

qpp
0.1

Generated by Doxygen 1.8.5

Thu Apr 3 2014 22:19:16

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	11
5.1.1.1	_init	11
5.1.1.2	absm	12
5.1.1.3	adjoint	12
5.1.1.4	conjugate	12
5.1.1.5	cosm	13
5.1.1.6	disp	13
5.1.1.7	disp	13
5.1.1.8	disp	13
5.1.1.9	displn	13
5.1.1.10	displn	14
5.1.1.11	displn	14
5.1.1.12	evals	14
5.1.1.13	evects	15
5.1.1.14	expm	15
5.1.1.15	fun	15
5.1.1.16	funm	16
5.1.1.17	hevals	17
5.1.1.18	hevects	18

5.1.1.19	kron	18
5.1.1.20	kron_list	18
5.1.1.21	kron_pow	19
5.1.1.22	load	19
5.1.1.23	loadMATLABmatrix	19
5.1.1.24	loadMATLABmatrix	19
5.1.1.25	loadMATLABmatrix	19
5.1.1.26	logm	19
5.1.1.27	norm	20
5.1.1.28	powm	20
5.1.1.29	powm_int	20
5.1.1.30	ptrace	21
5.1.1.31	ptrace2	21
5.1.1.32	ptranspose	22
5.1.1.33	rand	22
5.1.1.34	rand	22
5.1.1.35	rand	22
5.1.1.36	rand	22
5.1.1.37	randH	23
5.1.1.38	randket	23
5.1.1.39	randn	23
5.1.1.40	randn	23
5.1.1.41	randn	24
5.1.1.42	randn	24
5.1.1.43	randrho	24
5.1.1.44	randU	24
5.1.1.45	renyi	25
5.1.1.46	renyi_inf	25
5.1.1.47	reshape	25
5.1.1.48	save	26
5.1.1.49	saveMATLABmatrix	26
5.1.1.50	saveMATLABmatrix	26
5.1.1.51	saveMATLABmatrix	26
5.1.1.52	shannon	27
5.1.1.53	sinm	27
5.1.1.54	sqrtn	27
5.1.1.55	sum	28
5.1.1.56	syspermute	28
5.1.1.57	trace	29
5.1.1.58	transpose	29

5.2	qpp::ct Namespace Reference	29
5.2.1	Function Documentation	29
5.2.1.1	omega	29
5.2.2	Variable Documentation	29
5.2.2.1	chop	29
5.2.2.2	ee	30
5.2.2.3	ii	30
5.2.2.4	pi	30
5.3	qpp::gt Namespace Reference	30
5.3.1	Function Documentation	30
5.3.1.1	_init_gates	30
5.3.1.2	CU	30
5.3.1.3	CUd	30
5.3.1.4	Fd	31
5.3.1.5	Rtheta	31
5.3.1.6	TOF	31
5.3.1.7	Xd	31
5.3.1.8	Zd	31
5.3.2	Variable Documentation	31
5.3.2.1	CNOT	31
5.3.2.2	CP	32
5.3.2.3	H	32
5.3.2.4	Id2	32
5.3.2.5	S	32
5.3.2.6	T	32
5.3.2.7	TOF	32
5.3.2.8	X	32
5.3.2.9	Y	32
5.3.2.10	Z	32
5.4	qpp::internal Namespace Reference	32
5.4.1	Function Documentation	32
5.4.1.1	_check_dims	32
5.4.1.2	_check_dims_match_mat	32
5.4.1.3	_check_eq_dims	32
5.4.1.4	_check_nonzero_size	33
5.4.1.5	_check_perm	33
5.4.1.6	_check_square_mat	33
5.4.1.7	_check_subsys	33
5.4.1.8	_check_vector	33
5.4.1.9	_multiidx2n	33

5.4.1.10	_n2multiidx	33
5.4.1.11	_ptranspose_worker	33
5.4.1.12	_syspermute_worker	33
5.5	qpp::stat Namespace Reference	34
5.5.1	Variable Documentation	34
5.5.1.1	_rd	34
5.5.1.2	_rng	34
5.6	qpp::types Namespace Reference	34
5.6.1	Typedef Documentation	34
5.6.1.1	cmat	34
5.6.1.2	cplx	34
5.6.1.3	dmat	34
5.6.1.4	DynMat	34
5.6.1.5	Expression2DynMat	34
5.6.1.6	fmat	34
5.6.1.7	imat	34
6	Class Documentation	35
6.1	qpp::stat::DiscreteDistribution Class Reference	35
6.1.1	Constructor & Destructor Documentation	35
6.1.1.1	DiscreteDistribution	35
6.1.1.2	DiscreteDistribution	35
6.1.1.3	DiscreteDistribution	35
6.1.2	Member Function Documentation	35
6.1.2.1	probabilities	35
6.1.2.2	sample	35
6.1.3	Member Data Documentation	35
6.1.3.1	_d	35
6.2	qpp::stat::DiscreteDistributionFromComplex Class Reference	36
6.2.1	Constructor & Destructor Documentation	36
6.2.1.1	DiscreteDistributionFromComplex	36
6.2.1.2	DiscreteDistributionFromComplex	37
6.2.1.3	DiscreteDistributionFromComplex	37
6.2.1.4	DiscreteDistributionFromComplex	37
6.2.2	Member Function Documentation	37
6.2.2.1	cplx2amplitudes	38
6.2.2.2	probabilities	38
6.2.2.3	sample	38
6.2.3	Member Data Documentation	38
6.2.3.1	_d	38

6.3	qpp::Exception Class Reference	38
6.3.1	Member Enumeration Documentation	39
6.3.1.1	Type	39
6.3.2	Constructor & Destructor Documentation	40
6.3.2.1	Exception	40
6.3.2.2	Exception	40
6.3.2.3	~Exception	40
6.3.3	Member Function Documentation	40
6.3.3.1	_construct_exception_msg	40
6.3.3.2	what	40
6.3.4	Member Data Documentation	40
6.3.4.1	_custom	40
6.3.4.2	_msg	40
6.3.4.3	_type	40
6.3.4.4	_where	40
6.4	qpp::stat::NormalDistribution Class Reference	41
6.4.1	Constructor & Destructor Documentation	41
6.4.1.1	NormalDistribution	41
6.4.2	Member Function Documentation	41
6.4.2.1	sample	41
6.4.3	Member Data Documentation	41
6.4.3.1	_d	41
6.5	qpp::Timer Class Reference	41
6.5.1	Constructor & Destructor Documentation	42
6.5.1.1	Timer	42
6.5.1.2	~Timer	42
6.5.2	Member Function Documentation	42
6.5.2.1	seconds	42
6.5.2.2	tic	42
6.5.2.3	toc	42
6.5.3	Friends And Related Function Documentation	42
6.5.3.1	operator<<	42
6.5.4	Member Data Documentation	42
6.5.4.1	_end	42
6.5.4.2	_start	42
6.6	qpp::stat::UniformRealDistribution Class Reference	42
6.6.1	Constructor & Destructor Documentation	42
6.6.1.1	UniformRealDistribution	42
6.6.2	Member Function Documentation	42
6.6.2.1	sample	42

6.6.3	Member Data Documentation	42
6.6.3.1	_d	43
7	File Documentation	45
7.1	include/constants.h File Reference	45
7.2	include/entropies.h File Reference	46
7.3	include/exception.h File Reference	48
7.4	include/functions.h File Reference	49
7.5	include/gates.h File Reference	51
7.6	include/internal.h File Reference	53
7.7	include/io.h File Reference	54
7.8	include/matlab.h File Reference	55
7.9	include/qpp.h File Reference	56
7.10	include/random.h File Reference	57
7.11	include/stat.h File Reference	59
7.12	include/timer.h File Reference	60
7.13	include/types.h File Reference	61
7.14	src/main.cpp File Reference	63
7.14.1	Function Documentation	63
7.14.1.1	main	63

Chapter 1

Namespace Index

1.1 Namespace List

Here is a list of all namespaces with brief descriptions:

qpp	9
qpp::ct	29
qpp::gt	30
qpp::internal	32
qpp::stat	34
qpp::types	34

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

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

qpp::stat::DiscreteDistribution	35
qpp::stat::DiscreteDistributionFromComplex	36
exception	
qpp::Exception	38
qpp::stat::NormalDistribution	41
qpp::Timer	41
qpp::stat::UniformRealDistribution	42

Chapter 3

Class Index

3.1 Class List

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

qpp::stat::DiscreteDistribution	35
qpp::stat::DiscreteDistributionFromComplex	36
qpp::Exception	38
qpp::stat::NormalDistribution	41
qpp::Timer	41
qpp::stat::UniformRealDistribution	42

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

include/	constants.h	45
include/	entropies.h	46
include/	exception.h	48
include/	functions.h	49
include/	gates.h	51
include/	internal.h	53
include/	io.h	54
include/	matlab.h	55
include/	qpp.h	56
include/	random.h	57
include/	stat.h	59
include/	timer.h	60
include/	types.h	61
src/	main.cpp	63

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 evecs (const types::DynMat< Scalar > &A)`

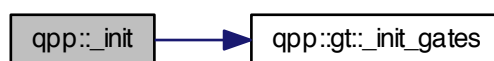
- `template<typename Scalar >`
`types::cmat hevals` (const `types::DynMat< Scalar >` &A)
- `template<typename Scalar >`
`types::cmat hevects` (const `types::DynMat< Scalar >` &A)
- `template<typename Scalar >`
`types::cmat funm` (const `types::DynMat< Scalar >` &A, `types::cplx`(*f)(const `types::cplx` &))
- `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 powm` (const `types::DynMat< Scalar >` &A, const `types::cplx` z)
- `template<typename Scalar >`
`types::DynMat< Scalar >` `powm_int` (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 >` `kron_list` (const `std::vector< types::DynMat< Scalar >>` &list)
- `template<typename Scalar >`
`types::DynMat< Scalar >` `kron_pow` (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 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 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

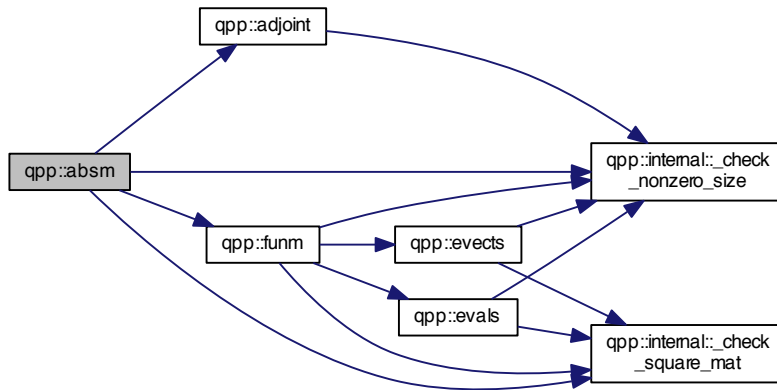
5.1.1.1 `int qpp::_init ()`

Here is the call graph for this function:



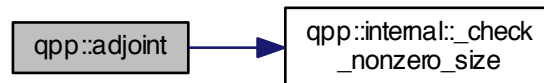
5.1.1.2 `template<typename Scalar > types::cmat qpp::absm (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



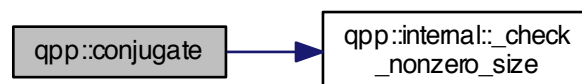
5.1.1.3 `template<typename Scalar > types::DynMat<Scalar> qpp::adjoint (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



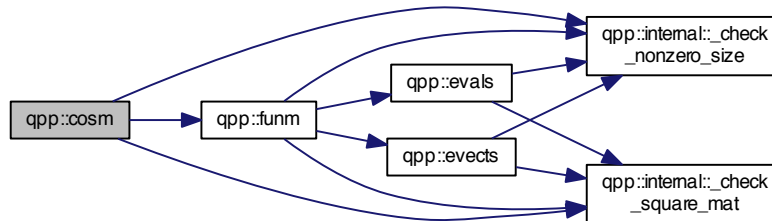
5.1.1.4 `template<typename Scalar > types::DynMat<Scalar> qpp::conjugate (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



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

Here is the call graph for this function:



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

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

5.1.1.8 `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:



5.1.1.9 `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:



5.1.1.10 `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:



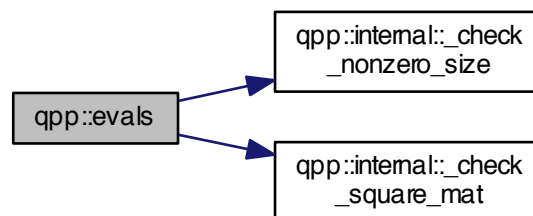
5.1.1.11 `void qpp::displn (const types::cplx c, double chop = ct:::chop, std::ostream & os = std:::cout)`
`[inline]`

Here is the call graph for this function:



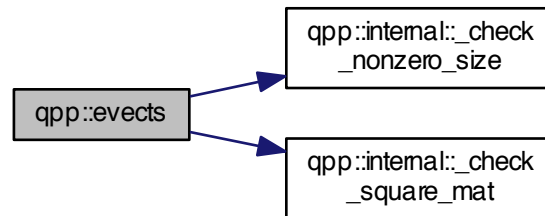
5.1.1.12 `template<typename Scalar > types::cmat qpp::evals (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



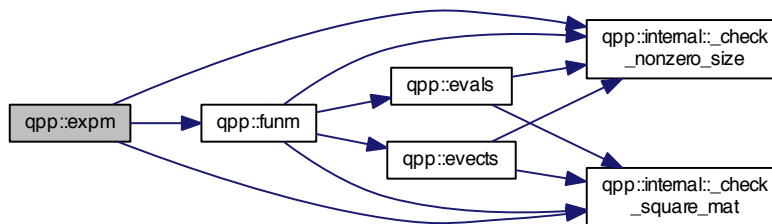
5.1.1.13 `template<typename Scalar > types::cmat qpp::evecs (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



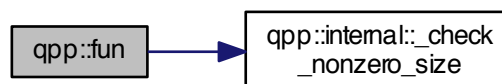
5.1.1.14 `template<typename Scalar > types::cmat qpp::expm (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



5.1.1.15 `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:



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

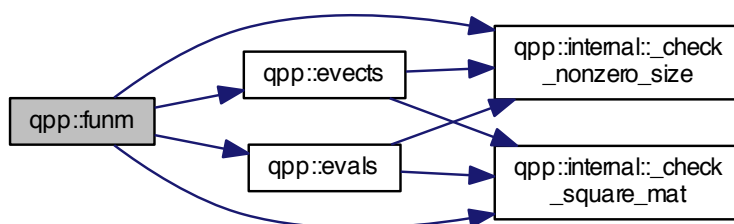
Parameters

A	input matrix
f	function pointer

Returns

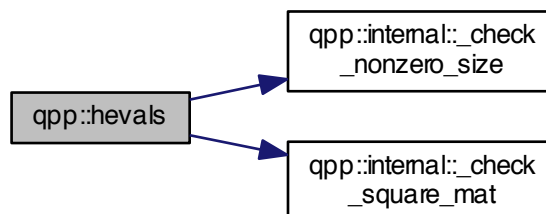
[types::cmat](#)

Here is the call graph for this function:



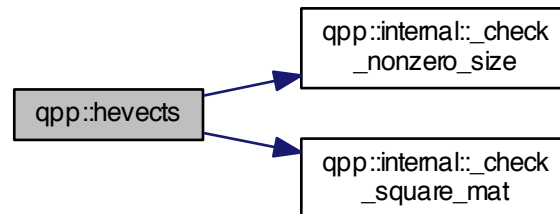
5.1.1.17 `template<typename Scalar > types::cmat qpp::hevals (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



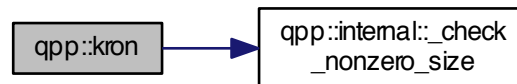
5.1.1.18 `template<typename Scalar > types::cmat qpp::hevects (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



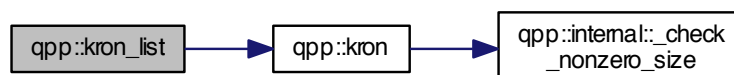
5.1.1.19 `template<typename Scalar > types::DynMat<Scalar> qpp::kron (const types::DynMat< Scalar > & A, const types::DynMat< Scalar > & B)`

Here is the call graph for this function:



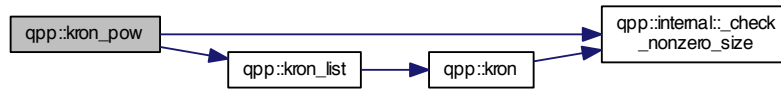
5.1.1.20 `template<typename Scalar > types::DynMat<Scalar> qpp::kron_list (const std::vector< types::DynMat< Scalar >> & list)`

Here is the call graph for this function:



5.1.1.21 `template<typename Scalar> types::DynMat<Scalar> qpp::kron_pow (const types::DynMat< Scalar> & A, size_t n)`

Here is the call graph for this function:



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

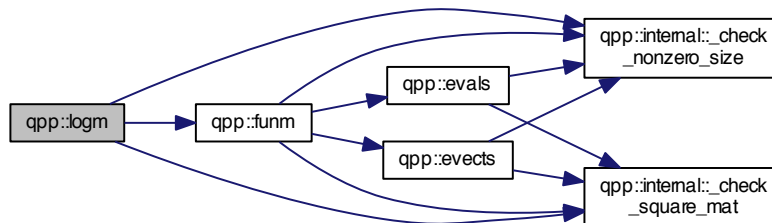
5.1.1.23 `template<typename Scalar> types::DynMat<Scalar> qpp::loadMATLABmatrix (const std::string & mat_file, const std::string & var_name)`

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

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

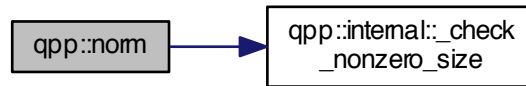
5.1.1.26 `template<typename Scalar> types::cmat qpp::logm (const types::DynMat< Scalar> & A)`

Here is the call graph for this function:



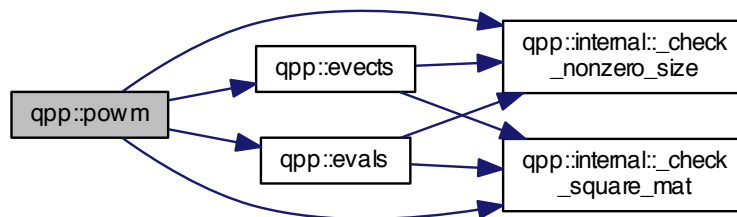
5.1.1.27 `template<typename Scalar > double qpp::norm (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



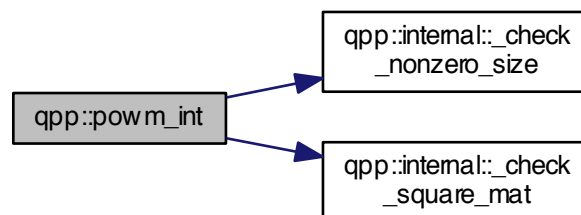
5.1.1.28 `template<typename Scalar > types::cmat qpp::powm (const types::DynMat< Scalar > & A, const types::cplx z)`

Here is the call graph for this function:



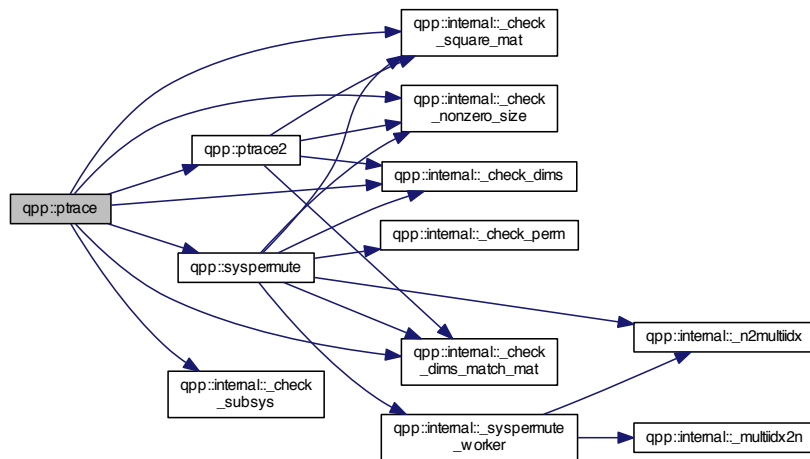
5.1.1.29 `template<typename Scalar > types::DynMat<Scalar> qpp::powm_int (const types::DynMat< Scalar > & A, size_t n)`

Here is the call graph for this function:



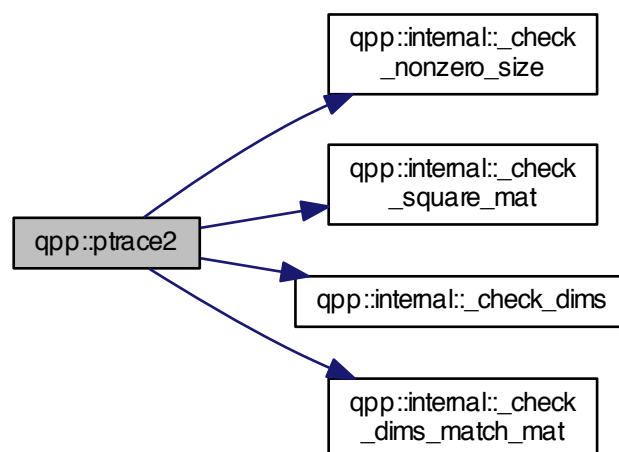
5.1.1.30 `template<typename Scalar> types::DynMat<Scalar> qpp::ptrace (const types::DynMat< Scalar> & A, const std::vector< size_t> & subsys, const std::vector< size_t> & dims)`

Here is the call graph for this function:



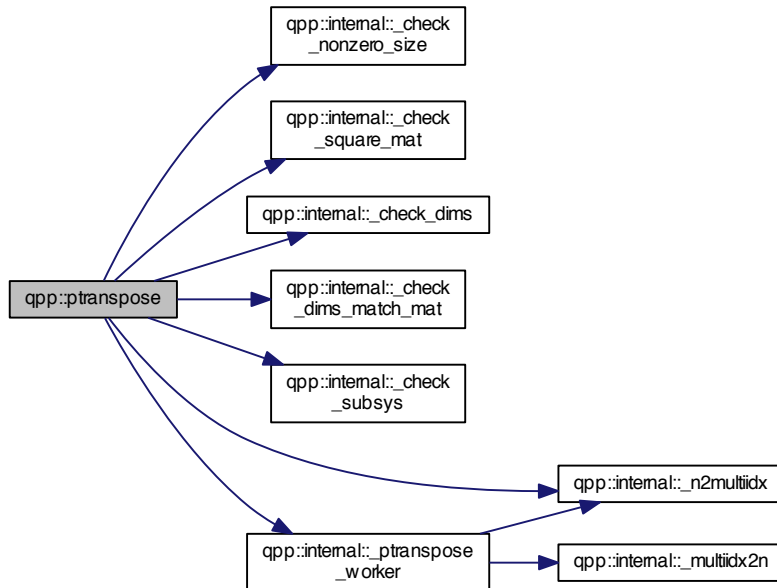
5.1.1.31 `template<typename Scalar> types::DynMat<Scalar> qpp::ptrace2 (const types::DynMat< Scalar> & A, const std::vector< size_t> dims)`

Here is the call graph for this function:



5.1.1.32 `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:



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

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

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

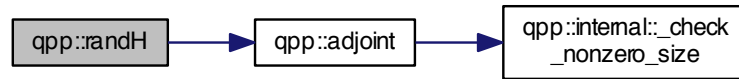
5.1.1.36 `double qpp::rand (double a = 0, double b = 1) [inline]`

Here is the call graph for this function:

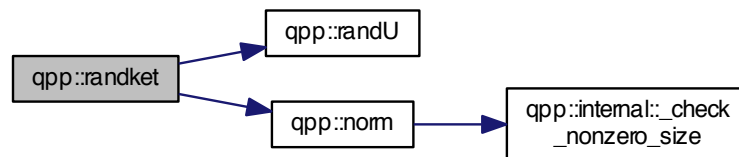


5.1.1.37 `types::cmat qpp::randH (size_t D) [inline]`

Here is the call graph for this function:

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

Here is the call graph for this function:

**5.1.1.39** `template<typename Scalar > types::DynMat<Scalar> qpp::randn (size_t rows, size_t cols, double mean = 0, double sigma = 1) [inline]`**5.1.1.40** `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:



5.1.1.41 `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:



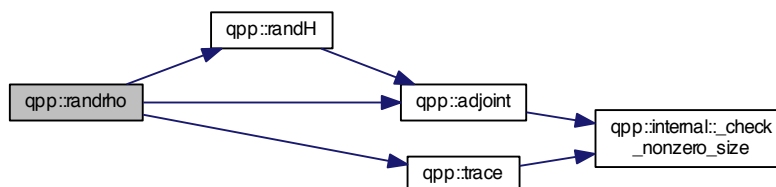
5.1.1.42 `double qpp::randn (double mean = 0, double sigma = 1)` `[inline]`

Here is the call graph for this function:



5.1.1.43 `types::cmat qpp::randrho (size_t D)` `[inline]`

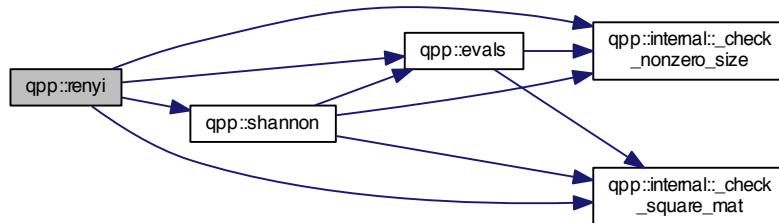
Here is the call graph for this function:



5.1.1.44 `types::cmat qpp::randU (size_t D)` `[inline]`

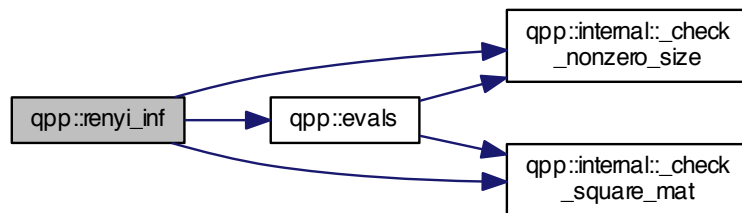
5.1.1.45 `template<typename Scalar > double qpp::renyi (const double alpha, const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



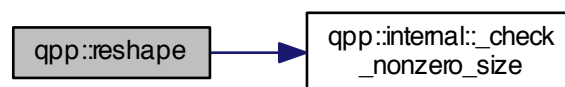
5.1.1.46 `template<typename Scalar > double qpp::renyi_inf (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



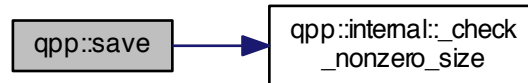
5.1.1.47 `template<typename Scalar > types::DynMat<Scalar> qpp::reshape (const types::DynMat< Scalar > & A, size_t rows, size_t cols)`

Here is the call graph for this function:



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

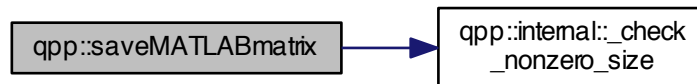
Here is the call graph for this function:



5.1.1.49 `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)`

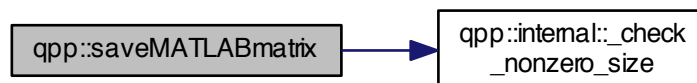
5.1.1.50 `template<> void qpp::saveMATLABmatrix (const types::DynMat< double > & A, const std::string & mat_file, const std::string & var_name, const std::string & mode)`

Here is the call graph for this function:



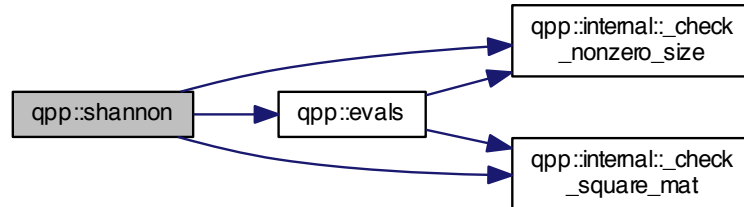
5.1.1.51 `template<> void qpp::saveMATLABmatrix (const types::DynMat< types::cplx > & A, const std::string & mat_file, const std::string & var_name, const std::string & mode)`

Here is the call graph for this function:



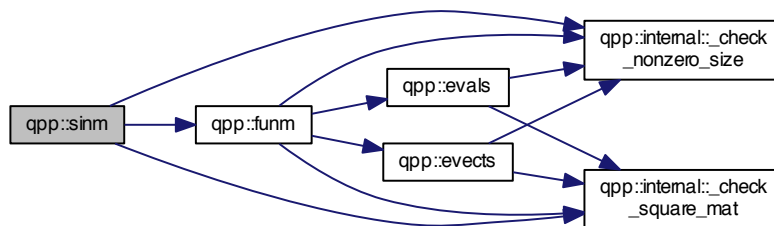
5.1.1.52 `template<typename Scalar > double qpp::shannon (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



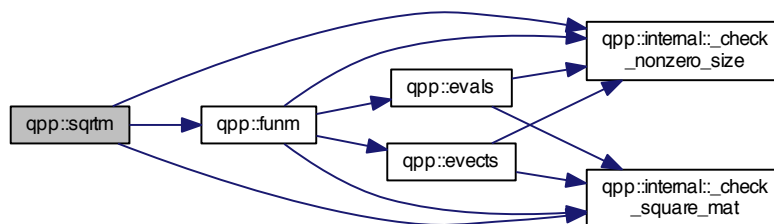
5.1.1.53 `template<typename Scalar > types::cmat qpp::sinm (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



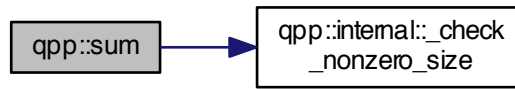
5.1.1.54 `template<typename Scalar > types::cmat qpp::sqrtm (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



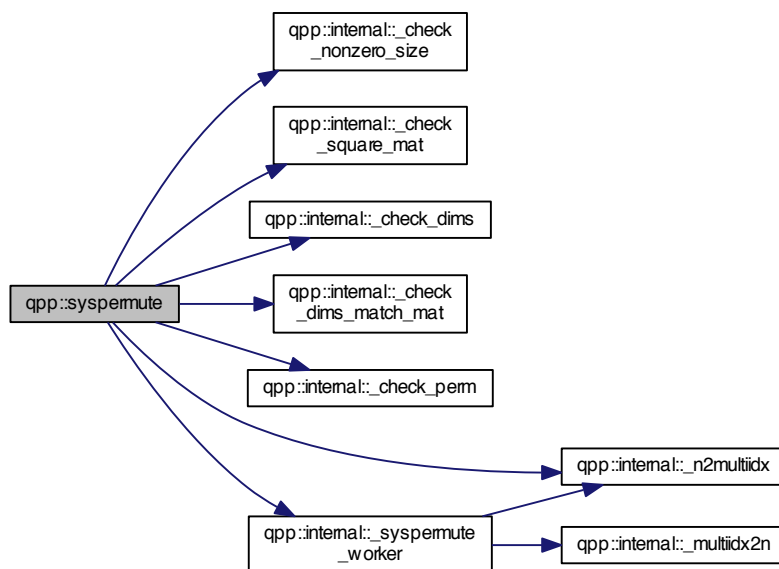
5.1.1.55 `template<typename Scalar > Scalar qpp::sum (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



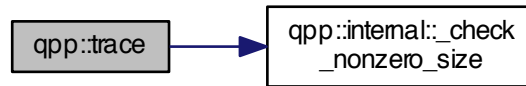
5.1.1.56 `template<typename Scalar > types::DynMat<Scalar> qpp::syspermute (const types::DynMat< Scalar > & A, const std::vector< size_t > perm, const std::vector< size_t > & dims)`

Here is the call graph for this function:



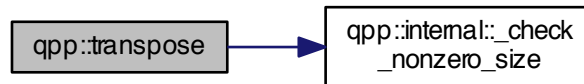
5.1.1.57 `template<typename Scalar > Scalar qpp::trace (const types::DynMat< Scalar > & A)`

Here is the call graph for this function:



5.1.1.58 `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 = 3.141592653589793238462643383279502884`
- `const double ee = 2.718281828459045235360287471352662497`

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 = 2.718281828459045235360287471352662497`

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

5.2.2.4 `const double qpp::ct::pi = 3.141592653589793238462643383279502884`

5.3 qpp::gt Namespace Reference

Functions

- `void _init_gates ()`
- `types::cmat Rtheta (double theta)`
- `types::cmat CU (const types::cmat &U)`
- `types::cmat Zd (size_t D)`
- `types::cmat Fd (size_t D)`
- `types::cmat Xd (size_t D)`
- `types::cmat CUd (const types::cmat &U)`
- `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`

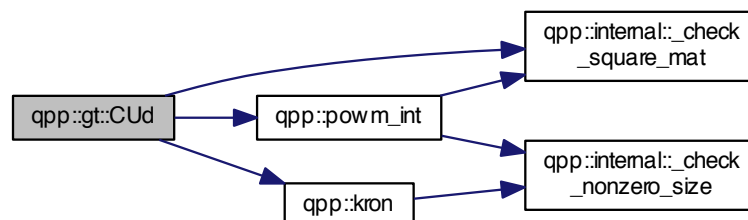
5.3.1 Function Documentation

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

5.3.1.2 `types::cmat qpp::gt::CU (const types::cmat & U) [inline]`

5.3.1.3 `types::cmat qpp::gt::CUd (const types::cmat & U) [inline]`

Here is the call graph for this function:



5.3.1.4 `types::cmat qpp::gt::Fd (size_t D) [inline]`

Here is the call graph for this function:



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::ld2`

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_nonzero_size (const types::DynMat< Scalar > &A)`
- `template<typename Scalar >`
`bool _check_dims_match_mat (const std::vector< size_t > &dims, const types::DynMat< Scalar > &A)`
- `bool _check_dims (const std::vector< size_t > &dims)`
- `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

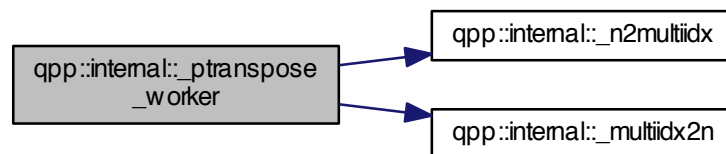
5.4.1.1 `bool qpp::internal::_check_dims (const std::vector< size_t > & dims) [inline]`

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

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

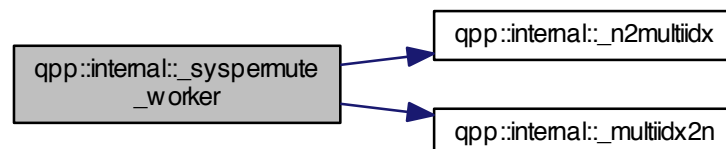
- 5.4.1.4 `template<typename Scalar > bool qpp::internal::_check_nonzero_size (const types::DynMat< Scalar > & A)`
- 5.4.1.5 `bool qpp::internal::_check_perm (const std::vector< size_t > & perm, const std::vector< size_t > & dims)`
[inline]
- 5.4.1.6 `template<typename Scalar > bool qpp::internal::_check_square_mat (const types::DynMat< Scalar > & A)`
- 5.4.1.7 `bool qpp::internal::_check_subsys (const std::vector< size_t > & subsys, const std::vector< size_t > & dims)`
[inline]
- 5.4.1.8 `template<typename Scalar > bool qpp::internal::_check_vector (const types::DynMat< Scalar > & A)`
- 5.4.1.9 `size_t qpp::internal::_multiidx2n (const size_t * midx, size_t numdims, const size_t * dims)` [inline]
- 5.4.1.10 `void qpp::internal::_n2multiidx (size_t n, size_t numdims, const size_t * dims, size_t * result)` [inline]
- 5.4.1.11 `template<typename Scalar > void qpp::internal::_ptranpose_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:



- 5.4.1.12 `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

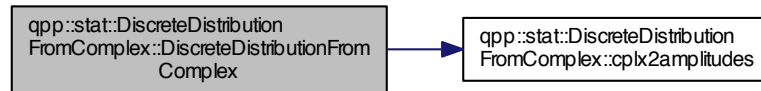
- 6.2.1.1 `template<typename InputIterator > qpp::stat::DiscreteDistributionFromComplex::DiscreteDistributionFromComplex (`
`InputIterator first, InputIterator last)` `[inline]`

Here is the call graph for this function:



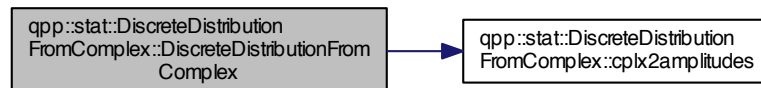
6.2.1.2 `qpp::stat::DiscreteDistributionFromComplex::DiscreteDistributionFromComplex (std::initializer_list< types::cplx > amplitudes) [inline]`

Here is the call graph for this function:



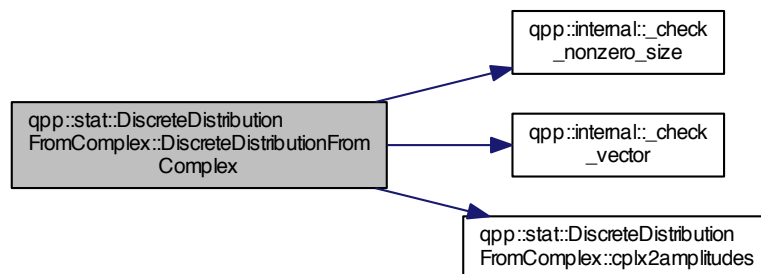
6.2.1.3 `qpp::stat::DiscreteDistributionFromComplex::DiscreteDistributionFromComplex (std::vector< types::cplx > amplitudes) [inline]`

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::DiscreteDistributionFromComplex::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]`

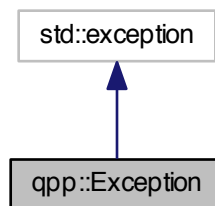
The documentation for this class was generated from the following file:

- include/[stat.h](#)

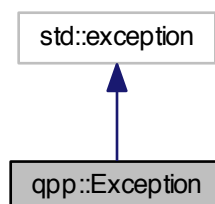
6.3 qpp::Exception Class Reference

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

Inheritance diagram for qpp::Exception:



Collaboration diagram for qpp::Exception:



Public Types

- enum [Type](#) {
[Type::UNKNOWN_EXCEPTION](#) = 0, [Type::MATRIX_NOT_SQUARE](#), [Type::MATRIX_NOT_VECTOR](#), [Type::MATRIX_ZERO_SIZE](#),
[Type::DIMS_MISMATCH_MATRIX](#), [Type::DIMS_HAVE_ZERO](#), [Type::DIMS_NOT_EQUAL](#), [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 noexcept override
- 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]

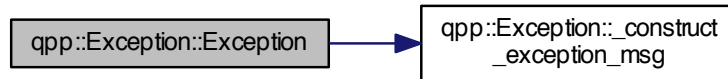
Enumerator

UNKNOWN_EXCEPTION
MATRIX_NOT_SQUARE
MATRIX_NOT_VECTOR
MATRIX_ZERO_SIZE
DIMS_MISMATCH_MATRIX
DIMS_HAVE_ZERO
DIMS_NOT_EQUAL
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

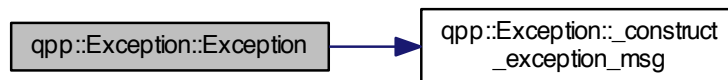
6.3.2.1 `qpp::Exception::Exception (const std::string & where, const Type & type)` `[inline]`

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](#)

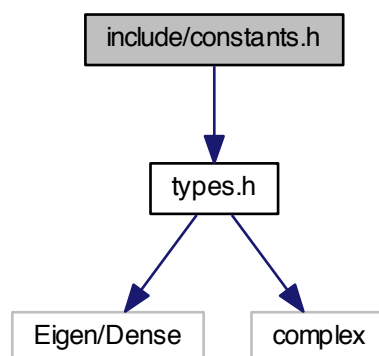
Chapter 7

File Documentation

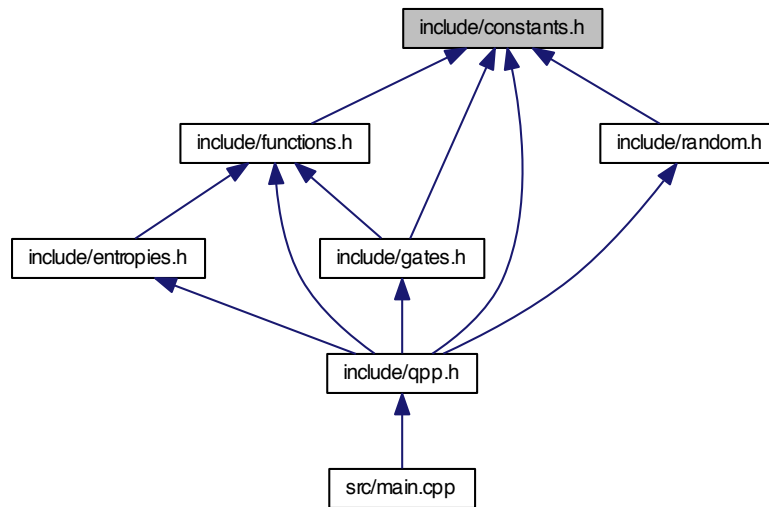
7.1 include/constants.h File Reference

```
#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 = 3.141592653589793238462643383279502884`
- `const double qpp::ct::ee = 2.718281828459045235360287471352662497`

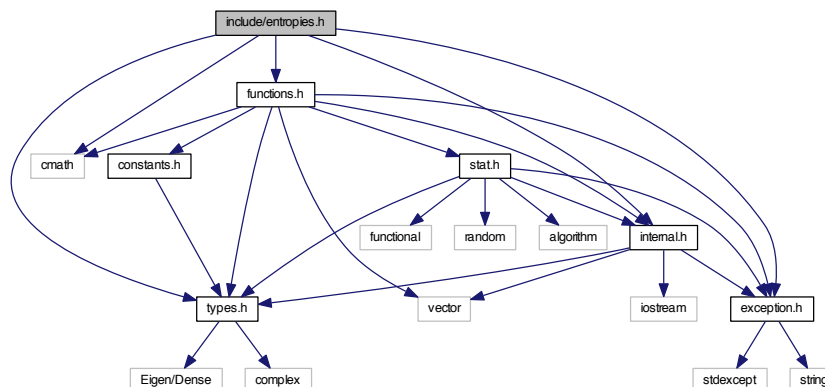
7.2 include/entropies.h File Reference

```

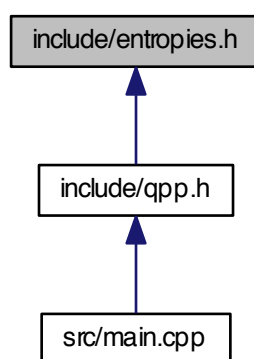
#include <cmath>
#include "types.h"
#include "functions.h"
#include "internal.h"
#include "exception.h"

```

Include dependency graph for entropies.h:



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



Namespaces

- [qpp](#)

Functions

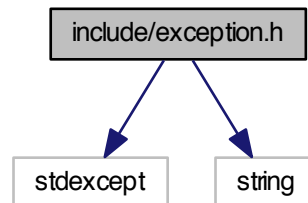
- `template<typename Scalar >`
`double qpp::shannon (const types::DynMat< Scalar > &A)`
- `template<typename Scalar >`
`double qpp::renyi (const double alpha, const types::DynMat< Scalar > &A)`
- `template<typename Scalar >`
`double qpp::renyi_inf (const types::DynMat< Scalar > &A)`

7.3 include/exception.h File Reference

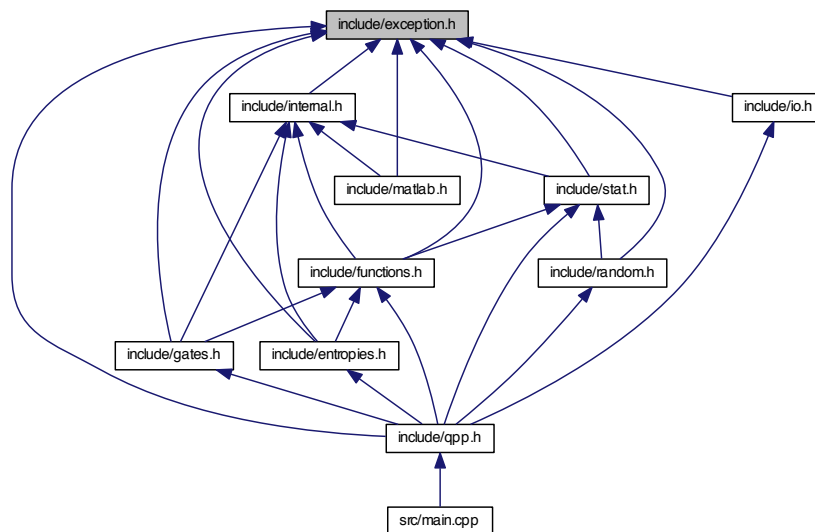
```
#include <stdexcept>
```

```
#include <string>
```

Include dependency graph for exception.h:



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



Classes

- class [qpp::Exception](#)

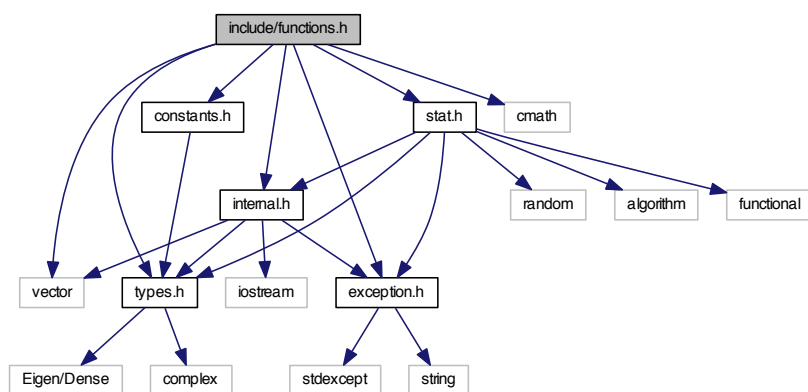
Namespaces

- [qpp](#)

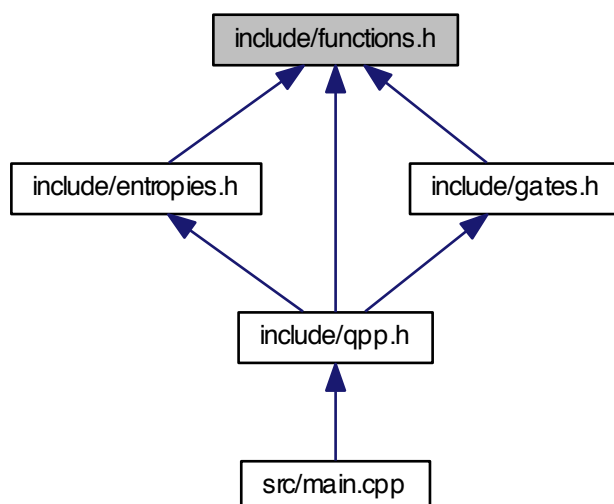
7.4 include/functions.h File Reference

```
#include <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](#)

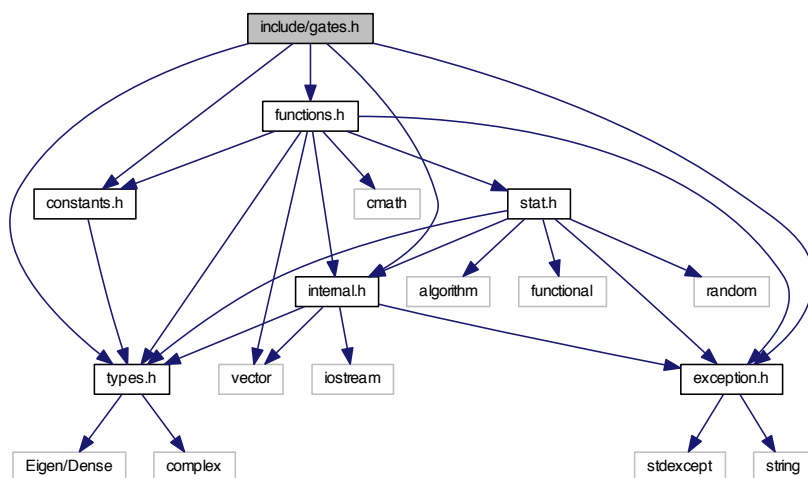
Functions

- `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::evecs (const types::DynMat< Scalar > &A)`
- `template<typename Scalar >`
`types::cmat qpp::hevals (const types::DynMat< Scalar > &A)`
- `template<typename Scalar >`
`types::cmat qpp::hevecs (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::powm (const types::DynMat< Scalar > &A, const types::cplx z)`
- `template<typename Scalar >`
`types::DynMat< Scalar > qpp::powm_int (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::kron_list (const std::vector< types::DynMat< Scalar > > &list)`
- `template<typename Scalar >`
`types::DynMat< Scalar > qpp::kron_pow (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)`

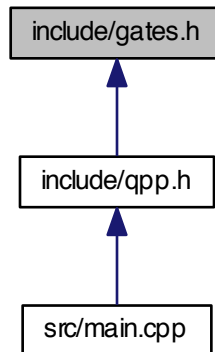
- `template<typename Scalar >`
`types::DynMat< Scalar > qpp::syspermute (const types::DynMat< Scalar > &A, const std::vector< size_t >`
`> perm, const std::vector< size_t > &dims)`
- `template<typename Scalar >`
`types::DynMat< Scalar > qpp::ptrace2 (const types::DynMat< Scalar > &A, const std::vector< 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)`

7.5 include/gates.h File Reference

```
#include "types.h"
#include "constants.h"
#include "functions.h"
#include "internal.h"
#include "exception.h"
Include dependency graph for gates.h:
```



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



Namespaces

- [qpp](#)
- [qpp::gt](#)

Functions

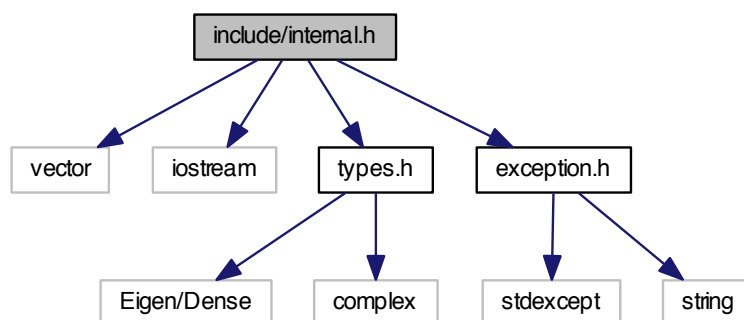
- void [qpp::gt::_init_gates](#) ()
- types::cmat [qpp::gt::Rtheta](#) (double theta)
- types::cmat [qpp::gt::CU](#) (const types::cmat &U)
- types::cmat [qpp::gt::Zd](#) (size_t D)
- types::cmat [qpp::gt::Fd](#) (size_t D)
- types::cmat [qpp::gt::Xd](#) (size_t D)
- types::cmat [qpp::gt::CUd](#) (const types::cmat &U)

Variables

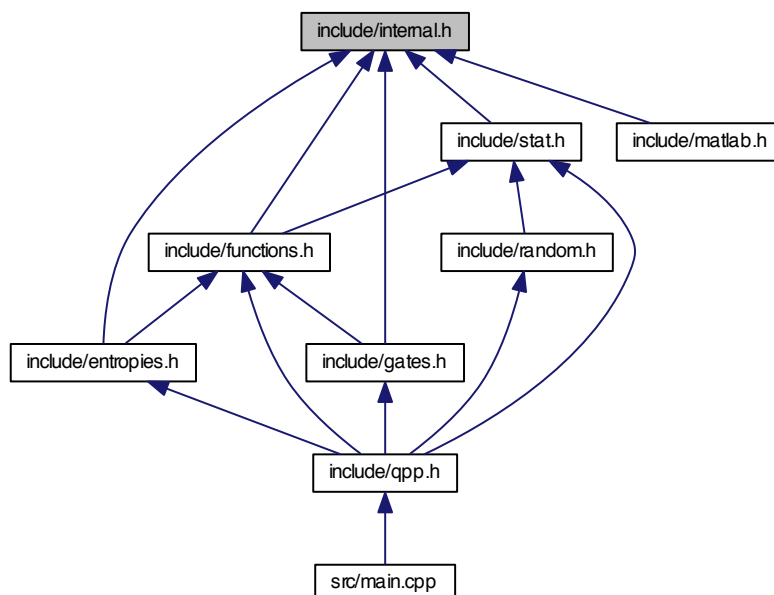
- types::cmat [qpp::gt::H](#)
- types::cmat [qpp::gt::Id2](#)
- types::cmat [qpp::gt::X](#)
- types::cmat [qpp::gt::Y](#)
- types::cmat [qpp::gt::Z](#)
- types::cmat [qpp::gt::S](#)
- types::cmat [qpp::gt::T](#)
- types::cmat [qpp::gt::CNOT](#)
- types::cmat [qpp::gt::CP](#)
- types::cmat [qpp::gt::TOF](#)

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

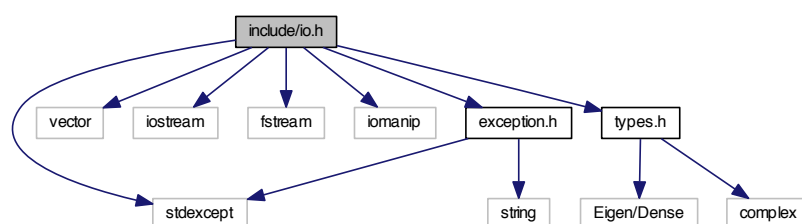
- `qpp`
- `qpp::internal`

Functions

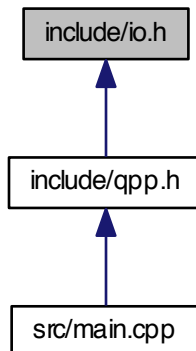
- void [qpp::internal::_n2multiidx](#) (size_t n, size_t numdims, const size_t *dims, size_t *result)
- size_t [qpp::internal::_multiidx2n](#) (const size_t *midx, size_t numdims, const size_t *dims)
- template<typename Scalar >
bool [qpp::internal::_check_square_mat](#) (const types::DynMat< Scalar > &A)
- template<typename Scalar >
bool [qpp::internal::_check_vector](#) (const types::DynMat< Scalar > &A)
- template<typename Scalar >
bool [qpp::internal::_check_nonzero_size](#) (const types::DynMat< Scalar > &A)
- 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_dims](#) (const std::vector< size_t > &dims)
- 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::_ptrtranspose_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 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)`

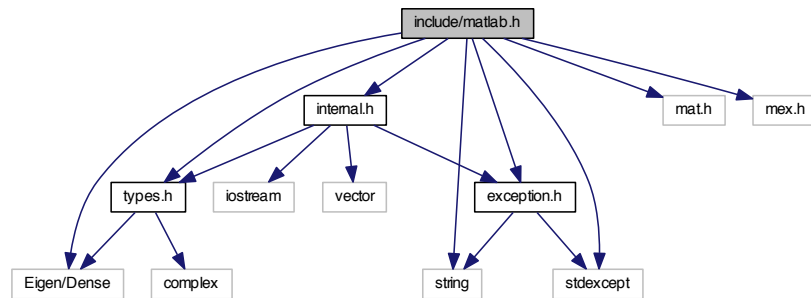
7.8 include/matlab.h File Reference

```

#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"

```



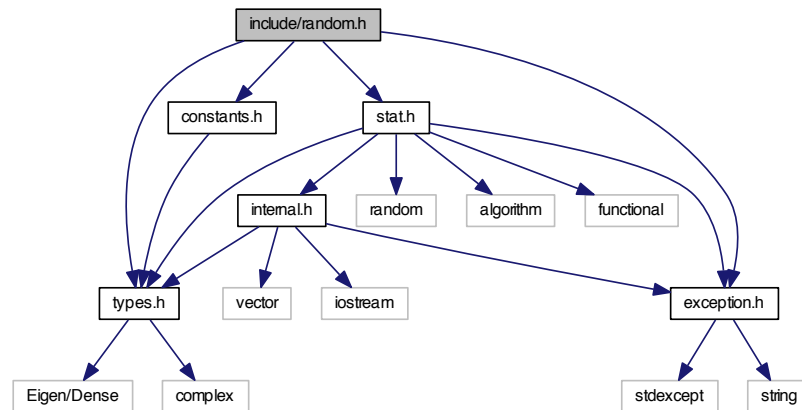
```
graph BT; A[src/main.cpp] --> B[include/qpp.h]
```

- qpp
- qpp::gt

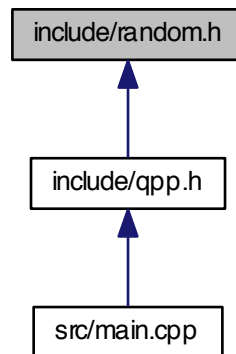
- types::cmat `qpp::gt::TOF` (8, 8)
- int `qpp::init` ()

```
#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](#)

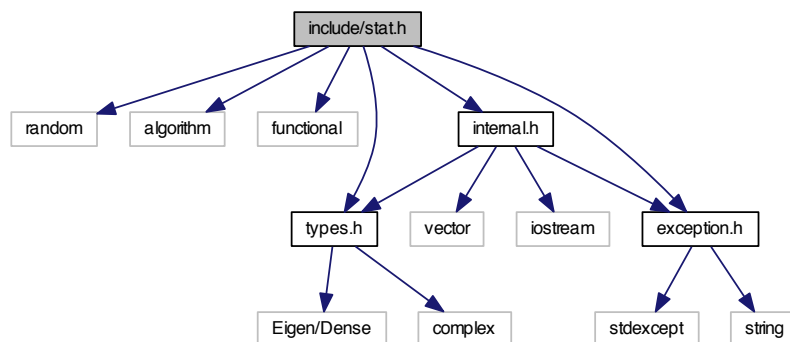
Functions

- `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)`

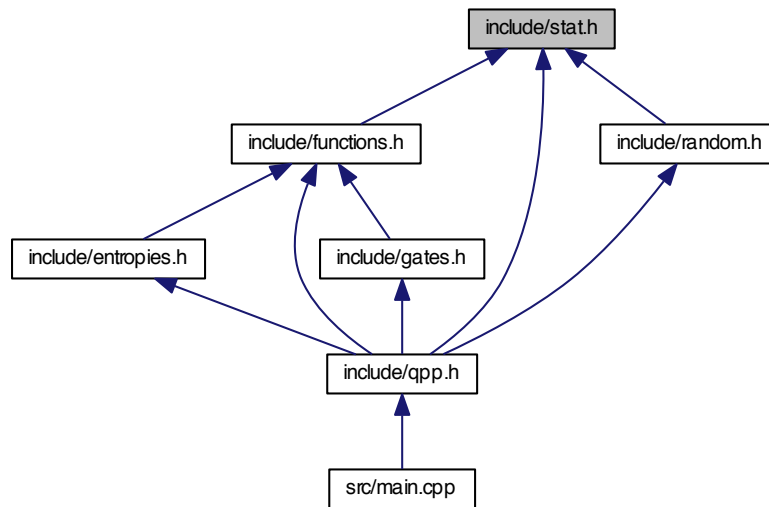
- `template<typename Scalar >`
`types::DynMat< Scalar > qpp::randn (size_t rows, size_t cols, double mean=0, double sigma=1)`
- `template<>`
`types::DynMat< double > qpp::randn (size_t rows, size_t cols, double mean, double sigma)`
- `template<>`
`types::DynMat< types::cplx > qpp::randn (size_t rows, 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](#)

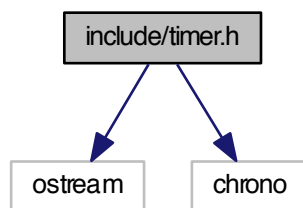
Variables

- `std::random_device` [qpp::stat::_rd](#)
- `std::mt19937` [qpp::stat::_rng](#)

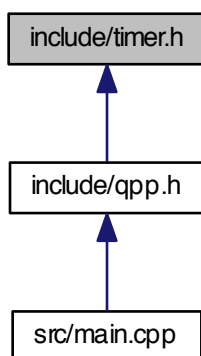
7.12 include/timer.h File Reference

```
#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](#)

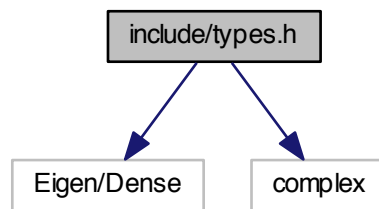
Namespaces

- [qpp](#)

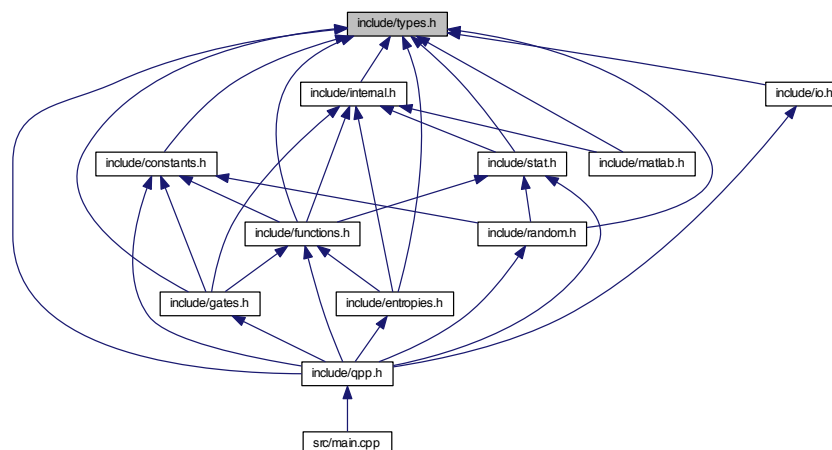
7.13 include/types.h File Reference

```
#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](#)

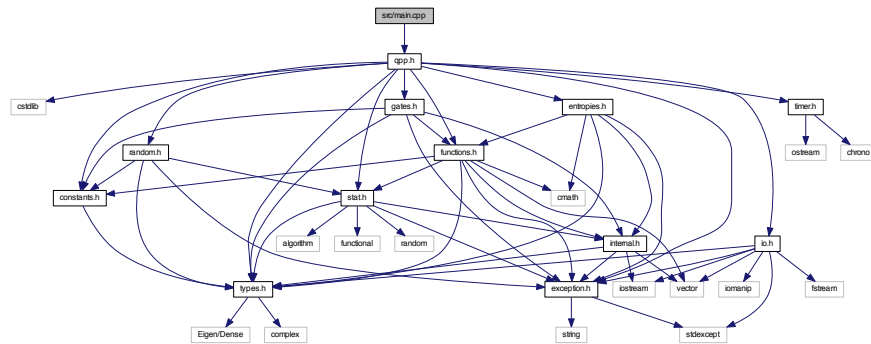
Typedefs

- `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:

