

# Raytracer Project

0.1

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# Chapter 1

## Namespace Index

### 1.1 Namespace List

Here is a list of all namespaces with brief descriptions:

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## Chapter 2

# Hierarchical Index

### 2.1 Class Hierarchy

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

raytracer::Camera . . . . .	15
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## Chapter 3

# Class Index

### 3.1 Class List

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

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<a href="#">raytracer::Camera</a>	15
<a href="#">raytracer::Color</a>	17
<a href="#">raytracer::Cube</a>	20
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## Chapter 4

# File Index

### 4.1 File List

Here is a list of all files with brief descriptions:

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src/utils.cc	65
src/vect.cc	65



## Chapter 5

# Namespace Documentation

### 5.1 raytracer Namespace Reference

#### Classes

- class [AmbientLight](#)
- class [Camera](#)
- class [Color](#)
- class [Cube](#)
- class [DirectionalLight](#)
- class [FlatShapable](#)
- class [Landmark](#)
- class [Lightable](#)
- class [Plan](#)
- class [PointLight](#)
- class [Ray](#)
- class [Screen](#)
- class [Shapable](#)
- class [Square](#)
- class [Vect2](#)
- class [Vect3](#)

#### Functions

- [Color operator\\*](#) (const float num, const [Color](#) &color)
- void [rotateX](#) ([Vect3](#) &vect, const float angle)
- void [rotateY](#) ([Vect3](#) &vect, const float angle)
- void [rotateZ](#) ([Vect3](#) &vect, const float angle)
- [Vect3 applyAngle](#) ([Vect3](#) &vect, const [Vect3](#) &angles)
- [Vect3 vectorFromAngles](#) (const [Vect3](#) &angles)
- [Vect3 getAngles](#) (const [Vect3](#) &v1, const [Vect3](#) &v2)
- [Vect3 vectorFromPoints](#) (const [Vect3](#) &v1, const [Vect3](#) &v2)
- std::vector< [Ray](#) > [genRays](#) (const [Camera](#) &cam, const [Screen](#) &screen)
- int [closerToOrigin](#) ([Vect3](#) origin, [Vect3](#) point1, [Vect3](#) point2)
- std::vector< [Color](#) > [renderFrame](#) (const std::vector< [Shapable](#) \*> &objects, const std::vector< [Ray](#) > &rays, const std::vector< [Lightable](#) \*> &lightList)
- [Vect3 operator\\*](#) (const float num, const [Vect3](#) &vect)  
*Overload of the product multiplication between a float and a vector.*
- [Vect2 operator\\*](#) (const float num, const [Vect2](#) &vect)

## Variables

- const float `pi` = `std::acos(-1)`

## 5.1.1 Function Documentation

### 5.1.1.1 `applyAngle()`

```
raytracer::Vect3 raytracer::applyAngle (
    raytracer::Vect3 & vect,
    const Vect3 & angles )
```

### 5.1.1.2 `closerToOrigin()`

```
int raytracer::closerToOrigin (
    raytracer::Vect3 origin,
    raytracer::Vect3 point1,
    raytracer::Vect3 point2 )
```

### 5.1.1.3 `genRays()`

```
std::vector< raytracer::Ray > raytracer::genRays (
    const Camera & cam,
    const Screen & screen )
```

### 5.1.1.4 `getAngles()`

```
raytracer::Vect3 raytracer::getAngles (
    const Vect3 & v1,
    const Vect3 & v2 )
```

### 5.1.1.5 `operator*()` [1/3]

```
raytracer::Color raytracer::operator* (
    const float num,
    const Color & color )
```

### 5.1.1.6 `operator*()` [2/3]

```
raytracer::Vect3 raytracer::operator* (
    const float num,
    const Vect3 & vect )
```

Overload of the product multiplication between a float and a vector.

## Parameters

<i>num</i>	the float to multiply with the vector.
<i>vect</i>	the vector to multiply with the float.

## Returns

A new vector.

## 5.1.1.7 operator\*() [3/3]

```
raytracer::Vect2 raytracer::operator* (
    const float num,
    const Vect2 & vect )
```

## 5.1.1.8 renderFrame()

```
std::vector< raytracer::Color > raytracer::renderFrame (
    const std::vector< Shapable *> & objects,
    const std::vector< Ray > & rays,
    const std::vector< Lightable *> & lightList )
```

## 5.1.1.9 rotateX()

```
void raytracer::rotateX (
    raytracer::Vect3 & vect,
    const float angle )
```

## 5.1.1.10 rotateY()

```
void raytracer::rotateY (
    raytracer::Vect3 & vect,
    const float angle )
```

#### 5.1.1.11 rotateZ()

```
void raytracer::rotateZ (
    raytracer::Vect3 & vect,
    const float angle )
```

#### 5.1.1.12 vectorFromAngles()

```
raytracer::Vect3 raytracer::vectorFromAngles (
    const Vect3 & angles )
```

#### 5.1.1.13 vectorFromPoints()

```
raytracer::Vect3 raytracer::vectorFromPoints (
    const Vect3 & v1,
    const Vect3 & v2 )
```

### 5.1.2 Variable Documentation

#### 5.1.2.1 pi

```
const float raytracer::pi = std::acos(-1)
```



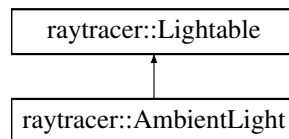
## Chapter 6

# Class Documentation

### 6.1 raytracer::AmbientLight Class Reference

```
#include <ambientlight.hh>
```

Inheritance diagram for raytracer::AmbientLight:



#### Public Member Functions

- `AmbientLight` (const `Color` &color, const float brightness)
- `Color getColor` () const
- float `getBrightness` () const
- void `setColor` (const `Color` &color)
- void `setBrightness` (const float brightness)
- virtual `Color interact` (const std::vector< `Shapable` \*> &obj, const `Vect3` &point, const `FlatShapable` &) const override

#### Private Attributes

- `Color color_`
- float `brightness_`

#### 6.1.1 Constructor & Destructor Documentation

#### 6.1.1.1 AmbientLight()

```
raytracer::AmbientLight::AmbientLight (
    const Color & color,
    const float brightness )
```

### 6.1.2 Member Function Documentation

#### 6.1.2.1 getBrightness()

```
float raytracer::AmbientLight::getBrightness ( ) const
```

#### 6.1.2.2 getColor()

```
raytracer::Color raytracer::AmbientLight::getColor ( ) const
```

#### 6.1.2.3 interact()

```
raytracer::Color raytracer::AmbientLight::interact (
    const std::vector< Shapable *> & obj,
    const Vect3 & point,
    const FlatShapable & obj ) const [override], [virtual]
```

Implements [raytracer::Lightable](#).

#### 6.1.2.4 setBrightness()

```
void raytracer::AmbientLight::setBrightness (
    const float brightness )
```

#### 6.1.2.5 setColor()

```
void raytracer::AmbientLight::setColor (
    const Color & color )
```

### 6.1.3 Member Data Documentation

#### 6.1.3.1 brightness\_

```
float raytracer::AmbientLight::brightness_ [private]
```

#### 6.1.3.2 color\_

```
Color raytracer::AmbientLight::color_ [private]
```

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

- includes/ambientlight.hh
- src/ambientlight.cc

## 6.2 raytracer::Camera Class Reference

```
#include <camera.hh>
```

### Public Member Functions

- [Camera](#) ()
- [Camera](#) ([Vect3](#) pos, [Vect3](#) angleVect, float viewAngle)
- [Vect3](#) [getPos](#) () const
- [Vect3](#) [getAng](#) () const
- float [getViewAngle](#) () const

### Private Attributes

- [Vect3](#) [pos\\_](#)
- [Vect3](#) [angleVect\\_](#)
- float [viewAngle\\_](#)

### 6.2.1 Constructor & Destructor Documentation

#### 6.2.1.1 [Camera\(\)](#) [1/2]

```
raytracer::Camera::Camera ( )
```

### 6.2.1.2 Camera() [2/2]

```
raytracer::Camera::Camera (
    raytracer::Vect3 pos,
    raytracer::Vect3 angleVect,
    float viewAngle = raytracer::pi / 2 )
```

## 6.2.2 Member Function Documentation

### 6.2.2.1 getAng()

```
raytracer::Vect3 raytracer::Camera::getAng ( ) const
```

### 6.2.2.2 getPos()

```
raytracer::Vect3 raytracer::Camera::getPos ( ) const
```

### 6.2.2.3 getViewAngle()

```
float raytracer::Camera::getViewAngle ( ) const
```

## 6.2.3 Member Data Documentation

### 6.2.3.1 angleVect\_

```
Vect3 raytracer::Camera::angleVect_ [private]
```

### 6.2.3.2 pos\_

```
Vect3 raytracer::Camera::pos_ [private]
```

### 6.2.3.3 viewAngle\_

```
float raytracer::Camera::viewAngle_ [private]
```

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

- includes/camera.hh
- src/camera.cc

## 6.3 raytracer::Color Class Reference

```
#include <color.hh>
```

### Public Member Functions

- [Color](#) ()
- [Color](#) (const float r, const float g, const float b)
- float [getR](#) () const
- float [getG](#) () const
- float [getB](#) () const
- void [setR](#) (const float v)
- void [setG](#) (const float v)
- void [setB](#) (const float v)
- void [normalize](#) ()
- [Color operator+](#) (const [Color](#) &other) const
- [Color operator+=](#) (const [Color](#) &other)
- [Color operator-](#) (const [Color](#) &other) const
- [Color operator\\*](#) (const float other) const
- [Color operator\\*](#) (const [Color](#) &other) const

### Private Attributes

- float [r\\_](#)
- float [g\\_](#)
- float [b\\_](#)

### Friends

- [Color operator\\*](#) (const float num, const [Color](#) &color)

### 6.3.1 Constructor & Destructor Documentation

#### 6.3.1.1 Color() [1/2]

```
raytracer::Color::Color ( )
```

#### 6.3.1.2 Color() [2/2]

```
raytracer::Color::Color (
    const float r,
    const float g,
    const float b )
```

### 6.3.2 Member Function Documentation

#### 6.3.2.1 getB()

```
float raytracer::Color::getB ( ) const
```

#### 6.3.2.2 getG()

```
float raytracer::Color::getG ( ) const
```

#### 6.3.2.3 getR()

```
float raytracer::Color::getR ( ) const
```

#### 6.3.2.4 normalize()

```
void raytracer::Color::normalize ( )
```

#### 6.3.2.5 operator\*() [1/2]

```
raytracer::Color raytracer::Color::operator* (
    const float other ) const
```

#### 6.3.2.6 operator\*() [2/2]

```
raytracer::Color raytracer::Color::operator* (
    const Color & other ) const
```

#### 6.3.2.7 operator+()

```
raytracer::Color raytracer::Color::operator+ (
    const Color & other ) const
```

#### 6.3.2.8 operator+=()

```
raytracer::Color raytracer::Color::operator+= (
    const Color & other )
```

#### 6.3.2.9 operator-()

```
raytracer::Color raytracer::Color::operator- (
    const Color & other ) const
```

#### 6.3.2.10 setB()

```
void raytracer::Color::setB (
    const float v )
```

#### 6.3.2.11 setG()

```
void raytracer::Color::setG (
    const float v )
```

#### 6.3.2.12 setR()

```
void raytracer::Color::setR (
    const float v )
```

### 6.3.3 Friends And Related Function Documentation

#### 6.3.3.1 operator\*

```
Color operator* (
    const float num,
    const Color & color ) [friend]
```

### 6.3.4 Member Data Documentation

#### 6.3.4.1 b\_

```
float raytracer::Color::b_ [private]
```

#### 6.3.4.2 g\_

```
float raytracer::Color::g_ [private]
```

#### 6.3.4.3 r\_

```
float raytracer::Color::r_ [private]
```

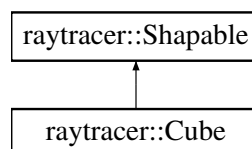
The documentation for this class was generated from the following files:

- includes/[color.hh](#)
- src/[color.cc](#)

## 6.4 raytracer::Cube Class Reference

```
#include <cube.hh>
```

Inheritance diagram for raytracer::Cube:





## Public Member Functions

- [Cube](#) (const [Vect3](#) &center, const float side, const [Vect3](#) &angles, const [Color](#) &color)
- [Vect3](#) [getCenter](#) () const
- float [getSide](#) () const
- [Vect3](#) [getAngles](#) () const
- [Landmark](#) [getLandmark](#) () const
- [Color](#) [getColor](#) () const
- virtual std::optional< std::tuple< [Vect3](#), [FlatShapable](#) \* > > [intersecte](#) (const [Ray](#) &ray) override

## Private Attributes

- [Vect3](#) [center\\_](#)
- float [side\\_](#)
- [Vect3](#) [angles\\_](#)
- [Landmark](#) [landmark\\_](#)
- std::vector< [Square](#) > [squares\\_](#)

### 6.4.1 Constructor & Destructor Documentation

#### 6.4.1.1 Cube()

```
raytracer::Cube::Cube (
    const Vect3 & center,
    const float side,
    const Vect3 & angles,
    const Color & color )
```

### 6.4.2 Member Function Documentation

#### 6.4.2.1 getAngles()

```
raytracer::Vect3 raytracer::Cube::getAngles ( ) const
```

#### 6.4.2.2 getCenter()

```
raytracer::Vect3 raytracer::Cube::getCenter ( ) const
```

#### 6.4.2.3 getColor()

```
raytracer::Color raytracer::Cube::getColor ( ) const [virtual]
```

Implements [raytracer::Shapable](#).

#### 6.4.2.4 getLandmark()

```
raytracer::Landmark raytracer::Cube::getLandmark ( ) const
```

#### 6.4.2.5 getSide()

```
float raytracer::Cube::getSide ( ) const
```

#### 6.4.2.6 intersecte()

```
std::optional< std::tuple< raytracer::Vect3, raytracer::FlatShapable * > > raytracer::Cube↵  
::intersecte (   
    const Ray & ray ) [override], [virtual]
```

Implements [raytracer::Shapable](#).

### 6.4.3 Member Data Documentation

#### 6.4.3.1 angles\_

```
Vect3 raytracer::Cube::angles_ [private]
```

#### 6.4.3.2 center\_

```
Vect3 raytracer::Cube::center_ [private]
```

## 6.4.3.3 landmark\_

```
Landmark raytracer::Cube::landmark_ [private]
```

## 6.4.3.4 side\_

```
float raytracer::Cube::side_ [private]
```

## 6.4.3.5 squares\_

```
std::vector<Square> raytracer::Cube::squares_ [private]
```

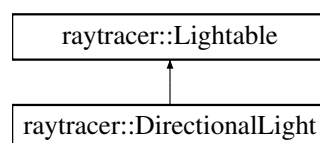
The documentation for this class was generated from the following files:

- includes/cube.hh
- src/cube.cc

## 6.5 raytracer::DirectionalLight Class Reference

```
#include <dirlight.hh>
```

Inheritance diagram for raytracer::DirectionalLight:



### Public Member Functions

- **DirectionalLight** (const **Vect3** &dir, const **Color** &color, const float brightness)
- **Vect3** getDir () const
- **Color** getColor () const
- float getBrightness () const
- void setDir (const **Vect3** &dir)
- void setColor (const **Color** &color)
- void setBrightness (const float brightness)
- virtual **Color** interact (const std::vector< **Shapable** \*> &obj, const **Vect3** &point, const **FlatShapable** &) const override

## Private Attributes

- [Vect3](#) `dir_`
- [Color](#) `color_`
- float `brightness_`

## 6.5.1 Constructor & Destructor Documentation

### 6.5.1.1 DirectionalLight()

```
raytracer::DirectionalLight::DirectionalLight (
    const Vect3 & dir,
    const Color & color,
    const float brightness )
```

## 6.5.2 Member Function Documentation

### 6.5.2.1 getBrightness()

```
float raytracer::DirectionalLight::getBrightness ( ) const
```

### 6.5.2.2 getColor()

```
raytracer::Color raytracer::DirectionalLight::getColor ( ) const
```

### 6.5.2.3 getDir()

```
raytracer::Vect3 raytracer::DirectionalLight::getDir ( ) const
```

### 6.5.2.4 interact()

```
raytracer::Color raytracer::DirectionalLight::interact (
    const std::vector< Shapable *> & obj,
    const Vect3 & point,
    const FlatShapable & ) const [override], [virtual]
```

Implements [raytracer::Lightable](#).

#### 6.5.2.5 setBrightness()

```
void raytracer::DirectionalLight::setBrightness (
    const float brightness )
```

#### 6.5.2.6 setColor()

```
void raytracer::DirectionalLight::setColor (
    const Color & color )
```

#### 6.5.2.7 setDir()

```
void raytracer::DirectionalLight::setDir (
    const Vect3 & dir )
```

### 6.5.3 Member Data Documentation

#### 6.5.3.1 brightness\_

```
float raytracer::DirectionalLight::brightness_ [private]
```

#### 6.5.3.2 color\_

```
Color raytracer::DirectionalLight::color_ [private]
```

#### 6.5.3.3 dir\_

```
Vect3 raytracer::DirectionalLight::dir_ [private]
```

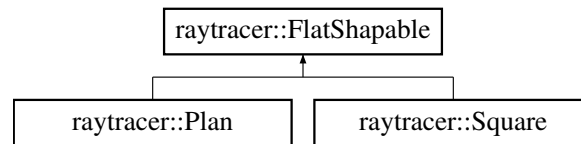
The documentation for this class was generated from the following files:

- [includes/dirlight.hh](#)
- [src/dirlight.cc](#)

## 6.6 raytracer::FlatShapable Class Reference

```
#include <flatshapable.hh>
```

Inheritance diagram for raytracer::FlatShapable:



### Public Member Functions

- virtual [Color](#) [getColor](#) () const =0
- virtual std::optional< std::tuple< [Vect3](#), [FlatShapable](#) \* > > [intersecte](#) (const [Ray](#) &ray)=0

### 6.6.1 Member Function Documentation

#### 6.6.1.1 getColor()

```
virtual Color raytracer::FlatShapable::getColor ( ) const [pure virtual]
```

Implemented in [raytracer::Square](#), and [raytracer::Plan](#).

#### 6.6.1.2 intersecte()

```
virtual std::optional<std::tuple<Vect3, FlatShapable* > > raytracer::FlatShapable::intersecte
(
    const Ray & ray ) [pure virtual]
```

Implemented in [raytracer::Square](#), and [raytracer::Plan](#).

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

- [includes/flatshapable.hh](#)

## 6.7 raytracer::Landmark Class Reference

```
#include <landmark.hh>
```

## Public Member Functions

- [Landmark](#) ()
- [Landmark](#) (const [Vect3](#) &o, const [Vect3](#) &x, const [Vect3](#) &y, const [Vect3](#) &z)
- [Vect3](#) getO () const
- [Vect3](#) getX () const
- [Vect3](#) getY () const
- [Vect3](#) getZ () const
- [Vect3](#) transposePoint (const [Vect3](#) &point) const
- [Vect3](#) transposeVect (const [Vect3](#) &vect) const

## Private Attributes

- [Vect3](#) o\_
- [Vect3](#) x\_
- [Vect3](#) y\_
- [Vect3](#) z\_

## 6.7.1 Constructor & Destructor Documentation

### 6.7.1.1 [Landmark\(\)](#) [1/2]

```
raytracer::Landmark::Landmark ( )
```

### 6.7.1.2 [Landmark\(\)](#) [2/2]

```
raytracer::Landmark::Landmark (
    const Vect3 & o,
    const Vect3 & x,
    const Vect3 & y,
    const Vect3 & z )
```

## 6.7.2 Member Function Documentation

### 6.7.2.1 [getO\(\)](#)

```
raytracer::Vect3 raytracer::Landmark::getO ( ) const
```

#### 6.7.2.2 getX()

```
raytracer::Vect3 raytracer::Landmark::getX ( ) const
```

#### 6.7.2.3 getY()

```
raytracer::Vect3 raytracer::Landmark::getY ( ) const
```

#### 6.7.2.4 getZ()

```
raytracer::Vect3 raytracer::Landmark::getZ ( ) const
```

#### 6.7.2.5 transposePoint()

```
raytracer::Vect3 raytracer::Landmark::transposePoint (
    const Vect3 & point ) const
```

#### 6.7.2.6 transposeVect()

```
raytracer::Vect3 raytracer::Landmark::transposeVect (
    const Vect3 & vect ) const
```

### 6.7.3 Member Data Documentation

#### 6.7.3.1 o\_

```
Vect3 raytracer::Landmark::o_ [private]
```

#### 6.7.3.2 x\_

```
Vect3 raytracer::Landmark::x_ [private]
```



6.7.3.3 `y_`

```
Vect3 raytracer::Landmark::y_ [private]
```

6.7.3.4 `z_`

```
Vect3 raytracer::Landmark::z_ [private]
```

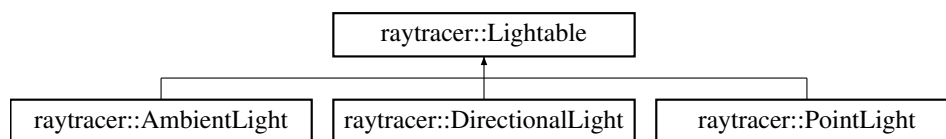
The documentation for this class was generated from the following files:

- includes/[landmark.hh](#)
- src/[landmark.cc](#)

## 6.8 raytracer::Lightable Class Reference

```
#include <lightable.hh>
```

Inheritance diagram for raytracer::Lightable:



### Public Member Functions

- [Color](#) [getColor](#) () const
- float [getBrightness](#) () const
- void [setColor](#) (const [Color](#) &color)
- void [setBrightness](#) (const float brightness)
- virtual [Color](#) [interact](#) (const std::vector< [Shapable](#) \*> &obj, const [Vect3](#) &point, const [FlatShapable](#) &) const =0

### 6.8.1 Member Function Documentation

#### 6.8.1.1 [getBrightness\(\)](#)

```
float raytracer::Lightable::getBrightness ( ) const
```

### 6.8.1.2 getColor()

```
Color raytracer::Lightable::getColor ( ) const
```

### 6.8.1.3 interact()

```
virtual Color raytracer::Lightable::interact (
    const std::vector< Shapable *> & obj,
    const Vect3 & point,
    const FlatShapable & ) const [pure virtual]
```

Implemented in [raytracer::DirectionalLight](#), [raytracer::PointLight](#), and [raytracer::AmbientLight](#).

### 6.8.1.4 setBrightness()

```
void raytracer::Lightable::setBrightness (
    const float brightness )
```

### 6.8.1.5 setColor()

```
void raytracer::Lightable::setColor (
    const Color & color )
```

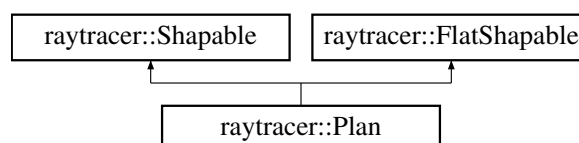
The documentation for this class was generated from the following file:

- [includes/lightable.hh](#)

## 6.9 raytracer::Plan Class Reference

```
#include <plan.hh>
```

Inheritance diagram for raytracer::Plan:



## Public Member Functions

- [Plan](#) ()
- [Plan](#) (const [Plan](#) &p)
- [Plan](#) (const [Vect3](#) &norm, const [Vect3](#) &point, const [Color](#) &color)
- [Vect3](#) [getNorm](#) () const
- float [getD](#) () const
- [Color](#) [getColor](#) () const override
- void [setColor](#) (const [Color](#) &color)
- std::optional< std::tuple< [Vect3](#), [FlatShapable](#) \* > > [intersecte](#) (const [Ray](#) &ray) override

## Private Attributes

- float [d\\_](#)
- [Vect3](#) [norm\\_](#)
- [Color](#) [color\\_](#)

## 6.9.1 Constructor & Destructor Documentation

### 6.9.1.1 Plan() [1/3]

```
raytracer::Plan::Plan ( )
```

### 6.9.1.2 Plan() [2/3]

```
raytracer::Plan::Plan (
    const Plan & p )
```

### 6.9.1.3 Plan() [3/3]

```
raytracer::Plan::Plan (
    const Vect3 & norm,
    const Vect3 & point,
    const Color & color )
```

## 6.9.2 Member Function Documentation

#### 6.9.2.1 getColor()

```
raytracer::Color raytracer::Plan::getColor ( ) const [override], [virtual]
```

Implements [raytracer::FlatShapable](#).

#### 6.9.2.2 getD()

```
float raytracer::Plan::getD ( ) const
```

#### 6.9.2.3 getNorm()

```
raytracer::Vect3 raytracer::Plan::getNorm ( ) const
```

#### 6.9.2.4 intersecte()

```
std::optional< std::tuple< raytracer::Vect3, raytracer::FlatShapable * > > raytracer::Plan↵  
::intersecte (   
    const Ray & ray ) [override], [virtual]
```

Implements [raytracer::FlatShapable](#).

#### 6.9.2.5 setColor()

```
void raytracer::Plan::setColor (   
    const Color & color )
```

### 6.9.3 Member Data Documentation

#### 6.9.3.1 color\_

```
Color raytracer::Plan::color_ [private]
```

## 6.9.3.2 d\_

```
float raytracer::Plan::d_ [private]
```

## 6.9.3.3 norm\_

```
Vect3 raytracer::Plan::norm_ [private]
```

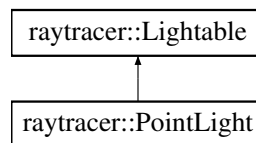
The documentation for this class was generated from the following files:

- includes/[plan.hh](#)
- src/[plan.cc](#)

## 6.10 raytracer::PointLight Class Reference

```
#include <pointlight.hh>
```

Inheritance diagram for raytracer::PointLight:



## Public Member Functions

- [PointLight](#) (const [Vect3](#) &pos, const [Color](#) &color, const float brightness)
- [Vect3 getPos](#) () const
- [Color getColor](#) () const
- float [getBrightness](#) () const
- void [setPos](#) (const [Vect3](#) &pos)
- void [setColor](#) (const [Color](#) &color)
- void [setBrightness](#) (const float brightness)
- virtual [Color interact](#) (const std::vector< [Shapable](#) \*> &obj, const [Vect3](#) &point, const [FlatShapable](#) &) const override

## Private Attributes

- [Vect3 pos\\_](#)
- [Color color\\_](#)
- float [brightness\\_](#)

## 6.10.1 Constructor &amp; Destructor Documentation

### 6.10.1.1 PointLight()

```
raytracer::PointLight::PointLight (
    const Vect3 & pos,
    const Color & color,
    const float brightness )
```

## 6.10.2 Member Function Documentation

### 6.10.2.1 getBrightness()

```
float raytracer::PointLight::getBrightness ( ) const
```

### 6.10.2.2 getColor()

```
raytracer::Color raytracer::PointLight::getColor ( ) const
```

### 6.10.2.3 getPos()

```
raytracer::Vect3 raytracer::PointLight::getPos ( ) const
```

### 6.10.2.4 interact()

```
raytracer::Color raytracer::PointLight::interact (
    const std::vector< Shapable *> & obj,
    const Vect3 & point,
    const FlatShapable & obj ) const [override], [virtual]
```

Implements [raytracer::Lightable](#).

### 6.10.2.5 setBrightness()

```
void raytracer::PointLight::setBrightness (
    const float brightness )
```

#### 6.10.2.6 setColor()

```
void raytracer::PointLight::setColor (
    const Color & color )
```

#### 6.10.2.7 setPos()

```
void raytracer::PointLight::setPos (
    const Vect3 & pos )
```

### 6.10.3 Member Data Documentation

#### 6.10.3.1 brightness\_

```
float raytracer::PointLight::brightness_ [private]
```

#### 6.10.3.2 color\_

```
Color raytracer::PointLight::color_ [private]
```

#### 6.10.3.3 pos\_

```
Vect3 raytracer::PointLight::pos_ [private]
```

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

- [includes/pointlight.hh](#)
- [src/pointlight.cc](#)

## 6.11 raytracer::Ray Class Reference

```
#include <ray.hh>
```

## Public Member Functions

- [Ray](#) (const [Vect3](#) &origin, const [Vect3](#) &vect)
- [Vect3 getOrigin](#) () const
- [Vect3 getVect](#) () const
- bool [colidesBefore](#) (const std::vector< [Shapable](#) \*> &objects, const float dist) const
- bool [colides](#) (const std::vector< [Shapable](#) \*> &objects) const

## Private Attributes

- [Vect3 origin\\_](#)
- [Vect3 vect\\_](#)

## 6.11.1 Constructor & Destructor Documentation

### 6.11.1.1 Ray()

```
raytracer::Ray::Ray (  
    const Vect3 & origin,  
    const Vect3 & vect )
```

## 6.11.2 Member Function Documentation

### 6.11.2.1 colides()

```
bool raytracer::Ray::colides (  
    const std::vector< Shapable *> & objects ) const
```

### 6.11.2.2 colidesBefore()

```
bool raytracer::Ray::colidesBefore (  
    const std::vector< Shapable *> & objects,  
    const float dist ) const
```

### 6.11.2.3 getOrigin()

```
raytracer::Vect3 raytracer::Ray::getOrigin ( ) const
```



#### 6.11.2.4 getVect()

```
raytracer::Vect3 raytracer::Ray::getVect ( ) const
```

### 6.11.3 Member Data Documentation

#### 6.11.3.1 origin\_

```
Vect3 raytracer::Ray::origin_ [private]
```

#### 6.11.3.2 vect\_

```
Vect3 raytracer::Ray::vect_ [private]
```

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

- [includes/ray.hh](#)
- [src/ray.cc](#)

## 6.12 raytracer::Screen Class Reference

```
#include <screen.hh>
```

### Public Member Functions

- [Screen](#) (const [Camera](#) &camera, float width, float height)
- float [getWidth](#) () const
- float [getHeight](#) () const
- float [getPixelSize](#) () const
- [Vect3](#) [getCenter](#) () const
- [Vect3](#) [getI](#) () const
- [Vect3](#) [getJ](#) () const

### Private Attributes

- float [width\\_](#)
- float [height\\_](#)
- float [pixelSize\\_](#)
- [Vect3](#) [center\\_](#)
- [Vect3](#) [i\\_](#)
- [Vect3](#) [j\\_](#)

## 6.12.1 Constructor & Destructor Documentation

### 6.12.1.1 Screen()

```
raytracer::Screen::Screen (
    const Camera & camera,
    float width,
    float height )
```

## 6.12.2 Member Function Documentation

### 6.12.2.1 getCenter()

```
raytracer::Vect3 raytracer::Screen::getCenter ( ) const
```

### 6.12.2.2 getHeight()

```
float raytracer::Screen::getHeight ( ) const
```

### 6.12.2.3 getI()

```
raytracer::Vect3 raytracer::Screen::getI ( ) const
```

### 6.12.2.4 getJ()

```
raytracer::Vect3 raytracer::Screen::getJ ( ) const
```

### 6.12.2.5 getPixelSize()

```
float raytracer::Screen::getPixelSize ( ) const
```

#### 6.12.2.6 getWidth()

```
float raytracer::Screen::getWidth ( ) const
```

### 6.12.3 Member Data Documentation

#### 6.12.3.1 center\_

```
Vect3 raytracer::Screen::center_ [private]
```

#### 6.12.3.2 height\_

```
float raytracer::Screen::height_ [private]
```

#### 6.12.3.3 i\_

```
Vect3 raytracer::Screen::i_ [private]
```

#### 6.12.3.4 j\_

```
Vect3 raytracer::Screen::j_ [private]
```

#### 6.12.3.5 pixelSize\_

```
float raytracer::Screen::pixelSize_ [private]
```

#### 6.12.3.6 width\_

```
float raytracer::Screen::width_ [private]
```

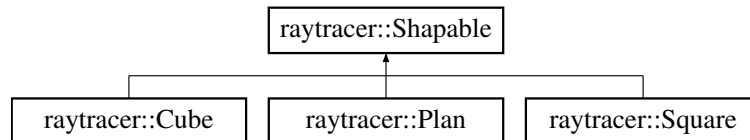
The documentation for this class was generated from the following files:

- [includes/screen.hh](#)
- [src/screen.cc](#)

## 6.13 raytracer::Shapable Class Reference

```
#include <shapable.hh>
```

Inheritance diagram for raytracer::Shapable:



### Public Member Functions

- virtual [Color](#) [getColor](#) () const =0
- virtual std::optional< std::tuple< [Vect3](#), [FlatShapable](#) \* > > [intersecte](#) (const [Ray](#) &ray)=0

### 6.13.1 Member Function Documentation

#### 6.13.1.1 getColor()

```
virtual Color raytracer::Shapable::getColor ( ) const [pure virtual]
```

Implemented in [raytracer::Cube](#), [raytracer::Square](#), and [raytracer::Plan](#).

#### 6.13.1.2 intersecte()

```
virtual std::optional<std::tuple<Vect3, FlatShapable*> > raytracer::Shapable::intersecte (
    const Ray & ray ) [pure virtual]
```

Implemented in [raytracer::Cube](#), [raytracer::Square](#), and [raytracer::Plan](#).

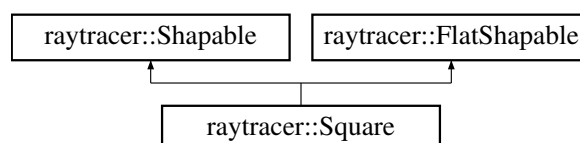
The documentation for this class was generated from the following file:

- includes/[shapable.hh](#)

## 6.14 raytracer::Square Class Reference

```
#include <square.hh>
```

Inheritance diagram for raytracer::Square:



## Public Member Functions

- [Square](#) (const [Square](#) &s)
- [Square](#) (const [Vect3](#) &A, const [Vect3](#) &B, const [Vect3](#) &D, const [Vect3](#) &norm, const [Color](#) &color)
- [Vect3](#) [getPos](#) () const
- [Vect3](#) [getAB](#) () const
- [Vect3](#) [getAD](#) () const
- [Plan](#) [getPlan](#) () const
- [Color](#) [getColor](#) () const override
- virtual std::optional< std::tuple< [Vect3](#), [FlatShapable](#) \* > > [intersecte](#) (const [Ray](#) &ray) override

## Private Attributes

- [Plan](#) p\_
- [Vect3](#) pA\_
- [Vect3](#) vAB\_
- [Vect3](#) vAD\_

## 6.14.1 Constructor & Destructor Documentation

### 6.14.1.1 Square() [1/2]

```
raytracer::Square::Square (
    const Square & s )
```

### 6.14.1.2 Square() [2/2]

```
raytracer::Square::Square (
    const Vect3 & A,
    const Vect3 & B,
    const Vect3 & D,
    const Vect3 & norm,
    const Color & color )
```

## 6.14.2 Member Function Documentation

### 6.14.2.1 getAB()

```
raytracer::Vect3 raytracer::Square::getAB ( ) const
```

#### 6.14.2.2 getAD()

```
raytracer::Vect3 raytracer::Square::getAD ( ) const
```

#### 6.14.2.3 getColor()

```
raytracer::Color raytracer::Square::getColor ( ) const [override], [virtual]
```

Implements [raytracer::FlatShapable](#).

#### 6.14.2.4 getPlan()

```
raytracer::Plan raytracer::Square::getPlan ( ) const
```

#### 6.14.2.5 getPos()

```
raytracer::Vect3 raytracer::Square::getPos ( ) const
```

#### 6.14.2.6 intersecte()

```
std::optional< std::tuple< raytracer::Vect3, raytracer::FlatShapable * > > raytracer::↵  
Square::intersecte (   
    const Ray & ray ) [override], [virtual]
```

Implements [raytracer::FlatShapable](#).

### 6.14.3 Member Data Documentation

#### 6.14.3.1 p\_

```
Plan raytracer::Square::p_ [private]
```

#### 6.14.3.2 pA\_

`Vect3 raytracer::Square::pA_ [private]`

#### 6.14.3.3 vAB\_

`Vect3 raytracer::Square::vAB_ [private]`

#### 6.14.3.4 vAD\_

`Vect3 raytracer::Square::vAD_ [private]`

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

- [includes/square.hh](#)
- [src/square.cc](#)

## 6.15 raytracer::Vect2 Class Reference

```
#include <vect.hh>
```

### Public Member Functions

- [Vect2](#) ()
- [Vect2](#) (float x, float y)
- [Vect2](#) (const [Vect2](#) &v)
- float [getX](#) () const
- float [getY](#) () const
- void [setX](#) (const float v)
- void [setY](#) (const float v)
- bool [isNullVect](#) () const
- float [getNorm](#) () const
- float [dot](#) (const [Vect2](#) &other) const
- void [normalize](#) ()
- [Vect2 operator-](#) () const
- [Vect2 operator+](#) (const [Vect2](#) &other) const
- [Vect2 operator-](#) (const [Vect2](#) &other) const
- [Vect2 operator\\*](#) (const float other) const

### Private Attributes

- float [x\\_](#)
- float [y\\_](#)

## Friends

- [Vect2 operator\\*](#) (const float num, const [Vect2](#) &vect)

## 6.15.1 Constructor & Destructor Documentation

### 6.15.1.1 Vect2() [1/3]

```
raytracer::Vect2::Vect2 ( )
```

### 6.15.1.2 Vect2() [2/3]

```
raytracer::Vect2::Vect2 (
    float x,
    float y )
```

### 6.15.1.3 Vect2() [3/3]

```
raytracer::Vect2::Vect2 (
    const Vect2 & v )
```

## 6.15.2 Member Function Documentation

### 6.15.2.1 dot()

```
float raytracer::Vect2::dot (
    const Vect2 & other ) const
```

### 6.15.2.2 getNorm()

```
float raytracer::Vect2::getNorm ( ) const
```



### 6.15.2.3 getX()

```
float raytracer::Vect2::getX ( ) const
```

### 6.15.2.4 getY()

```
float raytracer::Vect2::getY ( ) const
```

### 6.15.2.5 isNullVect()

```
bool raytracer::Vect2::isNullVect ( ) const
```

### 6.15.2.6 normalize()

```
void raytracer::Vect2::normalize ( )
```

### 6.15.2.7 operator\*()

```
raytracer::Vect2 raytracer::Vect2::operator* (
    const float other ) const
```

### 6.15.2.8 operator+()

```
raytracer::Vect2 raytracer::Vect2::operator+ (
    const Vect2 & other ) const
```

### 6.15.2.9 operator-() <sup>[1/2]</sup>

```
raytracer::Vect2 raytracer::Vect2::operator- ( ) const
```

#### 6.15.2.10 operator-() [2/2]

```
raytracer::Vect2 raytracer::Vect2::operator- (
    const Vect2 & other ) const
```

#### 6.15.2.11 setX()

```
void raytracer::Vect2::setX (
    const float v )
```

#### 6.15.2.12 setY()

```
void raytracer::Vect2::setY (
    const float v )
```

### 6.15.3 Friends And Related Function Documentation

#### 6.15.3.1 operator\*

```
Vect2 operator* (
    const float num,
    const Vect2 & vect ) [friend]
```

### 6.15.4 Member Data Documentation

#### 6.15.4.1 x\_

```
float raytracer::Vect2::x_ [private]
```

#### 6.15.4.2 y\_

```
float raytracer::Vect2::y_ [private]
```

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

- includes/[vect.hh](#)
- src/[vect.cc](#)

## 6.16 raytracer::Vect3 Class Reference

```
#include <vect.hh>
```

### Public Member Functions

- [Vect3](#) ()  
*Default constructor.*
- [Vect3](#) (float x, float y, float z)  
*Intuitive constructor.*
- [Vect3](#) (const [Vect3](#) &v)  
*Copy constructor.*
- float [getX](#) () const  
*Getter of x value.*
- float [getY](#) () const  
*Getter of y value.*
- float [getZ](#) () const  
*Getter of z value.*
- void [setX](#) (const float v)  
*Setter of x value.*
- void [setY](#) (const float v)  
*Setter of y value.*
- void [setZ](#) (const float v)  
*Setter of z value.*
- bool [isNullVect](#) () const  
*Check if the vector is null.*
- float [getNorm](#) () const  
*Get the norm of the vector.*
- float [dot](#) (const [Vect3](#) &other) const  
*Get the dot product of this vect with an other.*
- void [normalize](#) ()  
*Normalize the vector.*
- [Vect3 operator-](#) () const  
*Overload of the opposite operator.*
- [Vect3 operator+](#) (const [Vect3](#) &other) const  
*Overload of the addition operator between two vectors.*
- [Vect3 operator-](#) (const [Vect3](#) &other) const  
*Overload of the subtraction operator between two vectors.*
- [Vect3 operator\\*](#) (const float other) const  
*Overload of the product multiplication between a vector and a float.*

### Private Attributes

- float [x\\_](#)
- float [y\\_](#)
- float [z\\_](#)

## Friends

- [Vect3 operator\\*](#) (const float num, const [Vect3](#) &vect)  
*Overload of the product multiplication between a float and a vector.*

## 6.16.1 Constructor & Destructor Documentation

### 6.16.1.1 Vect3() [1/3]

```
raytracer::Vect3::Vect3 ( )
```

Default constructor.

### 6.16.1.2 Vect3() [2/3]

```
raytracer::Vect3::Vect3 (
    float x,
    float y,
    float z )
```

Intuitive constructor.

#### Parameters

<i>x</i>	value of the x coordinate.
<i>y</i>	value of the y coordinate.
<i>z</i>	value of the z coordinate.

### 6.16.1.3 Vect3() [3/3]

```
raytracer::Vect3::Vect3 (
    const Vect3 & v )
```

Copy constructor.

#### Parameters

<i>v</i>	vect to copy.
----------	---------------

## 6.16.2 Member Function Documentation

### 6.16.2.1 dot()

```
float raytracer::Vect3::dot (
    const Vect3 & other ) const
```

Get the dot product of this vect with an other.

#### Returns

The dot product of the two vectors.

### 6.16.2.2 getNorm()

```
float raytracer::Vect3::getNorm ( ) const
```

Get the norm of the vector.

#### Returns

The norm of the vector.

### 6.16.2.3 getX()

```
float raytracer::Vect3::getX ( ) const
```

Getter of x value.

#### Returns

Value of x value.

### 6.16.2.4 getY()

```
float raytracer::Vect3::getY ( ) const
```

Getter of y value.

#### Returns

Value of y value.

#### 6.16.2.5 getZ()

```
float raytracer::Vect3::getZ ( ) const
```

Getter of z value.

##### Returns

Value of z value.

#### 6.16.2.6 isNullVect()

```
bool raytracer::Vect3::isNullVect ( ) const
```

Check if the vector is null.

##### Returns

True if the vector is null, False otherwise.

#### 6.16.2.7 normalize()

```
void raytracer::Vect3::normalize ( )
```

Normalize the vector.

#### 6.16.2.8 operator\*()

```
raytracer::Vect3 raytracer::Vect3::operator* (
    const float other ) const
```

Overload of the product multiplication between a vector and a float.

##### Parameters

<i>other</i>	the float to multiply with this vector.
--------------	---

##### Returns

A new vector.

#### 6.16.2.9 operator+()

```
raytracer::Vect3 raytracer::Vect3::operator+ (
    const Vect3 & other ) const
```

Overload of the addition operator between two vectors.

##### Parameters

<i>other</i>	the vector to add to this one.
--------------	--------------------------------

##### Returns

A new vector.

#### 6.16.2.10 operator-() [1/2]

```
raytracer::Vect3 raytracer::Vect3::operator- ( ) const
```

Overload of the opposite operator.

##### Returns

The opposite vector of this one.

#### 6.16.2.11 operator-() [2/2]

```
raytracer::Vect3 raytracer::Vect3::operator- (
    const Vect3 & other ) const
```

Overload of the subtraction operator between two vectors.

##### Parameters

<i>other</i>	the vector to subtract to this one.
--------------	-------------------------------------

##### Returns

A new vector.

#### 6.16.2.12 setX()

```
void raytracer::Vect3::setX (
    const float v )
```

Setter of x value.

##### Parameters

<i>v</i>	value to set x with.
----------	----------------------

#### 6.16.2.13 setY()

```
void raytracer::Vect3::setY (
    const float v )
```

Setter of y value.

##### Parameters

<i>v</i>	value to set y with.
----------	----------------------

#### 6.16.2.14 setZ()

```
void raytracer::Vect3::setZ (
    const float v )
```

Setter of z value.

##### Parameters

<i>v</i>	value to set z with
----------	---------------------

### 6.16.3 Friends And Related Function Documentation

#### 6.16.3.1 operator\*

```
Vect3 operator* (
    const float num,
    const Vect3 & vect ) [friend]
```

Overload of the product multiplication between a float and a vector.



## Parameters

<i>num</i>	the float to multiply with the vector.
<i>vect</i>	the vector to multiply with the float.

## Returns

A new vector.

## 6.16.4 Member Data Documentation

### 6.16.4.1 x\_

```
float raytracer::Vect3::x_ [private]
```

the x coordinate

### 6.16.4.2 y\_

```
float raytracer::Vect3::y_ [private]
```

the y coordinate

### 6.16.4.3 z\_

```
float raytracer::Vect3::z_ [private]
```

the z coordinate

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

- includes/[vect.hh](#)
- src/[vect.cc](#)



## Chapter 7

# File Documentation

### 7.1 includes/ambientlight.hh File Reference

```
#include "fwd.hh"
#include <vector>
#include "color.hh"
#include "lightable.hh"
#include "shapable.hh"
#include "flatshapable.hh"
```

#### Classes

- class [raytracer::AmbientLight](#)

#### Namespaces

- [raytracer](#)

### 7.2 includes/camera.hh File Reference

```
#include "fwd.hh"
#include "vect.hh"
```

#### Classes

- class [raytracer::Camera](#)

#### Namespaces

- [raytracer](#)

### 7.3 includes/color.hh File Reference

```
#include "fwd.hh"
```

#### Classes

- class [raytracer::Color](#)

#### Namespaces

- [raytracer](#)

#### Functions

- Color [raytracer::operator\\*](#) (const float num, const Color &color)

### 7.4 includes/cube.hh File Reference

```
#include "fwd.hh"  
#include <vector>  
#include <tuple>  
#include "ray.hh"  
#include "vect.hh"  
#include "square.hh"  
#include "shapable.hh"  
#include "landmark.hh"  
#include "color.hh"  
#include "flatshapable.hh"
```

#### Classes

- class [raytracer::Cube](#)

#### Namespaces

- [raytracer](#)

### 7.5 includes/dirlight.hh File Reference

```
#include "fwd.hh"  
#include <vector>  
#include "vect.hh"  
#include "color.hh"  
#include "shapable.hh"  
#include "lightable.hh"  
#include "flatshapable.hh"
```

## Classes

- class [raytracer::DirectionalLight](#)

## Namespaces

- [raytracer](#)

## 7.6 includes/flatshapable.hh File Reference

```
#include "fwd.hh"
#include <optional>
#include <tuple>
#include "vect.hh"
#include "ray.hh"
#include "color.hh"
```

## Classes

- class [raytracer::FlatShapable](#)

## Namespaces

- [raytracer](#)

## 7.7 includes/fwd.hh File Reference

## Namespaces

- [raytracer](#)

## 7.8 includes/landmark.hh File Reference

```
#include "fwd.hh"
#include "vect.hh"
```

## Classes

- class [raytracer::Landmark](#)

## Namespaces

- [raytracer](#)

## 7.9 includes/lightable.hh File Reference

```
#include "fwd.hh"
#include "shapable.hh"
#include "flatshapable.hh"
```

## Classes

- class [raytracer::Lightable](#)

## Namespaces

- [raytracer](#)

## 7.10 includes/plan.hh File Reference

```
#include "fwd.hh"
#include <optional>
#include <tuple>
#include "ray.hh"
#include "vect.hh"
#include "shapable.hh"
#include "color.hh"
#include "flatshapable.hh"
```

## Classes

- class [raytracer::Plan](#)

## Namespaces

- [raytracer](#)

## 7.11 includes/pointlight.hh File Reference

```
#include "fwd.hh"
#include <vector>
#include "vect.hh"
#include "color.hh"
#include "shapable.hh"
#include "lightable.hh"
#include "flatshapable.hh"
```

## Classes

- class [raytracer::PointLight](#)

## Namespaces

- [raytracer](#)

## 7.12 includes/ray.hh File Reference

```
#include "fwd.hh"
#include <vector>
#include "vect.hh"
#include "shapable.hh"
```

## Classes

- class [raytracer::Ray](#)

## Namespaces

- [raytracer](#)

## 7.13 includes/screen.hh File Reference

```
#include "fwd.hh"
#include "vect.hh"
#include "camera.hh"
```

## Classes

- class [raytracer::Screen](#)

## Namespaces

- [raytracer](#)

## 7.14 includes/shapable.hh File Reference

```
#include "fwd.hh"
#include <optional>
#include <tuple>
#include "vect.hh"
#include "ray.hh"
#include "color.hh"
#include "shapable.hh"
#include "flatshapable.hh"
```

### Classes

- class [raytracer::Shapable](#)

### Namespaces

- [raytracer](#)

## 7.15 includes/square.hh File Reference

```
#include "fwd.hh"
#include <optional>
#include <tuple>
#include "ray.hh"
#include "vect.hh"
#include "plan.hh"
#include "shapable.hh"
#include "color.hh"
#include "flatshapable.hh"
```

### Classes

- class [raytracer::Square](#)

### Namespaces

- [raytracer](#)



## 7.16 includes/utils.hh File Reference

```
#include "fwd.hh"
#include <cmath>
#include <vector>
#include "vect.hh"
#include "ray.hh"
#include "screen.hh"
#include "camera.hh"
#include "shapable.hh"
#include "square.hh"
#include "pointlight.hh"
#include "color.hh"
#include "lightable.hh"
```

### Namespaces

- [raytracer](#)

### Functions

- void [raytracer::rotateX](#) (Vect3 &vect, const float angle)
- void [raytracer::rotateY](#) (Vect3 &vect, const float angle)
- void [raytracer::rotateZ](#) (Vect3 &vect, const float angle)
- Vect3 [raytracer::applyAngle](#) (Vect3 &vect, const Vect3 &angles)
- Vect3 [raytracer::vectorFromAngles](#) (const Vect3 &angles)
- Vect3 [raytracer::getAngles](#) (const Vect3 &v1, const Vect3 &v2)
- Vect3 [raytracer::vectorFromPoints](#) (const Vect3 &v1, const Vect3 &v2)
- std::vector< Ray > [raytracer::genRays](#) (const Camera &cam, const Screen &screen)
- int [raytracer::closerToOrigin](#) (Vect3 origin, Vect3 point1, Vect3 point2)
- std::vector< Color > [raytracer::renderFrame](#) (const std::vector< Shapable \*> &objects, const std::vector< Ray > &rays, const std::vector< Lightable \*> &lightList)

### Variables

- const float [raytracer::pi](#) = std::acos(-1)

## 7.17 includes/vect.hh File Reference

```
#include "fwd.hh"
```

### Classes

- class [raytracer::Vect3](#)
- class [raytracer::Vect2](#)

## Namespaces

- [raytracer](#)

## Functions

- Vect3 [raytracer::operator\\*](#) (const float num, const Vect3 &vect)  
*Overload of the product multiplication between a float and a vector.*
- Vect2 [raytracer::operator\\*](#) (const float num, const Vect2 &vect)

### 7.18 src/ambientlight.cc File Reference

```
#include "ambientlight.hh"
```

### 7.19 src/camera.cc File Reference

```
#include "camera.hh"  
#include "utils.hh"
```

### 7.20 src/color.cc File Reference

```
#include "color.hh"
```

### 7.21 src/cube.cc File Reference

```
#include "cube.hh"  
#include "utils.hh"
```

### 7.22 src/dirlight.cc File Reference

```
#include "dirlight.hh"  
#include "ray.hh"
```

### 7.23 src/landmark.cc File Reference

```
#include "landmark.hh"
```

## 7.24 src/main.cc File Reference

```
#include <iostream>
#include <vector>
#include <cmath>
#include <string>
#include <fstream>
#include "ray.hh"
#include "camera.hh"
#include "vect.hh"
#include "screen.hh"
#include "square.hh"
#include "utils.hh"
#include "cube.hh"
#include "color.hh"
#include "pointlight.hh"
#include "shapable.hh"
#include "lightable.hh"
#include "ambientlight.hh"
#include "dirlight.hh"
```

### Functions

- void `writeRender` (std::string filename, std::vector< `raytracer::Color` > &pixels, unsigned width, unsigned height)
- int `main` ()

#### 7.24.1 Function Documentation

##### 7.24.1.1 `main()`

```
int main ( )
```

##### 7.24.1.2 `writeRender()`

```
void writeRender (
    std::string filename,
    std::vector< raytracer::Color > & pixels,
    unsigned width,
    unsigned height )
```

## 7.25 src/plan.cc File Reference

```
#include "plan.hh"
```

## Functions

- float `computeD` (const `raytracer::Vect3` &p, const `raytracer::Vect3` &n)

### 7.25.1 Function Documentation

#### 7.25.1.1 `computeD()`

```
float computeD (
    const raytracer::Vect3 & p,
    const raytracer::Vect3 & n )
```

### 7.26 `src/pointlight.cc` File Reference

```
#include "pointlight.hh"
#include "utils.hh"
#include "ray.hh"
```

### 7.27 `src/ray.cc` File Reference

```
#include "ray.hh"
#include <tuple>
#include <optional>
#include "color.hh"
#include "utils.hh"
```

### 7.28 `src/screen.cc` File Reference

```
#include "screen.hh"
#include <cmath>
#include "utils.hh"
```

### 7.29 `src/square.cc` File Reference

```
#include "square.hh"
#include "utils.hh"
```

## 7.30 src/utils.cc File Reference

```
#include "utils.hh"  
#include <optional>  
#include <tuple>  
#include "flatshapable.hh"
```

## 7.31 src/vect.cc File Reference

```
#include "vect.hh"  
#include <cmath>
```



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