Documentation for _vec3 Class and Unit Tests

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Chapter 1

Hierarchical Index

1.1 Class Hierarchy

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

Chapter 2

Class Index

2.1 Class List

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

Chapter 3

File Index

3.1 File List

Here is a list of all files with brief descriptions:

Chapter 4

Class Documentation

4.1 _vec3< T > Class Template Reference

```
#include <Vec.h>
```

Public Member Functions

- _vec3 ()
- _vec3 (T a, T b, T c)
- T & operator[ ] (int i)
- T operator[ ] (int i) const

Protected Attributes

- T d [3]

Friends

- _vec3< T > operator+ (const _vec3< T > &a, const _vec3< T > &b)
- _vec3< T > operator- (const _vec3< T > &a, const _vec3< T > &b)
- T dot (const _vec3< T > &a, const _vec3< T > &b)
- double mag (const _vec3< T > &a)
- std::ostream & operator<< (std::ostream &out, const _vec3< T > &a)

4.1.1 Detailed Description

template<typename T>
class _vec3< T >

A class for creating a generic three-dimensional vector of type T. Includes operator overloading (for +, -, [], and <<) so that vector operations can be performed.

4.1.2 Constructor & Destructor Documentation

4.1.2.1 _vec3() [1/2]

```
template<typename T >
_vec3< T >::_vec3 ( ) [inline]
```

Constructor

4.1.2.2 _vec3() [2/2]

```
template<typename T >
_vec3< T >::_vec3 (
             T a,
             T b,
             T c ) [inline]
```

Destructor

4.1.3 Member Function Documentation

4.1.3.1 operator[]() [1/2]

```
template<typename T >
T & _vec3< T >::operator[] (
             int i ) [inline]
```

Operator for assigning a value to a component of the vector.

Parameters

in	*i*	The index of the component to be accessed.

Returns

Reference to the i-th component of the vector.

4.1.3.2 operator[]() [2/2]

```
template<typename T >
T _vec3< T >::operator[] (
             int i ) const [inline]
```

Operator for reading a component of the vector.

Parameters

in	*i*	The index of the component to be accessed.

Returns

The i-th component of the vector.

4.1.4 Friends And Related Function Documentation

4.1.4.1 dot

```
template<typename T >
T dot (
            const _vec3< T > & a,
            const _vec3< T > & b )  [friend]
```

Performs dot product of two vectors.

Parameters

in	*a*	Vector to be dotted.
in	*b*	Vector to be dotted.

Returns

$a \cdot b$

4.1.4.2 mag

```
template<typename T >
double mag (
            const _vec3< T > & a )  [friend]
```

Computes magnitude of a vector.

Parameters

in	*a*	Vector with unknown magnitude.

Returns

$\sqrt{a \cdot b}$

4.1.4.3 operator+

```
template<typename T >
_vec3< T > operator+ (
            const _vec3< T > & a,
            const _vec3< T > & b )  [friend]
```

Operator for adding two vectors together.

Parameters

in	*a*	Vector to be added.
in	*b*	Vector to be added.

Returns

$a + b$

4.1.4.4 operator-

```
template<typename T >
_vec3< T > operator- (
            const _vec3< T > & a,
            const _vec3< T > & b )  [friend]
```

Operator for subtracting one vector from another.

Parameters

in	*a*	Vector to be subtracted from.
in	*b*	Vector to be subtracted.

Returns

$a - b$

4.1.4.5 operator<<

```
template<typename T >
std::ostream & operator<< (
            std::ostream & out,
            const _vec3< T > & a )  [friend]
```

Operator for outputting vector components to a stream.

Parameters

in	*out*	Output stream object.
in	*a*	Vector to be outputted to stream.

Returns

Output stream object, so that operator can be used several times in a row.

4.1.5 Member Data Documentation

4.1.5.1 d

```
template<typename T >
T _vec3< T >::d[3]  [protected]
```

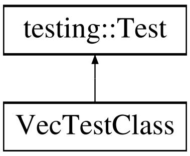
The documentation for this class was generated from the following file:

- Vec.h

4.2 VecTestClass Class Reference

This is a test class.

Inheritance diagram for VecTestClass:



Protected Member Functions

- VecTestClass ()
- ∼VecTestClass () override
- void SetUp () override
- void TearDown () override

Protected Attributes

- double3 a
- double3 b
- bool sub_matches = false
- bool add_matches = false

4.2.1 Detailed Description

This is a test class.

It will be used to test the addition and subtraction operators of the _vec3<double> class. GTest will automatically call the constructor and the SetUp function prior to each test, and TearDown and the destructor afterwards.

4.2.2 Constructor & Destructor Documentation

4.2.2.1 VecTestClass()

```
VecTestClass::VecTestClass ( )  [inline], [protected]
```

Constructor

4.2.2.2 ∼VecTestClass()

```
VecTestClass::∼VecTestClass ( )  [inline], [override], [protected]
```

Destructor

4.2.3 Member Function Documentation

4.2.3.1 SetUp()

```
void VecTestClass::SetUp ( )  [inline], [override], [protected]
```

Performs addition/subtraction of double3 objects, and compares with the direct addition/subtraction of double3 elements.

4.2.3.2 TearDown()

```
void VecTestClass::TearDown ( )  [inline], [override], [protected]
```

Optional code to call after each test prior to destructor.

4.2.4 Member Data Documentation

4.2.4.1 a

```
double3 VecTestClass::a  [protected]
```

This is a vec3_ object, as defined in Vec.h, and it uses double as template

4.2.4.2 add_matches

```
bool VecTestClass::add_matches = false  [protected]
```

Does the addition result match our expectation?

4.2.4.3 b

```
double3 VecTestClass::b  [protected]
```

This is a vec3_ object, as defined in Vec.h, and it uses double as template

4.2.4.4 sub_matches

```
bool VecTestClass::sub_matches = false  [protected]
```

Does the subtraction result match our expectation?

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

- Vec_tests.cpp

Chapter 5

File Documentation

5.1 Vec.h File Reference

```
#include <ostream>
#include <math.h>
```

Classes

- class _vec3< T >

Typedefs

- using double3 = _vec3< double >

5.1.1 Typedef Documentation

5.1.1.1 double3

```
using double3 = _vec3<double>
```

5.2 Vec.h

Go to the documentation of this file.

```
#ifndef _VEC_H
#define _VEC_H
#include <ostream>
#include <math.h>

template<typename T>
class _vec3{
public:

    _vec3<T>(): d{0,0,0} {}

    _vec3<T>(T a, T b, T c) : d{a,b,c} {}

    T& operator[] (int i) {return d[i];}

    T operator[] (int i) const {return d[i];}

    friend _vec3<T> operator+(const _vec3<T>&a, const _vec3<T>&b) {
        return _vec3<T>(a[0]+b[0],a[1]+b[1],a[2]+b[2]);
    }

    friend _vec3<T> operator-(const _vec3<T>&a, const _vec3<T>&b) {
        return _vec3<T>(a[0]-b[0],a[1]-b[1],a[2]-b[2]);
    }

    friend T dot(const _vec3<T>&a, const _vec3<T>&b)  {
        return a[0]*b[0]+a[1]*b[1]+a[2]*b[2];
    }

    friend double mag(const _vec3<T>&a) {return sqrt(dot(a,a));}

    friend std::ostream& operator«(std::ostream &out, const _vec3<T>&a) {
       out«a[0]«" "«a[1]«" "«a[2]; return out;
    }

protected:
    T d[3]; };

using double3 = _vec3<double>;

#endif
```

5.3 Vec_tests.cpp File Reference

```
#include "gtest/gtest.h"
#include <iostream>
#include "Vec.h"
```

Classes

- class VecTestClass

  This is a test class.

Functions

- TEST (VecTest, VecDot)

  Tests the dot() function of the _vec3 class.
- TEST_F (VecTestClass, VecAdd)
- TEST_F (VecTestClass, VecSub)
- int main (int argc, char **argv)

5.3.1 Function Documentation

5.3.1.1 main()

```
int main (
            int argc,
            char ** argv )
```

Runs several unit tests through GTest

Parameters

in	*argc*	Argument count - number of inputs to command line at runtime
in	*argv*	Argument vector - an array of character pointers listing all command line arguments

Returns

A call to run all GTest tests

5.3.1.2 TEST()

```
TEST (
            VecTest ,
            VecDot  )
```

Tests the dot() function of the _vec3 class.

5.3.1.3 TEST_F() [1/2]

```
TEST_F (
            VecTestClass ,
            VecAdd  )
```

Uses the VecTestClass class to test the + operator of the _vec3 class

Parameters

in	*VectTestClass*	Class for testing the _vec3 class

5.3.1.4 TEST_F() [2/2]

```
TEST_F (
            VecTestClass ,
            VecSub  )
```

Uses the VecTestClass class to test the - operator of the _vec3 class

Parameters

in	*VectTestClass*	Class for testing the _vec3 class

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