Raytracer Project

0.1

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## **README**

This projects goal is to make a simple raytracer with only cubes as 3D models.

#### **Example image**

#### Build

Build the project : make -> Builds the main program (-O3). make run -> Builds and runs the main program (-O3).

make debug -> Builds the main program in debug mode (-g -O0)

make clean -> Cleans the trash files created by make and the main program.

make doc -> Make the html and latex documentation html is in "html/index.html" latex is in "latex/refman.pdf"

#### Usage

The usage is juste ./main for now.

#### **AUTHORS**

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2 README

# Namespace Index

## 2.1 Namespace List

Here is a list of all namespaces with brief descriptions:

gameobj																			 						11
gameui																			 						11
ravtracer					 														 						12

4 Namespace Index

# **Hierarchical Index**

## 3.1 Class Hierarchy

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

raytracer::Camera	19
raytracer::Color	21
gameobj::FlatShapable	30
gameobj::Plan	34
gameobj::Square	45
raytracer::Landmark	30
gameobj::Lightable	33
gameobj::AmbientLight	17
gameobj::DirectionalLight	27
gameobj::PointLight	37
raytracer::Ray	39
raytracer::Screen	41
gameobj::Shapable	44
gameobj::Cube	24
gameobj::Plan	34
gameobj::Square	45
gameui::UIScreen	47
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raytracer::Vect3	53

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# **Class Index**

## 4.1 Class List

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

ameobj::AmbientLight	 17
aytracer::Camera	 19
aytracer::Color	 21
ameobj::Cube	 24
ameobj::DirectionalLight	 27
ameobj::FlatShapable	 30
aytracer::Landmark	 30
ameobj::Lightable	 33
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ameui::UIScreen	
Class to interacte with the user visual output	 47
aytracer::Vect2	 50
aytracer::Vect3	 53

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# File Index

## 5.1 File List

Here is a list of all files with brief descriptions:

includes/fwd.hh
includes/gameobj/ambientlight.hh
includes/gameobj/cube.hh
includes/gameobj/dirlight.hh
includes/gameobj/flatshapable.hh
includes/gameobj/lightable.hh
includes/gameobj/plan.hh
includes/gameobj/pointlight.hh
includes/gameobj/shapable.hh
includes/gameobj/square.hh
includes/raytracer/camera.hh
includes/raytracer/color.hh
includes/raytracer/landmark.hh
includes/raytracer/ray.hh
includes/raytracer/screen.hh
includes/raytracer/utils.hh
includes/raytracer/vect.hh
Vect2 and Vect3 class managing vector operation
The same result of the same results of the same results and the same results and the same results are same results are same results are same results and the same results are same results are same results and the same results are same results are same results and the same results are sam
includes/ui/gameui.hh
includes/ui/gameui.hh  Vect2 and Vect3 class managing vector operation
includes/ui/gameui.hh  Vect2 and Vect3 class managing vector operation
includes/ui/gameui.hh  Vect2 and Vect3 class managing vector operation
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includes/ui/gameui.hh  Vect2 and Vect3 class managing vector operation  src/main.cc  src/gameobj/ambientlight.cc  src/gameobj/cube.cc  src/gameobj/dirlight.cc  src/gameobj/dirlight.cc  src/gameobj/plan.cc  66
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# **Namespace Documentation**

#### 6.1 gameobj Namespace Reference

#### Classes

- class AmbientLight
- class Cube
- · class DirectionalLight
- class FlatShapable
- class Lightable
- class Plan
- class PointLight
- · class Shapable
- class Square

## 6.2 gameui Namespace Reference

#### Classes

• class UIScreen

Class to interacte with the user visual output.

#### **Enumerations**

 enum WINDOWPARAM { NO\_FULLSCREEN = 0, FULLSCREEN = 1, FULLSCREEN\_DESKTOP = 2, BORDERLESS = 4 }

Posible parameters for a window.

#### 6.2.1 Enumeration Type Documentation

#### 6.2.1.1 WINDOWPARAM

enum gameui::WINDOWPARAM

Posible parameters for a window.

#### Enumerator

NO_FULLSCREEN	Size the window to a fixed resolution
FULLSCREEN	Size the window fullscreen but don't change resolution
FULLSCREEN_DESKTOP	Size the window fullscreen and change resolution to sceen resolution
BORDERLESS	Make a borderless window

#### 6.3 raytracer Namespace Reference

#### Classes

- · class Camera
- class Color
- · class Landmark
- class Ray
- class Screen
- 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 < gameobj::Shapable \*> &objects, const std::vector < Ray > &rays, const std::vector < gameobj::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)

#### 6.3.1 Function Documentation

#### 6.3.1.1 applyAngle()

```
raytracer::Vect3 raytracer::applyAngle (
            raytracer:: Vect3 & vect,
             const Vect3 & angles )
6.3.1.2 closerToOrigin()
int raytracer::closerToOrigin (
            raytracer:: Vect3 origin,
             raytracer::Vect3 point1,
             raytracer::Vect3 point2 )
6.3.1.3 genRays()
std::vector< raytracer::Ray > raytracer::genRays (
           const Camera & cam,
            const Screen & screen )
6.3.1.4 getAngles()
raytracer::Vect3 raytracer::getAngles (
            const Vect3 & v1,
             const Vect3 & v2 )
6.3.1.5 operator*() [1/3]
raytracer::Color raytracer::operator* (
            const float num,
             const Color & color )
6.3.1.6 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**

num	the float to multiply with the vector.
vect	the vector to multiply with the float.

#### Returns

A new vector.

```
6.3.1.7 operator*() [3/3]
raytracer::Vect2 raytracer::operator* (
             const float num,
             const Vect2 & vect )
6.3.1.8 renderFrame()
\verb|std::vector| < |raytracer::Color| > |raytracer::renderFrame| (
            const std::vector< gameobj::Shapable *> & objects,
             const std::vector< Ray > & rays,
             const std::vector< gameobj::Lightable *> & lightList )
6.3.1.9 rotateX()
void raytracer::rotateX (
            raytracer::Vect3 & vect,
             const float angle )
6.3.1.10 rotateY()
void raytracer::rotateY (
            raytracer::Vect3 & vect,
```

const float angle )

#### 6.3.1.11 rotateZ()

#### 6.3.1.12 vectorFromAngles()

#### 6.3.1.13 vectorFromPoints()

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

#### 6.3.2 Variable Documentation

#### 6.3.2.1 pi

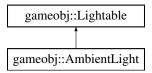
```
const float raytracer::pi = std::acos(-1)
```

## **Class Documentation**

#### 7.1 gameobj::AmbientLight Class Reference

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

Inheritance diagram for gameobj::AmbientLight:



#### **Public Member Functions**

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

#### **Private Attributes**

- · raytracer::Color color\_
- · float brightness\_

#### 7.1.1 Constructor & Destructor Documentation

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#### 7.1.1.1 AmbientLight()

#### 7.1.2 Member Function Documentation

```
7.1.2.1 getBrightness()
```

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

#### 7.1.2.2 getColor()

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

#### 7.1.2.3 interact()

Implements gameobj::Lightable.

#### 7.1.2.4 setBrightness()

#### 7.1.2.5 setColor()

#### 7.1.3 Member Data Documentation

# 7.1.3.1 brightness\_ float gameobj::AmbientLight::brightness\_ [private] 7.1.3.2 color\_

raytracer::Color gameobj::AmbientLight::color\_ [private]
The documentation for this class was generated from the following files:

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

## 7.2 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\_

#### 7.2.1 Constructor & Destructor Documentation

```
7.2.1.1 Camera() [1/2] raytracer::Camera::Camera ( )
```

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```
7.2.1.2 Camera() [2/2]
raytracer::Camera::Camera (
             raytracer::Vect3 pos,
             raytracer::Vect3 angleVect,
             float viewAngle = raytracer::pi / 2 )
7.2.2 Member Function Documentation
7.2.2.1 getAng()
raytracer::Vect3 raytracer::Camera::getAng ( ) const
7.2.2.2 getPos()
raytracer::Vect3 raytracer::Camera::getPos ( ) const
7.2.2.3 getViewAngle()
float raytracer::Camera::getViewAngle ( ) const
7.2.3 Member Data Documentation
7.2.3.1 angleVect_
Vect3 raytracer::Camera::angleVect_ [private]
7.2.3.2 pos_
Vect3 raytracer::Camera::pos_ [private]
```

#### 7.2.3.3 viewAngle\_

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

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

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

## 7.3 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)

#### 7.3.1 Constructor & Destructor Documentation

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```
7.3.1.1 Color() [1/2]
raytracer::Color::Color ( )
7.3.1.2 Color() [2/2]
raytracer::Color::Color (
            const float r,
             const float g,
             const float b )
7.3.2 Member Function Documentation
7.3.2.1 getB()
float raytracer::Color::getB ( ) const
7.3.2.2 getG()
float raytracer::Color::getG ( ) const
7.3.2.3 getR()
float raytracer::Color::getR ( ) const
7.3.2.4 normalize()
void raytracer::Color::normalize ( )
7.3.2.5 operator*() [1/2]
raytracer::Color raytracer::Color::operator* (
             const float other ) const
```

```
7.3.2.6 operator*() [2/2]
raytracer::Color raytracer::Color::operator* (
           const Color & other ) const
7.3.2.7 operator+()
raytracer::Color raytracer::Color::operator+ (
            const Color & other ) const
7.3.2.8 operator+=()
raytracer::Color raytracer::Color::operator+= (
            const Color & other )
7.3.2.9 operator-()
raytracer::Color raytracer::Color::operator- (
           const Color & other ) const
7.3.2.10 setB()
void raytracer::Color::setB (
           const float v )
7.3.2.11 setG()
void raytracer::Color::setG (
           const float v )
7.3.2.12 setR()
void raytracer::Color::setR (
            const float v )
```

## 7.3.3 Friends And Related Function Documentation

#### 7.3.3.1 operator\*

## 7.3.4 Member Data Documentation

```
7.3.4.1 b_
```

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

## 7.3.4.2 g\_

```
\verb|float raytracer::Color::g_ [private]|\\
```

## 7.3.4.3 r\_

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

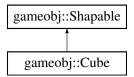
The documentation for this class was generated from the following files:

- · includes/raytracer/color.hh
- src/raytracer/color.cc

# 7.4 gameobj::Cube Class Reference

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

Inheritance diagram for gameobj::Cube:



### **Public Member Functions**

- Cube (const raytracer::Vect3 &center, const float side, const raytracer::Vect3 &angles, const raytracer::Color &color)
- raytracer::Vect3 getCenter () const
- float getSide () const
- raytracer::Vect3 getAngles () const
- · raytracer::Landmark getLandmark () const
- raytracer::Color getColor () const
- virtual std::optional< std::tuple< raytracer::Vect3, raytracer::Vect2, FlatShapable \* > intersecte (const raytracer::Ray &ray) override

## **Private Attributes**

- raytracer::Vect3 center\_
- float side
- raytracer::Vect3 angles\_
- raytracer::Landmark landmark
- std::vector < Square > squares\_

### 7.4.1 Constructor & Destructor Documentation

## 7.4.1.1 Cube()

## 7.4.2 Member Function Documentation

### 7.4.2.1 getAngles()

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

## 7.4.2.2 getCenter()

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

```
7.4.2.3 getColor()

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

Implements gameobj::Shapable.
```

## 7.4.2.4 getLandmark()

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

### 7.4.2.5 getSide()

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

## 7.4.2.6 intersecte()

Implements gameobj::Shapable.

## 7.4.3 Member Data Documentation

```
7.4.3.1 angles_
```

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

# 7.4.3.2 center\_

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

### 7.4.3.3 landmark\_

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

### 7.4.3.4 side

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

## 7.4.3.5 squares\_

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

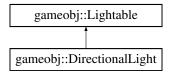
The documentation for this class was generated from the following files:

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

# 7.5 gameobj::DirectionalLight Class Reference

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

Inheritance diagram for gameobj::DirectionalLight:



### **Public Member Functions**

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

## **Private Attributes**

- raytracer::Vect3 dir\_
- · raytracer::Color color\_
- · float brightness\_

### 7.5.1 Constructor & Destructor Documentation

## 7.5.1.1 DirectionalLight()

### 7.5.2 Member Function Documentation

```
7.5.2.1 getBrightness()
```

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

## 7.5.2.2 getColor()

```
{\tt raytracer::Color}\ {\tt gameobj::DirectionalLight::getColor}\ (\ )\ {\tt const}
```

#### 7.5.2.3 getDir()

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

## 7.5.2.4 interact()

Implements gameobj::Lightable.

### 7.5.2.5 setBrightness()

## 7.5.3 Member Data Documentation

```
7.5.3.1 brightness_
```

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

7.5.3.2 color\_

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

7.5.3.3 dir\_

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

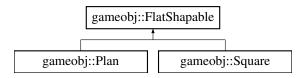
The documentation for this class was generated from the following files:

- includes/gameobj/dirlight.hh
- src/gameobj/dirlight.cc

# 7.6 gameobj::FlatShapable Class Reference

#include <flatshapable.hh>

Inheritance diagram for gameobj::FlatShapable:



#### **Public Member Functions**

- virtual raytracer::Color getColor () const =0
- virtual std::optional< std::tuple< raytracer::Vect3, raytracer::Vect2, FlatShapable \* > > intersecte (const raytracer::Ray &ray)=0

### 7.6.1 Member Function Documentation

## 7.6.1.1 getColor()

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

Implemented in gameobj::Square, and gameobj::Plan.

### 7.6.1.2 intersecte()

Implemented in gameobj::Square, and gameobj::Plan.

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

• includes/gameobj/flatshapable.hh

# 7.7 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\_

### 7.7.1 Constructor & Destructor Documentation

## 7.7.2 Member Function Documentation

const Vect3 & z )

```
7.7.2.1 getO()
```

```
raytracer::Vect3 raytracer::Landmark::get0 ( ) const
```

```
7.7.2.2 getX()
raytracer::Vect3 raytracer::Landmark::getX ( ) const
7.7.2.3 getY()
raytracer::Vect3 raytracer::Landmark::getY ( ) const
7.7.2.4 getZ()
raytracer::Vect3 raytracer::Landmark::getZ ( ) const
7.7.2.5 transposePoint()
raytracer::Vect3 raytracer::Landmark::transposePoint (
            const Vect3 & point ) const
7.7.2.6 transposeVect()
raytracer::Vect3 raytracer::Landmark::transposeVect (
             const Vect3 & vect ) const
7.7.3 Member Data Documentation
7.7.3.1 o_
Vect3 raytracer::Landmark::o_ [private]
7.7.3.2 x_
```

Vect3 raytracer::Landmark::x\_ [private]

```
7.7.3.3 y_
```

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

### 7.7.3.4 z

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

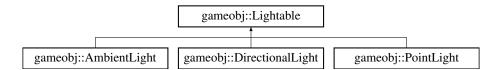
The documentation for this class was generated from the following files:

- · includes/raytracer/landmark.hh
- src/raytracer/landmark.cc

# 7.8 gameobj::Lightable Class Reference

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

Inheritance diagram for gameobj::Lightable:



## **Public Member Functions**

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

## 7.8.1 Member Function Documentation

## 7.8.1.1 getBrightness()

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

## 7.8.1.2 getColor()

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

### 7.8.1.3 interact()

Implemented in gameobj::DirectionalLight, gameobj::PointLight, and gameobj::AmbientLight.

### 7.8.1.4 setBrightness()

### 7.8.1.5 setColor()

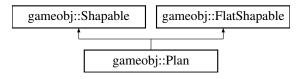
The documentation for this class was generated from the following file:

• includes/gameobj/lightable.hh

# 7.9 gameobj::Plan Class Reference

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

Inheritance diagram for gameobj::Plan:



### **Public Member Functions**

- Plan ()
- Plan (const Plan &p)
- Plan (const raytracer::Vect3 &norm, const raytracer::Vect3 &point, const raytracer::Color &color)
- raytracer::Vect3 getNorm () const
- float getD () const
- raytracer::Color getColor () const override
- void setColor (const raytracer::Color &color)
- std::optional< std::tuple< raytracer::Vect3, raytracer::Vect2, FlatShapable \* > > intersecte (const raytracer::Ray &ray) override

## **Private Attributes**

- float d\_
- raytracer::Vect3 norm\_
- raytracer::Color color\_

#### 7.9.1 Constructor & Destructor Documentation

### 7.9.2 Member Function Documentation

```
7.9.2.1 getColor()
raytracer::Color gameobj::Plan::getColor ( ) const [override], [virtual]
Implements gameobj::FlatShapable.
7.9.2.2 getD()
float gameobj::Plan::getD ( ) const
7.9.2.3 getNorm()
raytracer::Vect3 gameobj::Plan::getNorm ( ) const
7.9.2.4 intersecte()
std::optional< std::tuple< raytracer::Vect3, raytracer::Vect2, gameobj::FlatShapable * > >
gameobj::Plan::intersecte (
            const raytracer::Ray & ray ) [override], [virtual]
Implements gameobj::FlatShapable.
7.9.2.5 setColor()
void gameobj::Plan::setColor (
             const raytracer::Color & color )
7.9.3 Member Data Documentation
7.9.3.1 color_
raytracer::Color gameobj::Plan::color_ [private]
```

### 7.9.3.2 d\_

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

### 7.9.3.3 norm\_

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

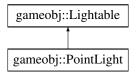
The documentation for this class was generated from the following files:

- includes/gameobj/plan.hh
- src/gameobj/plan.cc

# 7.10 gameobj::PointLight Class Reference

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

Inheritance diagram for gameobj::PointLight:



## **Public Member Functions**

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

### **Private Attributes**

- raytracer::Vect3 pos\_
- · raytracer::Color color\_
- float brightness

## 7.10.1 Constructor & Destructor Documentation

## 7.10.1.1 PointLight()

#### 7.10.2 Member Function Documentation

## 7.10.2.5 setBrightness()

## 7.10.2.6 setColor()

const raytracer::Vect3 & pos )

### 7.10.3 Member Data Documentation

```
7.10.3.1 brightness_
float gameobj::PointLight::brightness_ [private]

7.10.3.2 color_
raytracer::Color gameobj::PointLight::color_ [private]

7.10.3.3 pos_
```

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

raytracer::Vect3 gameobj::PointLight::pos\_ [private]

- includes/gameobj/pointlight.hh
- src/gameobj/pointlight.cc

# 7.11 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< gameobj::Shapable \*> &objects, const float dist) const
- bool colides (const std::vector< gameobj::Shapable \*> &objects) const

## **Private Attributes**

- · Vect3 origin\_
- Vect3 vect

### 7.11.1 Constructor & Destructor Documentation

```
7.11.1.1 Ray()
```

## 7.11.2 Member Function Documentation

```
7.11.2.1 colides()
```

### 7.11.2.2 colidesBefore()

# 7.11.2.3 getOrigin()

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

### 7.11.2.4 getVect()

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

### 7.11.3 Member Data Documentation

```
7.11.3.1 origin_
Vect3 raytracer::Ray::origin_ [private]
7.11.3.2 vect_
```

Vect3 raytracer::Ray::vect\_ [private]

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

- · includes/raytracer/ray.hh
- · src/raytracer/ray.cc

# 7.12 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\_

## 7.12.1 Constructor & Destructor Documentation

7.12.2.5 getPixelSize()

float raytracer::Screen::getPixelSize ( ) const

```
7.12.1.1 Screen()
raytracer::Screen::Screen (
            const Camera & camera,
             float width,
             float height )
7.12.2 Member Function Documentation
7.12.2.1 getCenter()
raytracer::Vect3 raytracer::Screen::getCenter ( ) const
7.12.2.2 getHeight()
float raytracer::Screen::getHeight ( ) const
7.12.2.3 getI()
raytracer::Vect3 raytracer::Screen::getI ( ) const
7.12.2.4 getJ()
raytracer::Vect3 raytracer::Screen::getJ ( ) const
```

```
7.12.2.6 getWidth()
float raytracer::Screen::getWidth ( ) const
7.12.3 Member Data Documentation
7.12.3.1 center_
Vect3 raytracer::Screen::center_ [private]
7.12.3.2 height_
float raytracer::Screen::height_ [private]
7.12.3.3 i_
Vect3 raytracer::Screen::i_ [private]
7.12.3.4 j_
Vect3 raytracer::Screen::j_ [private]
7.12.3.5 pixelSize_
float raytracer::Screen::pixelSize_ [private]
7.12.3.6 width_
```

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

• includes/raytracer/screen.hh

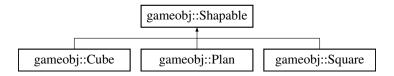
float raytracer::Screen::width\_ [private]

• src/raytracer/screen.cc

# 7.13 gameobj::Shapable Class Reference

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

Inheritance diagram for gameobj::Shapable:



## **Public Member Functions**

- virtual raytracer::Color getColor () const =0
- virtual std::optional< std::tuple< raytracer::Vect3, raytracer::Vect2, FlatShapable \* > intersecte (const raytracer::Ray &ray)=0

### 7.13.1 Member Function Documentation

## 7.13.1.1 getColor()

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

Implemented in gameobj::Cube, gameobj::Square, and gameobj::Plan.

## 7.13.1.2 intersecte()

Implemented in gameobj::Cube, gameobj::Square, and gameobj::Plan.

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

• includes/gameobj/shapable.hh

## 7.14 gameobj::Square Class Reference

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

Inheritance diagram for gameobj::Square:

```
gameobj::Shapable gameobj::FlatShapable gameobj::Square
```

### **Public Member Functions**

- Square (const Square &s)
- Square (const raytracer::Vect3 &A, const raytracer::Vect3 &B, const raytracer::Vect3 &D, const raytracer::Vect3 &norm, const raytracer::Color &color)
- raytracer::Vect3 getPos () const
- raytracer::Vect3 getAB () const
- raytracer::Vect3 getAD () const
- gameobj::Plan getPlan () const
- raytracer::Color getColor () const override
- virtual std::optional< std::tuple< raytracer::Vect3, raytracer::Vect2, FlatShapable \* > intersecte (const raytracer::Ray &ray) override

## **Private Attributes**

- Plan p\_
- raytracer::Vect3 pA\_
- raytracer::Vect3 vAB\_
- raytracer::Vect3 vAD\_

### 7.14.1 Constructor & Destructor Documentation

## 7.14.2 Member Function Documentation

```
7.14.2.1 getAB()
raytracer::Vect3 gameobj::Square::getAB ( ) const
7.14.2.2 getAD()
raytracer::Vect3 gameobj::Square::getAD ( ) const
7.14.2.3 getColor()
raytracer::Color gameobj::Square::getColor ( ) const [override], [virtual]
Implements gameobj::FlatShapable.
7.14.2.4 getPlan()
gameobj::Plan gameobj::Square::getPlan ( ) const
7.14.2.5 getPos()
raytracer::Vect3 gameobj::Square::getPos ( ) const
7.14.2.6 intersecte()
std::optional< std::tuple< raytracer::Vect3, raytracer::Vect2, gameobj::FlatShapable * > >
gameobj::Square::intersecte (
             const raytracer::Ray & ray ) [override], [virtual]
Implements gameobj::FlatShapable.
```

## 7.14.3 Member Data Documentation

```
7.14.3.1 p_
Plan gameobj::Square::p_ [private]

7.14.3.2 pA_
raytracer::Vect3 gameobj::Square::pA_ [private]

7.14.3.3 vAB_
raytracer::Vect3 gameobj::Square::vAB_ [private]

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

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

- includes/gameobj/square.hh
- src/gameobj/square.cc

# 7.15 gameui::UIScreen Class Reference

Class to interacte with the user visual output.

```
#include <gameui.hh>
```

## **Public Member Functions**

- UIScreen (std::string pageTitle, unsigned width, unsigned height, uint32\_t windowParam)

  Constructor of the object.
- ∼UIScreen ()
- void updateScreen ()
- void loadFrame (std::vector< raytracer::Color > \*pixels)

## **Private Attributes**

- · unsigned width
- · unsigned height
- SDL Window \* window
- SDL\_Surface \* screenSurface
- SDL\_Renderer \* renderer

## 7.15.1 Detailed Description

Class to interacte with the user visual output.

## 7.15.2 Constructor & Destructor Documentation

## 7.15.2.1 UIScreen()

Constructor of the object.

## **Parameters**

pageTitle	Title of the page
width	width of the window
height	height of the window
windowParam	Parameter of the window

The windowParam parameter has to be filled using the WINDOWPARAM enum.

```
7.15.2.2 \simUIScreen()
```

```
gameui::UIScreen::~UIScreen ( )
```

## 7.15.3 Member Function Documentation

## 7.15.3.1 loadFrame()

## 7.15.3.2 updateScreen()

```
void gameui::UIScreen::updateScreen ( )
```

### 7.15.4 Member Data Documentation

## 7.15.4.1 height

```
unsigned gameui::UIScreen::height [private]
```

## 7.15.4.2 renderer

```
SDL_Renderer* gameui::UIScreen::renderer [private]
```

### 7.15.4.3 screenSurface

```
SDL_Surface* gameui::UIScreen::screenSurface [private]
```

## 7.15.4.4 width

```
unsigned gameui::UIScreen::width [private]
```

## 7.15.4.5 window

```
SDL_Window* gameui::UIScreen::window [private]
```

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

- includes/ui/gameui.hh
- src/ui/gameui.cc

# 7.16 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)

## 7.16.1 Constructor & Destructor Documentation

```
7.16.1.3 Vect2() [3/3]
raytracer::Vect2::Vect2 (
           const Vect2 & v )
7.16.2 Member Function Documentation
7.16.2.1 dot()
float raytracer::Vect2::dot (
           const Vect2 & other ) const
7.16.2.2 getNorm()
float raytracer::Vect2::getNorm ( ) const
7.16.2.3 getX()
float raytracer::Vect2::getX ( ) const
7.16.2.4 getY()
float raytracer::Vect2::getY ( ) const
7.16.2.5 isNullVect()
bool raytracer::Vect2::isNullVect ( ) const
7.16.2.6 normalize()
void raytracer::Vect2::normalize ( )
```

```
7.16.2.7 operator*()
raytracer::Vect2 raytracer::Vect2::operator* (
           const float other ) const
7.16.2.8 operator+()
raytracer::Vect2 raytracer::Vect2::operator+ (
            const Vect2 & other ) const
7.16.2.9 operator-() [1/2]
raytracer::Vect2 raytracer::Vect2::operator- ( ) const
7.16.2.10 operator-() [2/2]
raytracer::Vect2 raytracer::Vect2::operator- (
           const Vect2 & other ) const
7.16.2.11 setX()
void raytracer::Vect2::setX (
           const float v )
7.16.2.12 setY()
void raytracer::Vect2::setY (
             const float v )
```

## 7.16.3 Friends And Related Function Documentation

### 7.16.3.1 operator\*

## 7.16.4 Member Data Documentation

```
7.16.4.1 x_
float raytracer::Vect2::x_ [private]
7.16.4.2 y_
float raytracer::Vect2::y_ [private]
```

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

- includes/raytracer/vect.hh
- src/raytracer/vect.cc

# 7.17 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.

## 7.17.1 Constructor & Destructor Documentation

Intuitive constructor.

### **Parameters**

Χ	value of the x coordinate.
y	value of the y coordinate.
Z	value of the z coordinate.

## **7.17.1.3 Vect3()** [3/3]

Copy constructor.

## **Parameters**

```
v vect to copy.
```

## 7.17.2 Member Function Documentation

## 7.17.2.1 dot()

Get the dot product of this vect with an other.

## Returns

The dot product of the two vectors.

## 7.17.2.2 getNorm()

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

Get the norm of the vector.

## Returns

The norm of the vector.

```
7.17.2.3 getX()
float raytracer::Vect3::getX ( ) const
Getter of x value.
Returns
     Value of x value.
7.17.2.4 getY()
float raytracer::Vect3::getY ( ) const
Getter of y value.
Returns
     Value of y value.
7.17.2.5 getZ()
float raytracer::Vect3::getZ ( ) const
Getter of z value.
Returns
     Value of z value.
7.17.2.6 isNullVect()
bool raytracer::Vect3::isNullVect ( ) const
Check if the vector is null.
Returns
     True if the vector is null, False otherwise.
7.17.2.7 normalize()
void raytracer::Vect3::normalize ( )
Normalize the vector.
7.17.2.8 operator*()
raytracer::Vect3 raytracer::Vect3::operator* (
```

const float other ) const

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

Generated by Doxygen

## **Parameters**

-

## Returns

A new vector.

## 7.17.2.9 operator+()

Overload of the addition operator between two vectors.

## **Parameters**

## Returns

A new vector.

```
7.17.2.10 operator-() [1/2]
raytracer::Vect3 raytracer::Vect3::operator- ( ) const
```

Overload of the opposite operator.

## Returns

The opposite vector of this one.

Overload of the subtraction operator between two vectors.

## **Parameters**

other the vector to subtract to this one.

Returns

A new vector.

```
7.17.2.12 setX()
```

Setter of x value.

### **Parameters**

```
v value to set x with.
```

## 7.17.2.13 setY()

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

Setter of y value.

## **Parameters**

```
v value to set y with.
```

## 7.17.2.14 setZ()

Setter of z value.

### **Parameters**

v value to set z with

### 7.17.3 Friends And Related Function Documentation

#### 7.17.3.1 operator\*

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

#### **Parameters**

num	the float to multiply with the vector.
vect	the vector to multiply with the float.

#### Returns

A new vector.

#### 7.17.4 Member Data Documentation

```
7.17.4.1 x_
float raytracer::Vect3::x_ [private]
the x coordinate

7.17.4.2 y_
float raytracer::Vect3::y_ [private]
the y coordinate

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

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

- includes/raytracer/vect.hh
- src/raytracer/vect.cc

the z coordinate

60 Class Documentation

# **Chapter 8**

# **File Documentation**

### 8.1 includes/fwd.hh File Reference

### **Namespaces**

- raytracer
- gameobj

### 8.2 includes/gameobj/ambientlight.hh File Reference

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

#### Classes

· class gameobj::AmbientLight

### **Namespaces**

• gameobj

### 8.3 includes/gameobj/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 gameobj::Cube

#### **Namespaces**

gameobj

### 8.4 includes/gameobj/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 gameobj::DirectionalLight

### **Namespaces**

gameobj

### 8.5 includes/gameobj/flatshapable.hh File Reference

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

#### **Classes**

· class gameobj::FlatShapable

### **Namespaces**

gameobj

### 8.6 includes/gameobj/lightable.hh File Reference

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

#### Classes

• class gameobj::Lightable

### **Namespaces**

· gameobj

### 8.7 includes/gameobj/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 gameobj::Plan

#### **Namespaces**

• gameobj

### 8.8 includes/gameobj/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 gameobj::PointLight

#### **Namespaces**

• gameobj

### 8.9 includes/gameobj/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 gameobj::Shapable

### **Namespaces**

• gameobj

### 8.10 includes/gameobj/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 gameobj::Square

### **Namespaces**

• gameobj

### 8.11 includes/raytracer/camera.hh File Reference

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

#### Classes

· class raytracer::Camera

### **Namespaces**

raytracer

### 8.12 includes/raytracer/color.hh File Reference

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

### Classes

• class raytracer::Color

### **Namespaces**

raytracer

#### **Functions**

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

### 8.13 includes/raytracer/landmark.hh File Reference

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

### Classes

· class raytracer::Landmark

### **Namespaces**

· raytracer

### 8.14 includes/raytracer/ray.hh File Reference

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

### Classes

class raytracer::Ray

### **Namespaces**

raytracer

### 8.15 includes/raytracer/screen.hh File Reference

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

### **Classes**

• class raytracer::Screen

### **Namespaces**

raytracer

### 8.16 includes/raytracer/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< gameobj::Shapable \*> &objects, const std::vector< Ray > &rays, const std::vector< gameobj::Lightable \*> &lightList)

#### **Variables**

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

### 8.17 includes/raytracer/vect.hh File Reference

Vect2 and Vect3 class managing vector operation.

```
#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)

### 8.17.1 Detailed Description

Vect2 and Vect3 class managing vector operation.

### 8.18 includes/ui/gameui.hh File Reference

Vect2 and Vect3 class managing vector operation.

```
#include "fwd.hh"
#include "color.hh"
#include <SDL2/SDL.h>
#include <vector>
#include <string>
```

#### Classes

· class gameui::UIScreen

Class to interacte with the user visual output.

### **Namespaces**

• gameui

### **Enumerations**

enum gameui::WINDOWPARAM { gameui::NO\_FULLSCREEN = 0, gameui::FULLSCREEN = 1, gameui::FULLSCREEN\_DESKTOP = 2, gameui::BORDERLESS = 4 }

Posible parameters for a window.

### 8.18.1 Detailed Description

Vect2 and Vect3 class managing vector operation.

### 8.19 README.md File Reference

### 8.20 src/gameobj/ambientlight.cc File Reference

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

### 8.21 src/gameobj/cube.cc File Reference

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

### 8.22 src/gameobj/dirlight.cc File Reference

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

### 8.23 src/gameobj/plan.cc File Reference

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

#### **Functions**

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

### 8.23.1 Function Documentation

### 8.23.1.1 computeD()

### 8.24 src/gameobj/pointlight.cc File Reference

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

### 8.25 src/gameobj/square.cc File Reference

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

### 8.26 src/main.cc File Reference

```
#include <iostream>
#include <vector>
#include <cmath>
#include <string>
#include <fstream>
#include <SDL2/SDL.h>
#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"
#include "gameui.hh"
```

#### **Functions**

- void writeRender (std::string filename, std::vector< raytracer::Color > &pixels, unsigned width, unsigned height)
- int main (int argc, char \*argv[])

### 8.26.1 Function Documentation

#### 8.26.1.1 main()

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

#### 8.26.1.2 writeRender()

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

### 8.27 src/raytracer/camera.cc File Reference

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

### 8.28 src/raytracer/color.cc File Reference

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

### 8.29 src/raytracer/landmark.cc File Reference

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

### 8.30 src/raytracer/ray.cc File Reference

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

### 8.31 src/raytracer/screen.cc File Reference

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

### 8.32 src/raytracer/utils.cc File Reference

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

### 8.33 src/raytracer/vect.cc File Reference

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

### 8.34 src/ui/gameui.cc File Reference

```
#include "gameui.hh"
```

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