GPML

0.1

Generated by Doxygen 1.8.13

Contents

1 Class Index **1**

1.1 Class List 1

2 File Index **3**

2.1 File List 3

3 Class Documentation **5**

3.1 math::Matrix< N > Class Template Reference 5

3.1.1 Detailed Description 6

3.1.2 Constructor & Destructor Documentation 6

3.1.2.1 Matrix() `[1/7]` 6

3.1.2.2 Matrix() `[2/7]` 6

3.1.2.3 Matrix() `[3/7]` 7

3.1.2.4 Matrix() `[4/7]` 7

3.1.2.5 Matrix() `[5/7]` 7

3.1.2.6 Matrix() `[6/7]` 8

3.1.2.7 Matrix() `[7/7]` 8

3.1.2.8 ∼Matrix() 8

3.1.3 Member Function Documentation 8

3.1.3.1 at() 9

3.1.3.2 cols() 9

3.1.3.3 operator∗=() `[1/2]` 9

3.1.3.4 operator∗=() `[2/2]` 10

3.1.3.5 operator+=() 10

3.1.3.6 operator-=() 10

3.1.3.7 operator/=() 11

3.1.3.8 operator=() 11

3.1.3.9 rows() 12

3.1.3.10 set() 12

3.1.3.11 shape() 12

3.1.3.12 size() 13

4 File Documentation 15

4.1 /home/daniel/dev/cpp/math/include/Matrix.hpp File Reference 15

4.1.1 Detailed Description 16

4.1.2 Typedef Documentation 16

4.1.2.1 dMatrix 16

4.1.2.2 fMatrix 16

4.1.2.3 iMatrix 16

4.1.3 Function Documentation 17

4.1.3.1 operator∗() [1/3] 17

4.1.3.2 operator∗() [2/3] 17

4.1.3.3 operator∗() [3/3] 17

4.1.3.4 operator+() 18

4.1.3.5 operator-() 18

4.1.3.6 operator/() 19

4.2 /home/daniel/dev/cpp/math/include/typedefs.h File Reference 20

4.2.1 Detailed Description 20

4.2.2 Typedef Documentation 20

4.2.2.1 uint 21

4.2.2.2 ul 21

4.2.2.3 ull 21

Index 23

Chapter 1

Class Index

1.1 Class List

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

math::Matrix< N >
Matrix generic class 5

Chapter 2

File Index

2.1 File List

Here is a list of all documented files with brief descriptions:

/home/daniel/dev/cpp/math/include/Matrix.hpp 15
/home/daniel/dev/cpp/math/include/typedefs.h 20

Chapter 3

Class Documentation

3.1 math::Matrix< N > Class Template Reference

Matrix generic class.

```
#include <Matrix.hpp>
```

Public Member Functions

- Matrix (uint size, const N &fill)
- Matrix (uint rows, uint cols, const N &fill)
- Matrix (uint size, N **data)
- Matrix (uint size, const std::vector< std::vector< N > > &data)
- Matrix (uint rows, uint cols, N **data)
- Matrix (uint rows, uint cols, const std::vector< std::vector< N > > &data)
- Matrix (const Matrix &m)
- N at (uint r, uint c) const
- void set (uint r, uint c, N val)
- std::pair< uint, uint > shape () const
- uint rows () const
- uint cols () const
- uint size () const
- Matrix & operator= (const Matrix &m)
- Matrix & operator+= (const Matrix &m)
- Matrix & operator-= (const Matrix &m)
- Matrix & operator*= (const N &scal)
- Matrix & operator*= (const Matrix &m)
- Matrix & operator/= (const N &scal)
- ∼Matrix ()

3.1.1 Detailed Description

template<typename N>
class math::Matrix< N >

Matrix generic class.

Author

Daniel Nichols

Date

October 2018

3.1.2 Constructor & Destructor Documentation

3.1.2.1 Matrix() [1/7]

```
template<typename N >
math::Matrix< N >::Matrix (
             uint size,
             const N & fill )
```

Square matrix constructor. Creates a size∗size matrix with every value set to fill.

Parameters

size	- size of the rows and cols of the matrix
fill	- default value for every entry

3.1.2.2 Matrix() [2/7]

```
template<typename N >
math::Matrix< N >::Matrix (
             uint rows,
             uint cols,
             const N & fill )
```

Matrix constructor. Creates a rows∗cols matrix with every value set to fill.

Parameters

rows	- number of rows
cols	- number of cols
fill	- default value for every entry

3.1.2.3 Matrix() [3/7]

```
template<typename N >
math::Matrix< N >::Matrix (
            uint size,
            N ** data )
```

Creates and fills matrix with data from `N** data` array. Will seg-fault if `data` is not `size * size`.

Parameters

size	- size of square matrix
data	- 2d array of data to fill matrix

3.1.2.4 Matrix() [4/7]

```
template<typename N >
math::Matrix< N >::Matrix (
            uint size,
            const std::vector< std::vector< N > > & data )
```

Creates and fills matrix with data from `vector<vector<N> > data`. Will seg-fault or ignore excess data if `data` is not `size * size`.

Parameters

size	- size of square matrix
data	- 2d vector of data to fill matrix

3.1.2.5 Matrix() [5/7]

```
template<typename N >
math::Matrix< N >::Matrix (
            uint rows,
            uint cols,
            N ** data )
```

Creates and fills matrix with data from `N** data` array. Will seg-fault if `data` is not `rows * cols`.

Parameters

rows	- number of rows in resulting matrix
cols	- number of columns in resulting matrix
data	- 2d array of data to fill matrix

3.1.2.6 Matrix() [6/7]

```
template<typename N >
math::Matrix< N >::Matrix (
            uint rows,
            uint cols,
            const std::vector< std::vector< N > > & data )
```

Creates and fills matrix with data from `vector<vector<N> > data`. Will seg-fault or ignore excess data if `data` is not `rows * cols`.

Parameters

rows	- number of rows in resulting matrix
cols	- number of cols in resulting matrix
data	- 2d vector of data to fill matrix

3.1.2.7 Matrix() [7/7]

```
template<typename N >
math::Matrix< N >::Matrix (
            const Matrix< N > & m )
```

Copy constructor. Copies matrix m into new matrix.

Parameters

m	- matrix to be copied

3.1.2.8 ∼Matrix()

```
template<typename N >
math::Matrix< N >::∼Matrix ( )
```

Destructor. Deletes the matrix internally

3.1.3 Member Function Documentation

3.1.3.1 at()

```
template<typename N >
N math::Matrix< N >::at (
             uint r,
             uint c ) const
```

Get element at r, c of the matrix 0-indexed.

Parameters

r	- row of return element
c	- column of return element

Exceptions

invalid_argument	thrown if r<0 or r>=rows() or c<0 or c>=cols()

3.1.3.2 cols()

```
template<typename N>
uint math::Matrix< N >::cols ( ) const  [inline]
```

Get the number of columns in the matrix.

Returns

the number of columns in the matrix

3.1.3.3 operator*=() [1/2]

```
template<typename N >
Matrix< N > & math::Matrix< N >::operator*= (
             const N & scal )
```

Adds Multiplies `this` by scaler `scal`

Parameters

scal	- scaler to multiply `this` by

Returns

a pointer to `m` after multiplication

3.1.3.4 operator*=() [2/2]

```
template<typename N >
Matrix< N > & math::Matrix< N >::operator*= (
              const Matrix< N > & m )
```

Performs matrix multiplication between `this` and `m`. This operation will throw an exception if `cols!=m.rows()`. It will also reshape `this` to that `rows()` does not change and `cols()` becomes `m.cols()`.

Parameters

m	- matrix to multiply by `this`.

Returns

a pointer to `this` after multiplication.

Exceptions

invalid_argument	if `cols()!=m.rows()` matrix multiplication is undefined

3.1.3.5 operator+=()

```
template<typename N >
Matrix< N > & math::Matrix< N >::operator+= (
              const Matrix< N > & m )
```

Adds matrix `m` to `this` element-wise

Parameters

m	- matrix to add to `this`. rows and cols must be equivalent.

Returns

a pointer to `this` after addition

Exceptions

invalid_argument	thrown if `rows()!=m.rows()` or `cols()!=m.cols()`

3.1.3.6 operator-=()

```
template<typename N >
```

```
Matrix< N > & math::Matrix< N >::operator-= (
             const Matrix< N > & m )
```

Subtracts matrix m from this element-wise

Parameters

m	- matrix to subtract from this. rows and cols must be equivalent.

Returns

a pointer to this after subtraction

Exceptions

invalid_argument	thrown if rows()!=m.rows() or cols()!=m.cols()

3.1.3.7 operator/=()

```
template<typename N >
Matrix< N > & math::Matrix< N >::operator/= (
             const N & scal )
```

Divides this by scalar scal element-wise. Does not check for scal==0 as division for class N might have non-standard definition.

Parameters

scal	- scalar to divide this by

Returns

a pointer to m after division

3.1.3.8 operator=()

```
template<typename N >
Matrix< N > & math::Matrix< N >::operator= (
             const Matrix< N > & m )
```

Copies m into this. Performs an element-wise copy. Ignores self-copy.

Parameters

m	- matrix to copy into this

Returns

pointer to `this` after copy

3.1.3.9 rows()

```
template<typename N>
uint math::Matrix< N >::rows ( ) const  [inline]
```

Get the number of rows in the matrix.

Returns

the number of rows in the matrix

3.1.3.10 set()

```
template<typename N >
void math::Matrix< N >::set (
             uint r,
             uint c,
             N val )
```

Set element at r, c of the matrix 0-indexed.

Parameters

r	- row of element set
c	- column of element set
val	- value to set element at r,c

Exceptions

invalid_argument	thrown if r<0 or r>=rows() or c<0 or c>=cols()

3.1.3.11 shape()

```
template<typename N>
std::pair<uint, uint> math::Matrix< N >::shape ( ) const  [inline]
```

Get the shape or (rows, cols). This is equivalent to `std::make_pair(rows(), cols());`

Returns

an STL pair containing the row count and column count

3.1.3.12 size()

```
template<typename N>
uint math::Matrix< N >::size ( ) const  [inline]
```

Get the size of the matrix (`size() == rows() * cols()`)

Returns

the size of the matrix

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

- /home/daniel/dev/cpp/math/include/Matrix.hpp

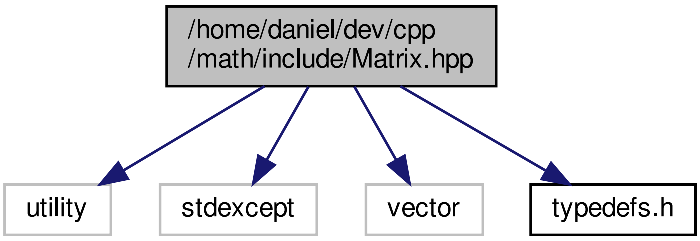
Chapter 4

File Documentation

4.1 /home/daniel/dev/cpp/math/include/Matrix.hpp File Reference

```
#include <utility>
#include <stdexcept>
#include <vector>
#include "typedefs.h"
```

Include dependency graph for Matrix.hpp:



Classes

- class math::Matrix< N >

  Matrix generic class.

Typedefs

- typedef Matrix< int > math::iMatrix
- typedef Matrix< float > math::fMatrix
- typedef Matrix< double > math::dMatrix

Functions

- template<typename N >
  Matrix< N > math::operator+ (Matrix< N > lhs, const Matrix< N > &rhs)
- template<typename N >
  Matrix< N > math::operator- (Matrix< N > lhs, const Matrix< N > &rhs)
- template<typename N >
  Matrix< N > math::operator* (Matrix< N > lhs, const N &rhs)
- template<typename N >
  Matrix< N > math::operator* (const N &lhs, Matrix< N > rhs)
- template<typename N >
  Matrix< N > math::operator/ (Matrix< N > lhs, const N &rhs)
- template<typename N >
  Matrix< N > math::operator* (Matrix< N > lhs, const Matrix< N > &rhs)

4.1.1 Detailed Description

Contains Matrix class definition and implementation.

Author

Daniel Nichols

Date

October 2018

4.1.2 Typedef Documentation

4.1.2.1 dMatrix

```
typedef Matrix<double> math::dMatrix
```

double precision matrix

4.1.2.2 fMatrix

```
typedef Matrix<float> math::fMatrix
```

float precision matrix

4.1.2.3 iMatrix

```
typedef Matrix<int> math::iMatrix
```

integer matrix

4.1.3 Function Documentation

4.1.3.1 operator*() [1/3]

```
template<typename N >
Matrix< N > math::operator* (
             Matrix< N > lhs,
             const N & rhs )
```

Multiplies lhs and scalar rhs. Copies lhs and multiplies by scalar rhs

Parameters

lhs	- left hand side matrix
rhs	- right hand side scalar

Returns

a new matrix with elements multiplication of `lhs` and `rhs`

4.1.3.2 operator*() [2/3]

```
template<typename N >
Matrix< N > math::operator* (
             const N & lhs,
             Matrix< N > rhs )
```

Multiplies scalar lhs and matrix rhs. Copies rhs and multiplies by scalar lhs

Parameters

lhs	- left hand side scalar
rhs	- right hand side matrix

Returns

a new matrix with elements multiplication of `lhs` and `rhs`

4.1.3.3 operator*() [3/3]

```
template<typename N >
Matrix< N > math::operator* (
            Matrix< N > lhs,
            const Matrix< N > & rhs )
```

Performs matrix multiplication of `rhs` and `lhs`

Parameters

lhs	- left hand side matrix
rhs	- right hand side matrix

Returns

a new matrix resulting from matrix multiplication. Result will have shape `lhs.rows(), rhs.cols()`.

Exceptions

invalid_argument	if `lhs.cols() != rhs.rows()`

4.1.3.4 operator+()

```
template<typename N >
Matrix< N > math::operator+ (
            Matrix< N > lhs,
            const Matrix< N > & rhs )
```

Adds lhs and rhs matrices element-wise. Copies lhs and add rhs to it.

Parameters

lhs	- left hand side matrix of addition
rhs	- right hand side matrix of addition

Returns

a new matrix with elements from element-wise addition of `lhs` and `rhs`

Exceptions

invalid_argument	if `lhs` and `rhs` do not have same shape

4.1.3.5 operator-()

```
template<typename N >
Matrix< N > math::operator- (
            Matrix< N > lhs,
            const Matrix< N > & rhs )
```

Subtracts lhs and rhs matrices element-wise. Copies lhs and subtract rhs from it.

Parameters

lhs	- left hand side matrix of subtraction
rhs	- right hand side matrix of subtraction

Returns

a new matrix with elements from element-wise subtraction of `lhs` and `rhs`

Exceptions

invalid_argument	if `lhs` and `rhs` do not have same shape

4.1.3.6 operator/()

```
template<typename N >
Matrix< N > math::operator/ (
            Matrix< N > lhs,
            const N & rhs )
```

Divides lhs matrix by scalar rhs. Copies lhs and divides by scalar rhs. Does not check if rhs is zero due to unknown type of `N`.

Parameters

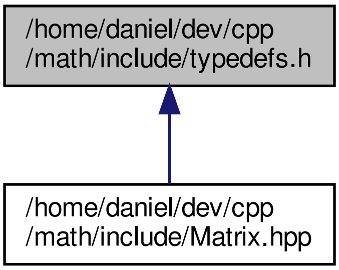
lhs	- left hand side matrix
rhs	- right hand side scalar

Returns

a new matrix with elements division of `lhs` and `rhs`

4.2 /home/daniel/dev/cpp/math/include/typedefs.h File Reference

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



Typedefs

- typedef unsigned int math::uint
- typedef unsigned long math::ul
- typedef unsigned long long math::ull

4.2.1 Detailed Description

Defines utilility types for math library.

Author

Daniel Nichols

Date

October 2018

4.2.2 Typedef Documentation

4.2.2.1 uint

```
typedef unsigned int math::uint
```

shorthand for unsigned int type

4.2.2.2 ul

```
typedef unsigned long math::ul
```

shorthand for unsigned long

4.2.2.3 ull

```
typedef unsigned long long math::ull
```

shorthand for unsigned long long

Index

/home/daniel/dev/cpp/math/include/Matrix.hpp, 15
/home/daniel/dev/cpp/math/include/typedefs.h, 20
∼Matrix
  math::Matrix, 8

at
  math::Matrix, 8

cols
  math::Matrix, 9

dMatrix
  Matrix.hpp, 16

fMatrix
  Matrix.hpp, 16

iMatrix
  Matrix.hpp, 16

math::Matrix
  ∼Matrix, 8
  at, 8
  cols, 9
  Matrix, 6–8
  operator∗=, 9
  operator+=, 10
  operator-=, 10
  operator/=, 11
  operator=, 11
  rows, 12
  set, 12
  shape, 12
  size, 13
math::Matrix< N >, 5
Matrix
  math::Matrix, 6–8
Matrix.hpp
  dMatrix, 16
  fMatrix, 16
  iMatrix, 16
  operator∗, 17
  operator+, 18
  operator-, 18
  operator/, 19

operator∗
  Matrix.hpp, 17
operator∗=
  math::Matrix, 9
operator+
  Matrix.hpp, 18
operator+=
  math::Matrix, 10
operator-
  Matrix.hpp, 18
operator-=
  math::Matrix, 10
operator/
  Matrix.hpp, 19
operator/=
  math::Matrix, 11
operator=
  math::Matrix, 11

rows
  math::Matrix, 12

set
  math::Matrix, 12
shape
  math::Matrix, 12
size
  math::Matrix, 13

typedefs.h
  uint, 20
  ul, 21
  ull, 21

uint
  typedefs.h, 20
ul
  typedefs.h, 21
ull
  typedefs.h, 21