Fotorealistyczna Grafika Komputerowa

Pan Trójkąt

Adam Błaszczyk 239636
Antonina Matuszek 239687

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Chapter 1

Hierarchical Index

1.1 Class Hierarchy

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

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Chapter 2

Class Index

2.1 Class List

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

light_intensity.LightIntensity
: Documentation for a class LightIntensity . . . 5

mesh.Mesh
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image.MyImage
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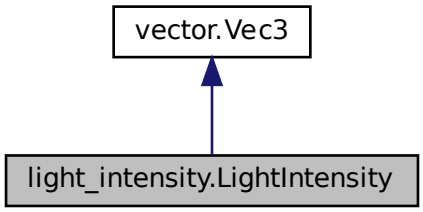
Chapter 3

Class Documentation

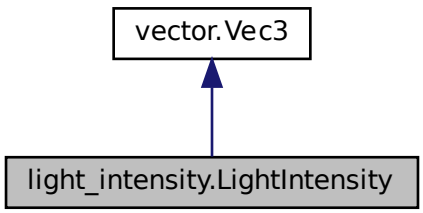
3.1 light_intensity.LightIntensity Class Reference

Documentation for a class LightIntensity.

Inheritance diagram for light_intensity.LightIntensity:



Collaboration diagram for light_intensity.LightIntensity:



Public Member Functions

- def clamp_0_1 (light)

  Function clamping values to 0 - 1 range.
- def clamp_0_255 (light)

  Function clamping values to 0 - 255 range.

Additional Inherited Members

3.1.1 Detailed Description

Documentation for a class LightIntensity.

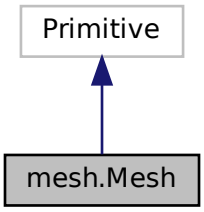
The documentation for this class was generated from the following file:

- light_intensity.py

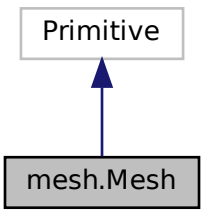
3.2 mesh.Mesh Class Reference

Documentation for a class Mesh.

Inheritance diagram for mesh.Mesh:



Collaboration diagram for mesh.Mesh:



Public Member Functions

- def __init__ (self, obj_file, position=Vec3())

  Constructor.
- def get_detailed_intersection (self, ray)

  Checks if ray intersects with mesh and returns point closest to ray origin.
- def get_intersection (self, ray)

  Function returning intersection point and distance.

Public Attributes

- **triangles**

3.2.1 Detailed Description

Documentation for a class Mesh.

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

- mesh.py

3.3 image.MyImage Class Reference

Documentation for a class MyImage.

Public Member Functions

- def __init__ (self, width=500, height=500)

  The constructor.
- def len (self)

  Function returning image length.
- def clear_color (self, rgb_color)

  Function setting background color.
- def fancy_background (self)

  Function setting background color.
- def set_pixel (self, i, j, value)

  Function changing pixel color.
- def get_pixel_color (self, i, j)

  Function getting pixel color.
- def save_image (self)

  Function saving image to png format.

Public Attributes

- **width**
- **height**
- **image_matrix**

3.3.1 Detailed Description

Documentation for a class MyImage.

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

- image.py

3.4 orthogonal_camera.OrthogonalCamera Class Reference

Class for othogonal camera.

Public Member Functions

- def __init__ (self, position=Vec3(0, 0, 0), view_direction=Vec3(0, 0, 1), width=512, height=512, pixel_size=(0.01, 0.01))

  Constructor.
- def render_scene (self, primitives)

  Function rendering the scene.

Public Attributes

- position

  Position of the camera.
- view_direction

  Direction camera is facing.
- w

  Width in pixels.
- h

  Height in pixels.
- wh_ratio

  Width-height raio.
- hw_ratio

  Height-width ratio.
- arRay

  Array of rays.
- x_angle

  Angle between view direction vector and X axis.
- y_angle

  Angle between view direction vector and Y axis.
- z_angle

  Angle between view direction vector and Z axis.

3.4.1 Detailed Description

Class for othogonal camera.

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

- orthogonal_camera.py

3.5 perspective_camera.PerspectiveCamera Class Reference

Class for othogonal camera.

Public Member Functions

- def __init__ (self, position=Vec3(0, 0, 0), view_direction=Vec3(0, 0, 1), width=512, height=512, near=.1, far=1000, fov=60)

  Constructor.
- def render_scene (self, primitives, antialiasing=True)

  Function rendering the scene.

Static Public Member Functions

- def adaptive_antialiasing (ray, A, B, C, D, E, depth, max_depth, horizontal, vertical, background_color, primitives)

  Function calculating color of pixel using adaptive antialiasing.

Public Attributes

- position

  Position of the camera.
- view_direction

  Direction camera is facing.
- width

  Width in pixels.
- height

  Height in pixels.
- near

  Near clipping plane.
- far

  Far clipping plane.
- fov

  Field of View.
- up

  Vector direction aligned with the "up" direction of camera.

3.5.1 Detailed Description

Class for othogonal camera.

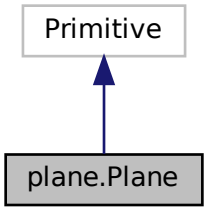
The documentation for this class was generated from the following file:

- perspective_camera.py

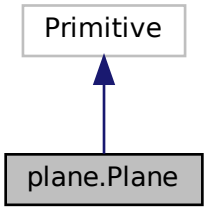
3.6 plane.Plane Class Reference

Documentation for a class Plane.

Inheritance diagram for plane.Plane:



Collaboration diagram for plane.Plane:



Public Member Functions

- def __init__ (self, normal_vector, d, color=[1, 0, 1])

  Constructor.
- def __str__ (self)

  Function returning object values in string format.
- def get_detailed_intersection (self, ray)

  Returns tuple with multiple data: point (None if no intersection), distance to point.
- def get_intersection (self, ray)

  Checks if plane and ray intersect witch each other and returns intersection point if they do, otherwise None.

Public Attributes

- normal_vector

  Vector perpendicular to plane.
- a

  Represents A in 'Ax + By + Cz D = 0' equation.
- b

  Represents B in 'Ax + By + Cz D = 0' equation.
- c

  Represents C in 'Ax + By + Cz D = 0' equation.
- d

  Represents D in 'Ax + By + Cz D = 0' equation.

3.6.1 Detailed Description

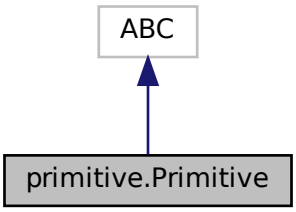
Documentation for a class Plane.

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

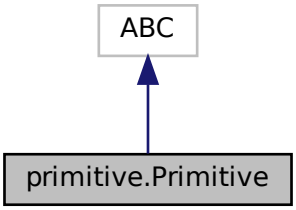
- plane.py

3.7 primitive.Primitive Class Reference

Inheritance diagram for primitive.Primitive:



Collaboration diagram for primitive.Primitive:



Public Member Functions

- def **__init__** (self, color)
- def **get_intersection** (self, ray)
- def **get_detailed_intersection** (self, ray)

Public Attributes

- **color**

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

- primitive.py

3.8 ray.Ray Class Reference

Documentation for a class Ray.

Public Member Functions

- def __init__ (self, origin=Vec3(0, 0, 0), direction=None, target=None, length=math.inf)

  Constructor.
- def __str__ (self)

  Function returning object values in string format.
- def is_point_on_ray (self, point)

  Check if point is on ray, returns true if yes, false otherwise.
- def set_direction (self, new_direction)

  Sets new direction vector and converts it to normalized vector.
- def set_target (self, new_target)

  Sets new target and updates direction vector.
- def get_plane_intersection (self, plane)

  Plane.get_intersection(ray) wrapper.
- def get_sphere_intersection (self, sphere)

  Sphere.get_intersection(ray) wrapper.
- def get_sphere_intersections (self, sphere)

  Sphere.get_ray_intersections(ray) wrapper.
- def get_pixel_color (self, primitives)

  Iterates through list of primitives and returns color of the pixel.

Public Attributes

- origin

  Origin vector of a given ray.
- direction

  Direction vector of a given ray.
- target

  Target point of a given ray.
- length

  Length of a given ray.

3.8.1 Detailed Description

Documentation for a class Ray.

3.8.2 Member Data Documentation

3.8.2.1 direction

`ray.Ray.direction`

Direction vector of a given ray.

Cannot be (0, 0, 0).

3.8.2.2 length

`ray.Ray.length`

Length of a given ray.

Default = Infinity

3.8.2.3 origin

`ray.Ray.origin`

Origin vector of a given ray.

Default = (0, 0, 0)

3.8.2.4 target

`ray.Ray.target`

Target point of a given ray.

Cannot be the same as origin.

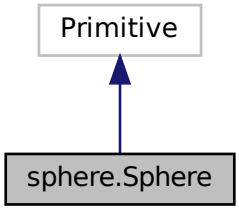
The documentation for this class was generated from the following file:

- ray.py

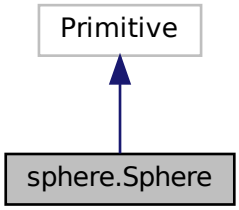
3.9 sphere.Sphere Class Reference

Documentation for a class Sphere.

Inheritance diagram for sphere.Sphere:



Collaboration diagram for sphere.Sphere:



Public Member Functions

- def __init__ (self, centre=Vec3(0, 0, 0), radius=1, color=[1, 0, 1])

  Constructor.
- def change_radius (self, new_radius)

  Sets radius and recalculates area and volume.
- def __str__ (self)

  Function returning object values in string format.
- def get_ray_intersections (self, ray)

  Checks if ray intersects with sphere and returns intersection points in form one- or two-element array.
- def get_intersection (self, ray)

  Checks if ray intersects with sphere and returns point closest to ray origin.
- def get_detailed_intersection (self, ray)

  Function returning intersection point and distance.

Public Attributes

- centre

  Centre of the sphere.
- **color**
- radius

  Radius of the sphere.
- area

  Area of the sphere.
- volume

  Volume of the sphere.

3.9.1 Detailed Description

Documentation for a class Sphere.

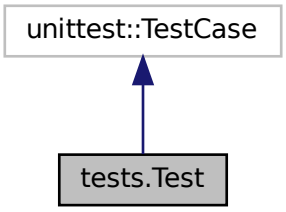
The documentation for this class was generated from the following file:

- sphere.py

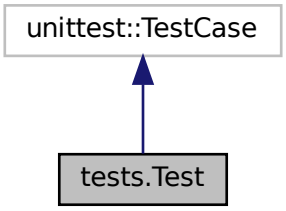
3.10 tests.Test Class Reference

Documentation for a class Test.

Inheritance diagram for tests.Test:



Collaboration diagram for tests.Test:



Public Member Functions

- def **setUp** (self)
- def test_add (self)

  Vector tests.
- def test_sub (self)

  Vector tests.
- def test_pos (self)

  Vector tests.
- def test_neg (self)

  Vector tests.
- def test_length (self)

  Vector tests.
- def test___truediv__ (self)

  Vector tests.
- def test_mul (self)

  Vector tests.
- def test_cross (self)

  Vector tests.
- def test_point_on_line (self)

  Ray tests.
- def test_plane_intersection (self)

  Plane tests.
- def test_get_centre (self)

  Sphere tests.
- def test_get_radius (self)

  Sphere tests.
- def test_surface_area (self)

  Sphere tests.
- def test_get_volume (self)

  Sphere tests.
- def test_get_sphere_intersection (self)

  Sphere tests.
- def test_clamp_0_255 (self)

  Light intensity tests.

Public Attributes

- **v1**
- **v2**
- **v3**
- **v4**
- **v5**
- **v6**
- **v7**
- **r1**
- **r2**
- **r3**
- **r4**
- **p1**
- **p2**
- **s1**
- **s2**
- **li1**
- **li2**
- **li3**

3.10.1 Detailed Description

Documentation for a class Test.

Unit tests.

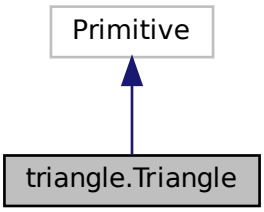
The documentation for this class was generated from the following file:

- tests.py

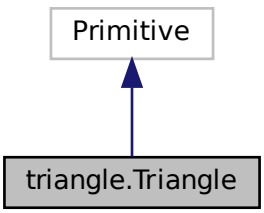
3.11 triangle.Triangle Class Reference

Documentation for a class Triangle.

Inheritance diagram for triangle.Triangle:



Collaboration diagram for triangle.Triangle:



Public Member Functions

- def __init__ (self, v1=Vec3(0, 0, 0), v2=Vec3(0, 0, 0), v3=Vec3(0, 0, 0), color=[1, 0, 1])

  Constructor.
- def __str__ (self)

  Function returning object values in string format.
- def get_ray_intersections (self, ray)

  Checks if ray intersects with triangle and returns intersection points in form one- or two-element array.
- def get_intersection (self, ray)

  Checks if ray intersects with triangle and returns point closest to ray origin.
- def get_detailed_intersection (self, ray)

  Function returning intersection point and distance.

Public Attributes

- v1

  Triangle vertex.
- v2

  Triangle vertex.
- v3

  Triangle vertex.
- color

  Color of triangle.
- normal_vector

  Vector perpendicular to plane.

3.11.1 Detailed Description

Documentation for a class Triangle.

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

- triangle.py

3.12 vector.Vec2 Class Reference

Documentation for a class Vec2.

Public Member Functions

- def __init__ (self, x, y)

  The constructor.
- def __add__ (self, other)

  Function returning sum of two vectors or sum of a vector and a scalar.
- def __iadd__ (self, other)

  Function returning sum (In-place addition) of two vectors or sum of a vector and a scalar.
- def __sub__ (self, other)

  Function returning difference of two vectors or difference of a vector and a scalar.
- def __isub__ (self, other)

  Function returning difference (In-place Subtraction) of two vectors or difference of a vector and a scalar.
- def __eq__ (self, other)

  Function "equal".
- def __abs__ (self)

  Function returning absolute value of a given vector.
- def __ne__ (self, other)

  Function "not equal".
- def __neg__ (self)

  Function negating vector coordinates.
- def __pos__ (self)

  Function for positive vector coordinates.
- def __str__ (self)

  Function returning object values in string format.
- def length (self)

  Function returning vector length.
- def distance (self, other)

  Function returning the length of the displacement vector (distance between two points).
- def __truediv__ (self, other)

  Function returning quotient of two vectors or quotient of a vector and a scalar.
- def __itruediv__ (self, other)

  Function returning quotient (In-place Division) of two vectors or quotient of a vector and a scalar.
- def __mul__ (self, other)

  Function returning dot product of two vectors or dot product of a vector and a scalar.
- def __imul__ (self, other)

  Function returning dot product (In-place multiplication) of two vectors or dot product of a vector and a scalar.
- def __rmul__ (self, other)

  Function returning cross product of two vectors.

Public Attributes

- x

  A class variable.
- y

  A class variable.

3.12.1 Detailed Description

Documentation for a class Vec2.

3.12.2 Member Data Documentation

3.12.2.1 x

`vector.Vec2.x`

A class variable.

Coordinate x of a given vector.

3.12.2.2 y

`vector.Vec2.y`

A class variable.

Coordinate y of a given vector.

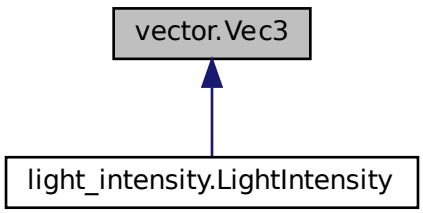
The documentation for this class was generated from the following file:

- vector.py

3.13 vector.Vec3 Class Reference

Documentation for a class Vec3.

Inheritance diagram for vector.Vec3:



Public Member Functions

- def __init__ (self, x=0, y=0, z=0)

  The constructor.
- def **x** (self)
- def **x** (self, inp)
- def **x** (self)
- def **y** (self)
- def **y** (self, inp)
- def **y** (self)
- def **z** (self)
- def **z** (self, inp)
- def **z** (self)
- def __add__ (self, other)

  Function returning sum of two vectors or sum of a vector and a scalar.
- def __iadd__ (self, other)

  Function returning sum (In-place addition) of two vectors or sum of a vector and a scalar.
- def __sub__ (self, other)

  Function returning difference of two vectors or difference of a vector and a scalar.
- def __isub__ (self, other)

  Function returning difference (In-place Subtraction) of two vectors or difference of a vector and a scalar.
- def __eq__ (self, other)

  Function "equal".
- def __abs__ (self)

  Function returning absolute value of a given vector.
- def __ne__ (self, other)

  Function "not equal".
- def __neg__ (self)

  Function negating vector coordinates.
- def __pos__ (self)

  Function for positive vector coordinates.
- def __str__ (self)

  Function returning object values in string format.
- def length (self)

  Function returning vector length.
- def distance (self, other)

  Function returning the length of the displacement vector (distance between two points).
- def is_point_on_ray (self, ray)

  Is point on ray wrapper.
- def **normalize** (self)
- def __truediv__ (self, other)

  Function returning quotient of two vectors or quotient of a vector and a scalar.
- def __itruediv__ (self, other)

  Function returning quotient (In-place Division) of two vectors or quotient of a vector and a scalar.
- def __mul__ (self, other)

  Function returning dot product of two vectors or dot product of a vector and a scalar.
- def __imul__ (self, other)

  Function returning dot product (In-place multiplication) of two vectors or dot product of a vector and a scalar.
- def __rmul__ (self, other)

  Function returning dot product (Reverse multiplication).
- def cross (self, other)

  Function returning cross product of two vectors.

Public Attributes

- x
  A class variable.
- y
  A class variable.
- z
  A class variable.

Static Public Attributes

- def r = x
  Alias
- def g = y
  Alias.
- def b = z
  Alias.

3.13.1 Detailed Description

Documentation for a class Vec3.

3.13.2 Member Data Documentation

3.13.2.1 x

`vector.Vec3.x`

A class variable.

Coordinate x of a given vector.

3.13.2.2 y

`vector.Vec3.y`

A class variable.

Coordinate y of a given vector.

3.13.2.3 z

`vector.Vec3.z`

A class variable.

Coordinate z of a given vector.

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

- vector.py

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