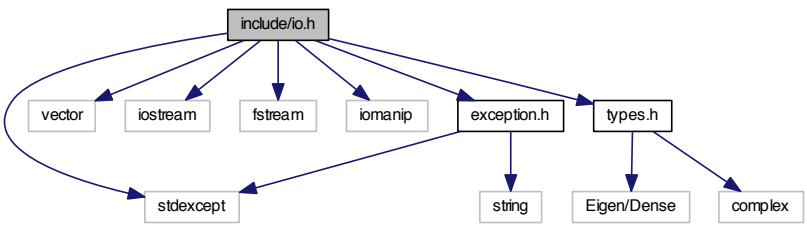
Functions

- 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 Scalar >
  bool qpp::internal::_check_square_mat (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  bool qpp::internal::_check_vector (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  bool qpp::internal::_check_row_vector (const types::DynMat< Scalar > &A)
- template<typename Scalar >
  bool qpp::internal::_check_col_vector (const types::DynMat< Scalar > &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 Scalar >
  bool qpp::internal::_check_dims_match_mat (const std::vector< size_t > &dims, const types::DynMat< Scalar > &A)
- bool qpp::internal::_check_eq_dims (const std::vector< size_t > &dims, size_t dim)
- bool qpp::internal::_check_subsys (const std::vector< size_t > &subsys, const std::vector< size_t > &dims)
- bool qpp::internal::_check_perm (const std::vector< size_t > &perm, const std::vector< size_t > &dims)
- template<typename Scalar >
  void qpp::internal::_syspermute_worker (const size_t ∗midxcol, size_t numdims, const size_t ∗cdims, const size_t ∗cperm, size_t i, size_t j, size_t &iperm, size_t &jperm, const types::DynMat< Scalar > &A, types::DynMat< Scalar > &result)
- template<typename Scalar >
  void qpp::internal::_ptranspose_worker (const size_t ∗midxcol, size_t numdims, size_t numsubsys, const size_t ∗cdims, const size_t ∗csubsys, size_t i, size_t j, size_t &iperm, size_t &jperm, const types::DynMat< Scalar > &A, types::DynMat< Scalar > &result)

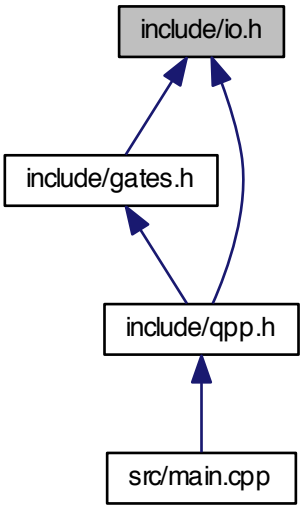
7.7 include/io.h File Reference

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

Include dependency graph for io.h:



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



Namespaces

- qpp

Functions

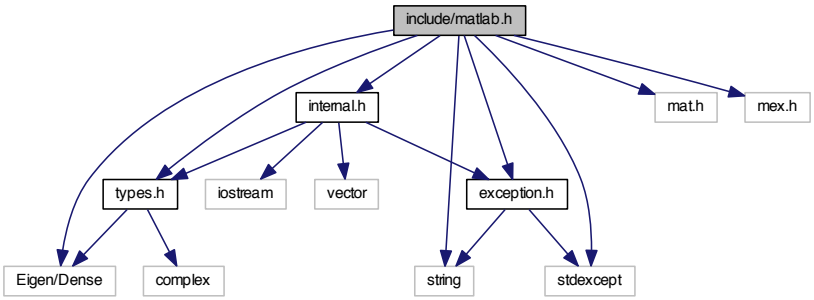
- template<typename T >
  void qpp::disp (const T &x, const std::string &separator=" ", std::ostream &os=std::cout)
- template<typename T >
  void qpp::displn (const T &x, const std::string &separator=" ", std::ostream &os=std::cout)
- template<typename T >
  void qpp::disp (const T *x, const size_t n, const std::string &separator=" ", std::ostream &os=std::cout)
- template<typename T >
  void qpp::displn (const T *x, const size_t n, const std::string &separator=" ", std::ostream &os=std::cout)
- template<typename Scalar >
  void qpp::disp (const types::DynMat< Scalar > &A, double chop=ct::chop, std::ostream &os=std::cout)
- template<typename Scalar >
  void qpp::displn (const types::DynMat< Scalar > &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 Scalar >
  void qpp::save (const types::DynMat< Scalar > &A, const std::string &fname)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::load (const std::string &fname)

7.8 include/matlab.h File Reference

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

```
#include <string>
#include <stdexcept>
#include "types.h"
#include "internal.h"
#include "exception.h"
#include "mat.h"
#include "mex.h"
```

Include dependency graph for matlab.h:



Namespaces

- qpp

Functions

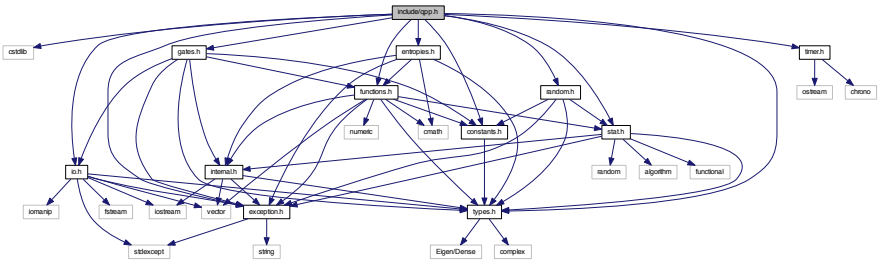
- template<typename Scalar >
  types::DynMat< Scalar > qpp::loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<>
  types::DynMat< double > qpp::loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<>
  types::DynMat< types::cplx > qpp::loadMATLABmatrix (const std::string &mat_file, const std::string &var_name)
- template<typename Scalar >
  void qpp::saveMATLABmatrix (const types::DynMat< Scalar > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- template<>
  void qpp::saveMATLABmatrix (const types::DynMat< double > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)
- template<>
  void qpp::saveMATLABmatrix (const types::DynMat< types::cplx > &A, const std::string &mat_file, const std::string &var_name, const std::string &mode)

7.9 include/qpp.h File Reference

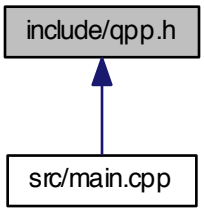
```
#include <cstdlib>
```

```
#include "types.h"
#include "constants.h"
#include "gates.h"
#include "stat.h"
#include "functions.h"
#include "random.h"
#include "entropies.h"
#include "io.h"
#include "timer.h"
#include "exception.h"
```

Include dependency graph for qpp.h:



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



Namespaces

- qpp
- qpp::gt

Functions

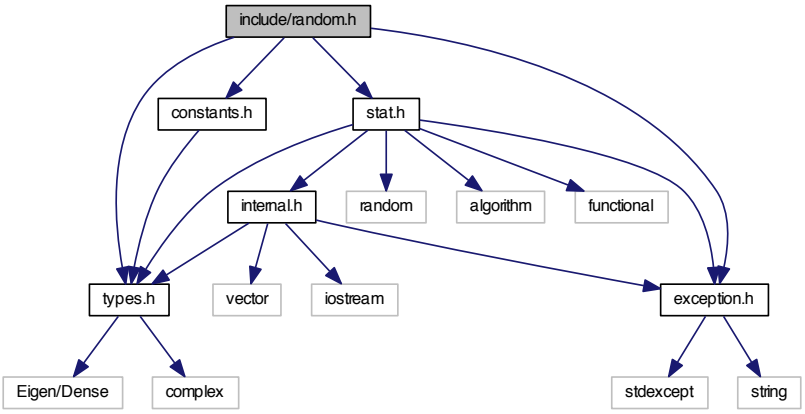
- types::cmat qpp::gt::TOF (8, 8)
- int qpp::_init ()

7.10 include/random.h File Reference

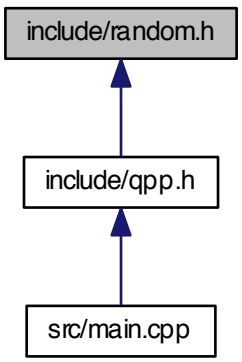
```
#include "types.h"
```

```
#include "stat.h"
#include "constants.h"
#include "exception.h"
```

Include dependency graph for random.h:



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



Namespaces

- qpp

Functions

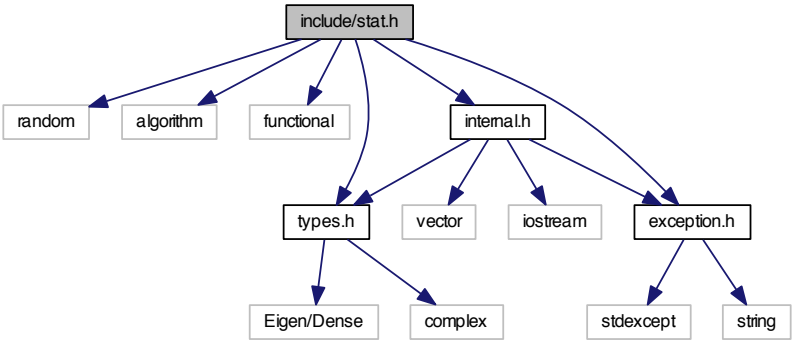
- template<typename Scalar >
  types::DynMat< Scalar > qpp::rand (size_t rows, size_t cols, double a=0, double b=1)
- template<>
  types::DynMat< double > qpp::rand (size_t rows, size_t cols, double a, double b)

- template<>
  types::DynMat< types::cplx > qpp::rand (size_t rows, size_t cols, double a, double b)
- double qpp::rand (double a=0, double b=1)
- template<typename Scalar >
  types::DynMat< Scalar > qpp::randn (size_t rows, size_t cols, double mean=0, double sigma=1)
- template<>
  types::DynMat< double > qpp::randn (size_t rows, size_t cols, double mean, double sigma)
- template<>
  types::DynMat< types::cplx > 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::randH (size_t D)
- types::cmat qpp::randket (size_t D)
- types::cmat qpp::randrho (size_t D)

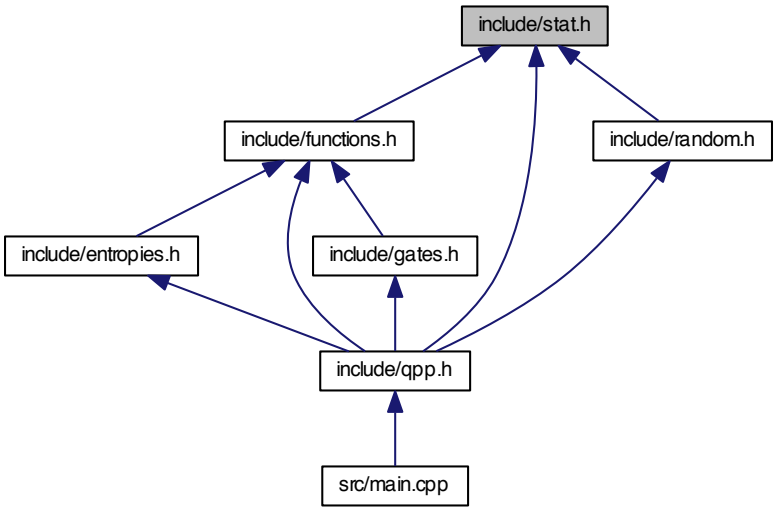
7.11 include/stat.h File Reference

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

Include dependency graph for stat.h:



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



Classes

- class qpp::stat::NormalDistribution
- class qpp::stat::UniformRealDistribution
- class qpp::stat::DiscreteDistribution
- class qpp::stat::DiscreteDistributionFromComplex

Namespaces

- qpp
- qpp::stat

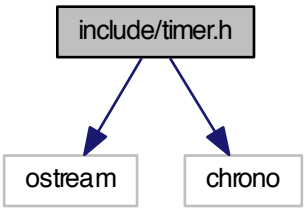
Variables

- std::random_device qpp::stat::_rd
- std::mt19937 qpp::stat::_rng

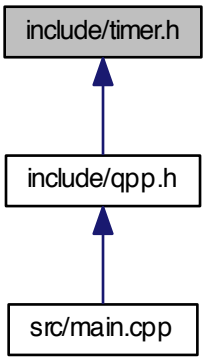
7.12 include/timer.h File Reference

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

Include dependency graph for timer.h:



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



Classes

- class qpp::Timer

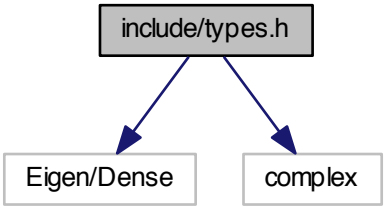
Namespaces

- qpp

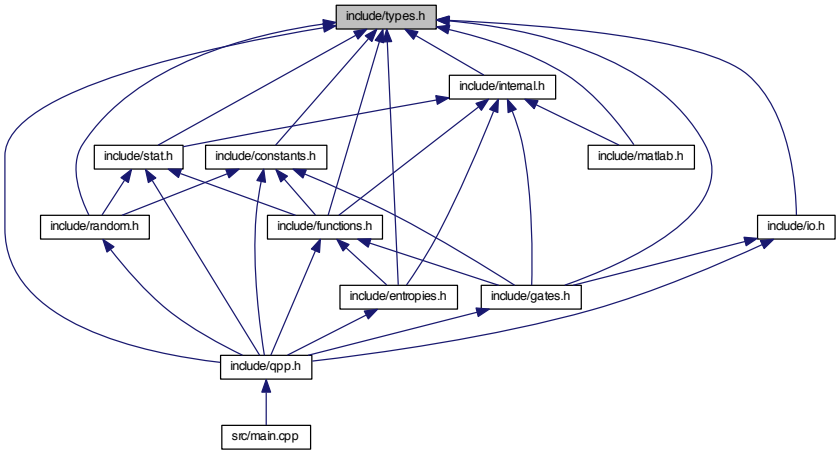
7.13 include/types.h File Reference

```
#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

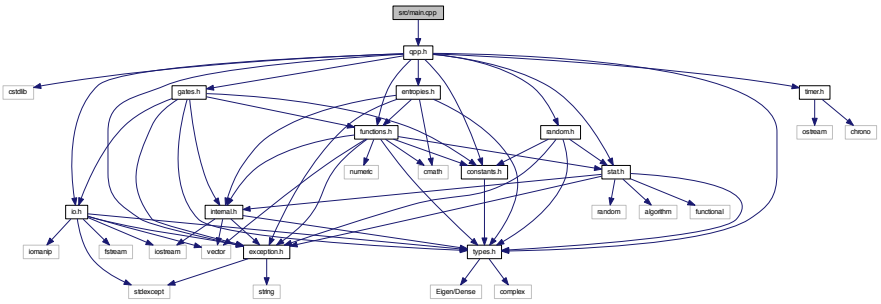
Typedefs

- typedef std::complex< double > qpp::types::cplx
- typedef Eigen::MatrixXcd qpp::types::cmat
- typedef Eigen::MatrixXd qpp::types::dmat
- typedef Eigen::MatrixXf qpp::types::fmat
- typedef Eigen::MatrixXi qpp::types::imat
- template<typename Expression >
  using qpp::types::Expression2DynMat = Eigen::Matrix< typename Expression::Scalar, Eigen::Dynamic, Eigen::Dynamic >
- template<typename Scalar >
  using qpp::types::DynMat = Eigen::Matrix< Scalar, Eigen::Dynamic, Eigen::Dynamic >

7.14 src/main.cpp File Reference

```
#include "qpp.h"
```

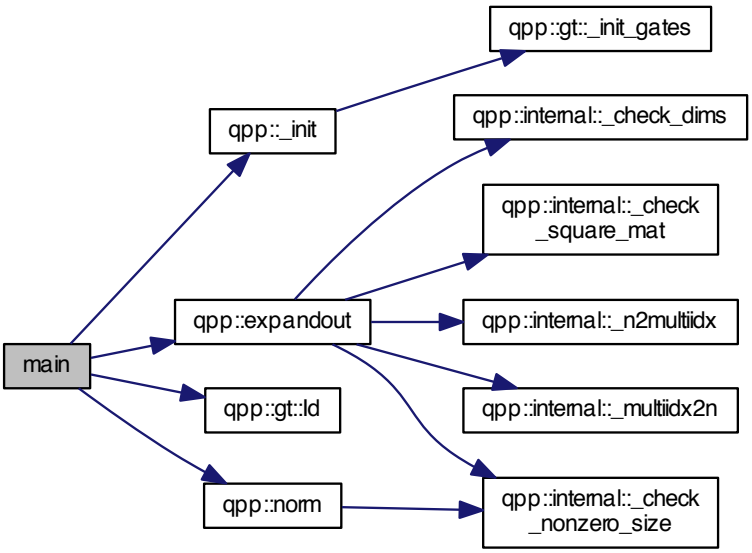
Include dependency graph for main.cpp:



Functions

- int main ()

7.14.1 Function Documentation

7.14.1.1 int main ( )

Here is the call graph for this function: