Aqua

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Chapter 1

Hierarchical Index

1.1 Class Hierarchy

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

Chapter 2

Class Index

2.1 Class List

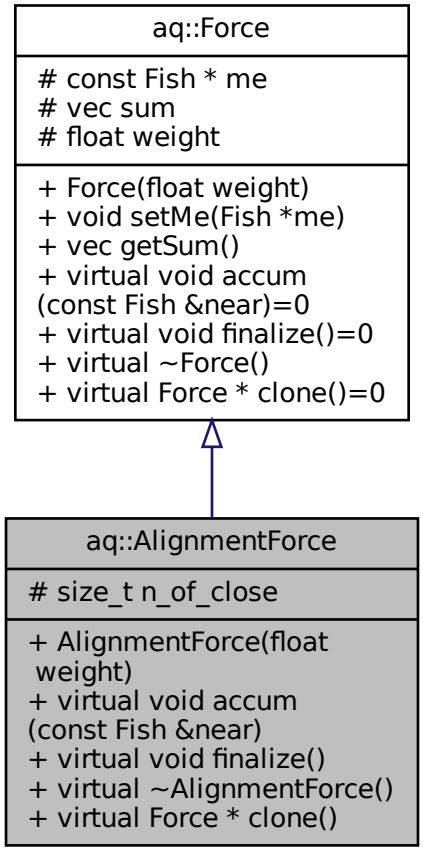
Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 3

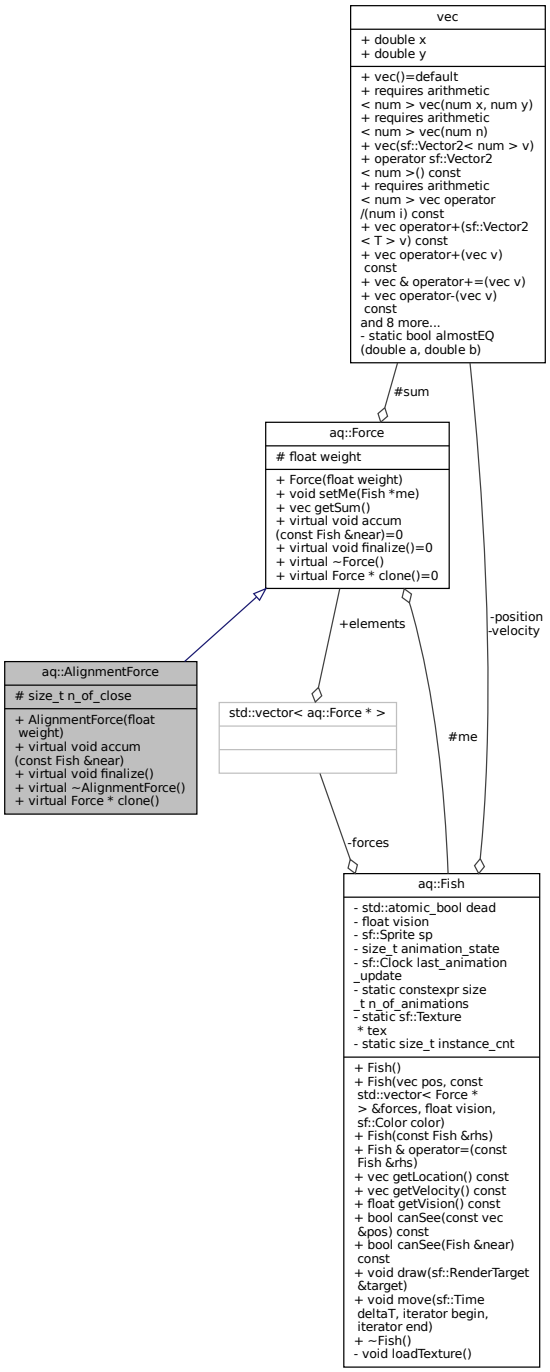
Class Documentation

3.1 aq::AlignmentForce Class Reference

Inheritance diagram for aq::AlignmentForce:



Collaboration diagram for aq::AlignmentForce:



Public Member Functions

- **AlignmentForce** (float weight)
- virtual void **accum** (const Fish &near)
- virtual void **finalize** ()
- virtual Force ∗ **clone** ()

Protected Attributes

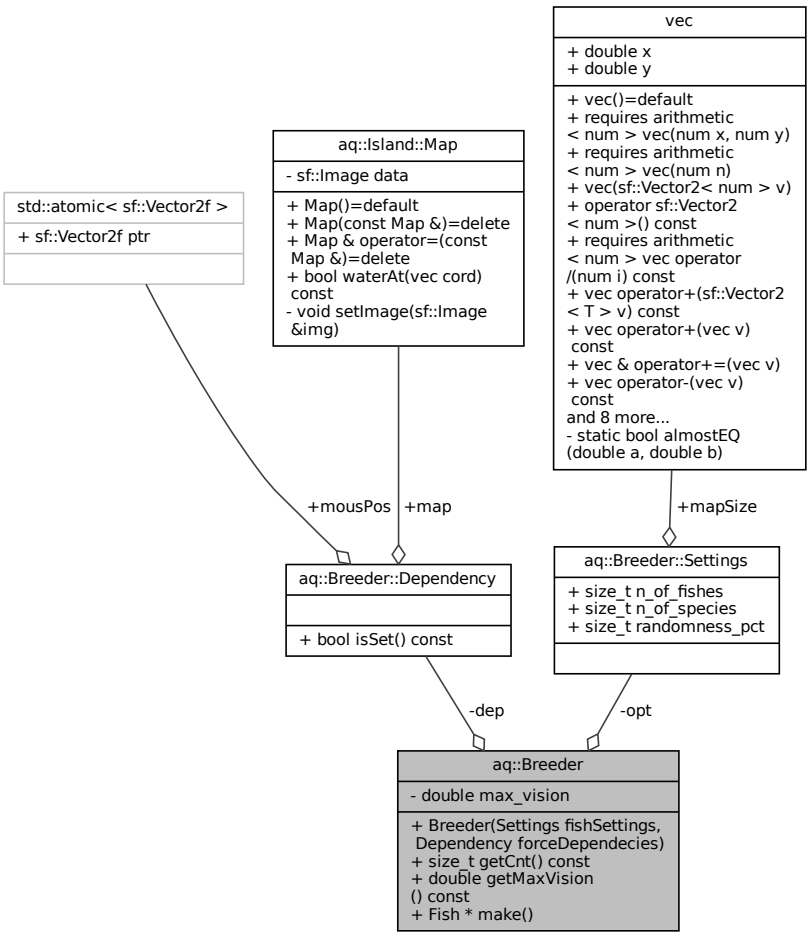
- size_t **n_of_close** {0}

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

- inc/forces.hpp

3.2 aq::Breeder Class Reference

Collaboration diagram for aq::Breeder:



Classes

- struct Dependency
- struct Settings

Public Member Functions

- **Breeder** (Settings fishSettings, Dependency forceDependecies)
- size_t **getCnt** () const
- double **getMaxVision** () const
- Fish * **make** ()

Private Attributes

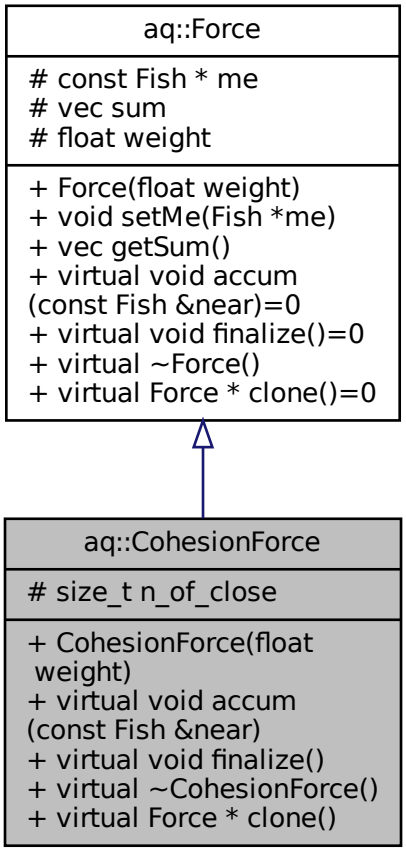
- const Settings **opt**
- const Dependency **dep**
- double **max_vision** = 0

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

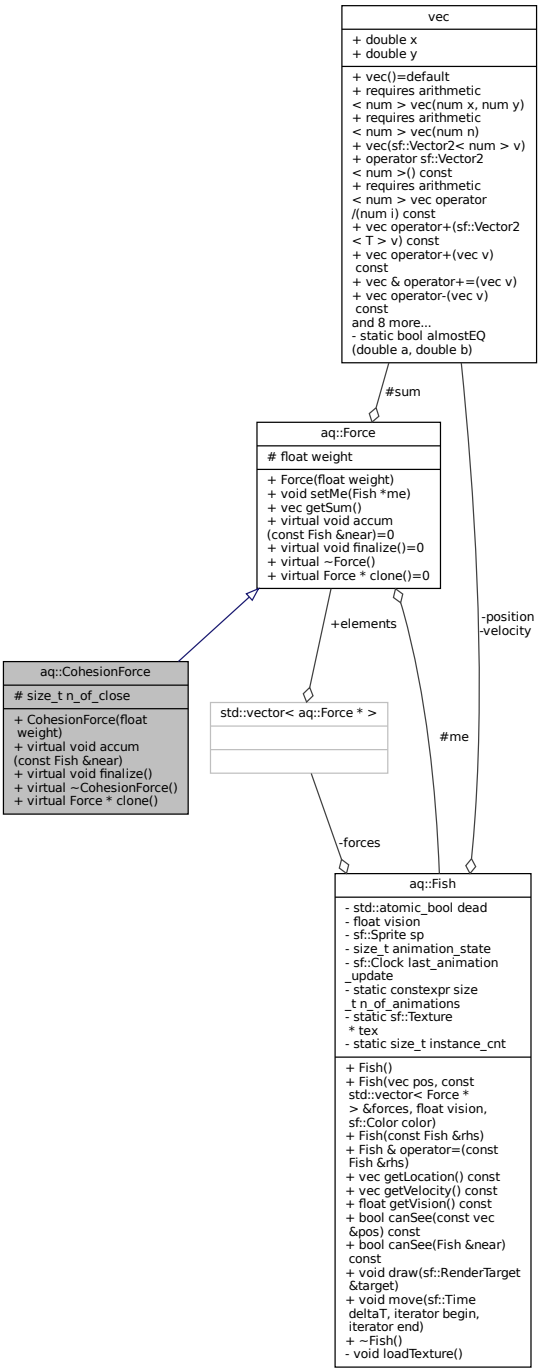
- inc/breeder.hpp
- src/breeder.cpp

3.3 aq::CohesionForce Class Reference

Inheritance diagram for aq::CohesionForce:



Collaboration diagram for aq::CohesionForce:



Public Member Functions

- **CohesionForce** (float weight)
- virtual void **accum** (const Fish &near)
- virtual void **finalize** ()
- virtual Force ∗ **clone** ()

Protected Attributes

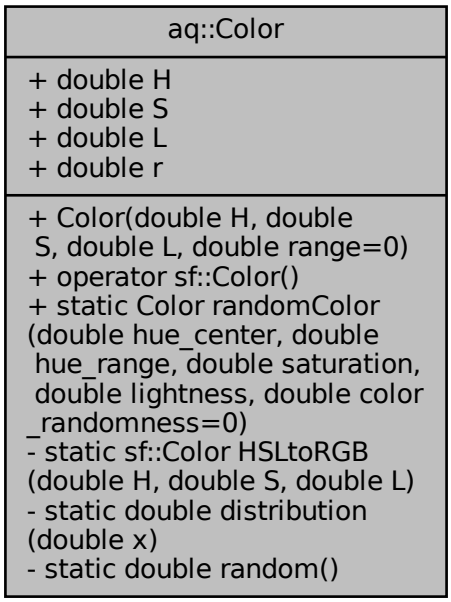
- size_t **n_of_close** {0}

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

- inc/forces.hpp

3.4 aq::Color Class Reference

Collaboration diagram for aq::Color:



Public Member Functions

- Color (double H, double S, double L, double range=0)
- **operator sf::Color** ()

Static Public Member Functions

- static Color randomColor (double hue_center, double hue_range, double saturation, double lightness, double color_randomness=0)

  Generate a random color centered with a distribution.

Public Attributes

- double **H**
- double **S**
- double **L**
- double **r**

Static Private Member Functions

- static sf::Color HSLtoRGB (double H, double S, double L)
- static double **distribution** (double x)
- static double **random** ()

3.4.1 Constructor & Destructor Documentation

3.4.1.1 Color()

```
aq::Color::Color (
            double H,
            double S,
            double L,
            double range = 0 )  [inline]
```

Parameters

H	Hue [0,360)
S	Saturation [0,1]
L	Lightness [0,1]
range	allowed +- from hue

3.4.2 Member Function Documentation

3.4.2.1 HSLtoRGB()

```
sf::Color Color::HSLtoRGB (
            double H,
            double S,
            double L )  [static], [private]
```

Equations from https://en.wikipedia.org/wiki/HSL_and_HSV

3.4.2.2 randomColor()

```
static Color aq::Color::randomColor (
            double hue_center,
            double hue_range,
            double saturation,
            double lightness,
            double color_randomness = 0 )  [inline], [static]
```

Generate a random color centered with a distribution.

Parameters

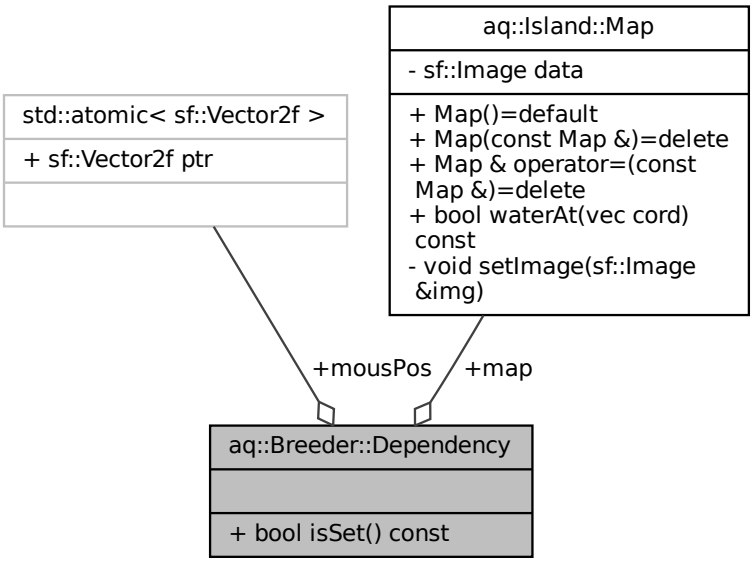
hue_center	[0,360)
hue_range	allowed +- from center
color_randomness	randomness of rgb generated from the returned color

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

- inc/color.hpp
- src/color.cpp

3.5 aq::Breeder::Dependency Struct Reference

Collaboration diagram for aq::Breeder::Dependency:



Public Member Functions

- bool **isSet** () const

Public Attributes

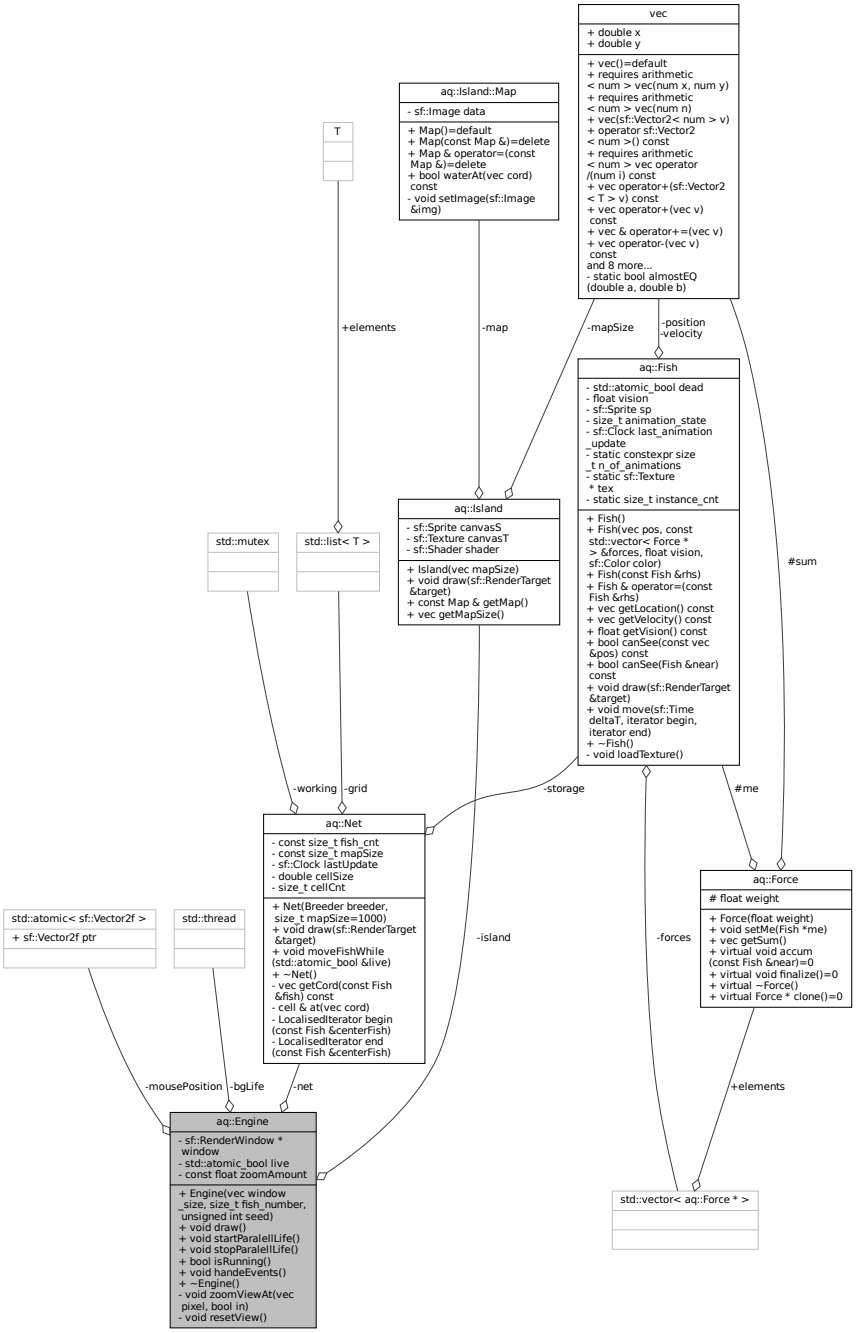
- const Island::Map * **map**
- const std::atomic< sf::Vector2f > * **mousPos**

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

- inc/breeder.hpp

3.6 aq::Engine Class Reference

Collaboration diagram for aq::Engine:



Public Member Functions

- **Engine** (vec window_size, size_t fish_number, unsigned int seed)
- void **draw** ()
- void **startParalellLife** ()
- void **stopParalellLife** ()
- bool **isRunning** ()
- void **handeEvents** ()

Private Member Functions

- void **zoomViewAt** (vec pixel, bool in)
- void **resetView** ()

Private Attributes

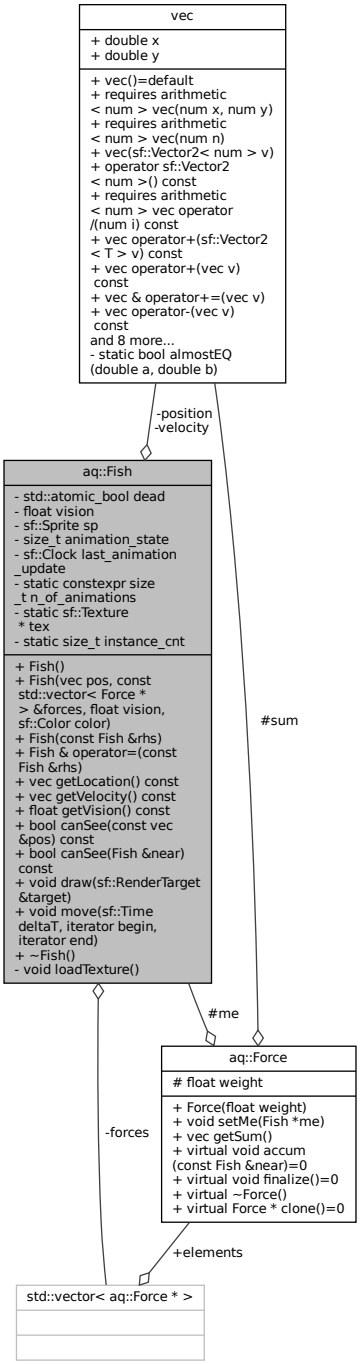
- sf::RenderWindow * **window**
- Net * **net**
- Island * **island**
- std::atomic_bool **live** {false}
- const float **zoomAmount** = 1.3F
- std::thread **bgLife**
- std::atomic< sf::Vector2f > **mousePosition**

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

- inc/engine.hpp
- src/engine.cpp
- src/event_handler.cpp

3.7 aq::Fish Class Reference

Collaboration diagram for aq::Fish:



Public Member Functions

- **Fish** (vec pos, const std::vector< Force * > &forces, float vision, sf::Color color)
- **Fish** (const Fish &rhs)

- Fish & **operator=** (const Fish &rhs)
- vec **getLocation** () const
- vec **getVelocity** () const
- float **getVision** () const
- bool **canSee** (const vec &pos) const
- bool **canSee** (Fish &near) const
- void **draw** (sf::RenderTarget &target)
- template<typename iterator >
  void **move** (sf::Time deltaT, iterator begin, iterator end)

Private Member Functions

- void **loadTexture** ()

Private Attributes

- vec **position**
- vec **velocity**
- std::vector< Force * > **forces**
- std::atomic_bool **dead** {false}
- float **vision**
- sf::Sprite **sp**
- size_t **animation_state** {0}
- sf::Clock **last_animation_update**

Static Private Attributes

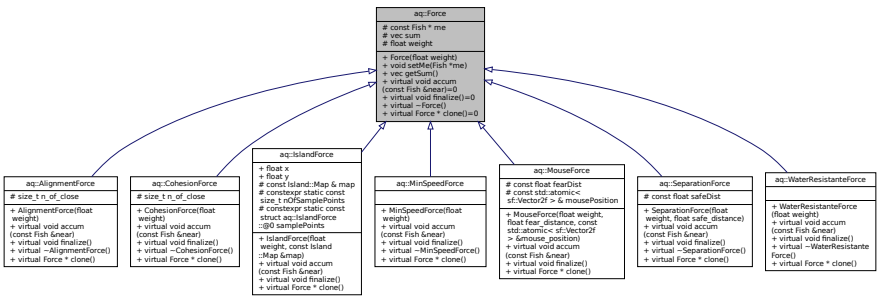
- static constexpr size_t **n_of_animations** = 4
- static sf::Texture * **tex** = nullptr
- static size_t **instance_cnt** = 0

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

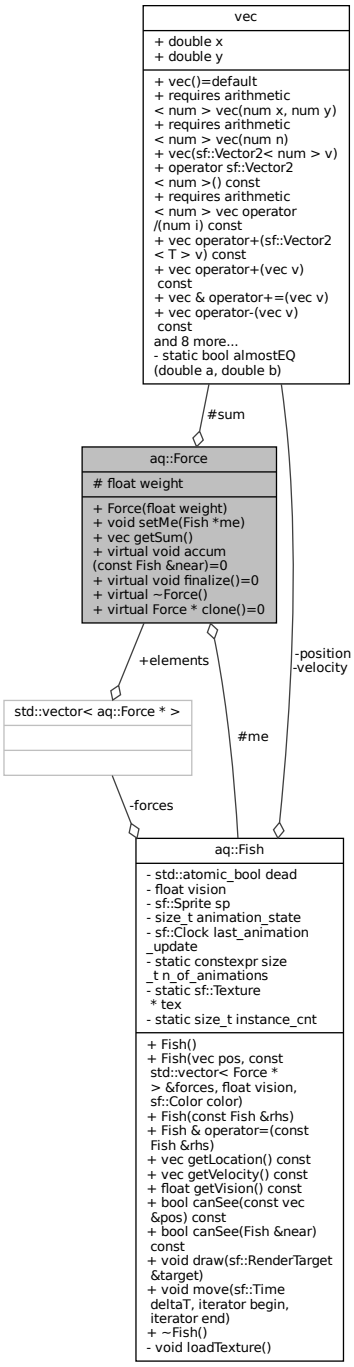
- inc/fish.hpp
- src/fish.cpp

3.8 aq::Force Class Reference

Inheritance diagram for aq::Force:



Collaboration diagram for aq::Force:



Public Member Functions

- **Force** (float weight)
- void **setMe** (Fish ∗me)
- vec **getSum** ()
- virtual void **accum** (const Fish &near)=0
- virtual void **finalize** ()=0
- virtual Force ∗ **clone** ()=0

Protected Attributes

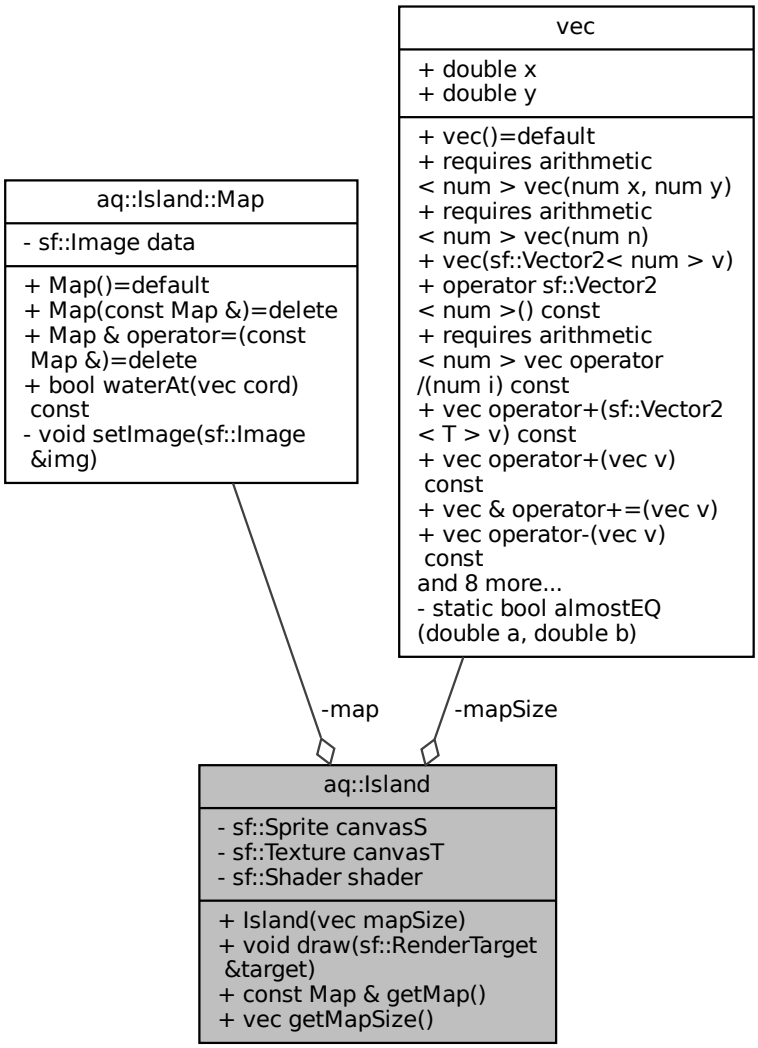
- const Fish * **me** {nullptr}
- vec **sum** {0, 0}
- float **weight**

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

- inc/force.hpp
- src/force.cpp

3.9 aq::Island Class Reference

Collaboration diagram for aq::Island:



Classes

- struct Map

Public Member Functions

- **Island** (vec mapSize)
- void **draw** (sf::RenderTarget &target)
- const Map & **getMap** ()
- vec **getMapSize** ()

Private Attributes

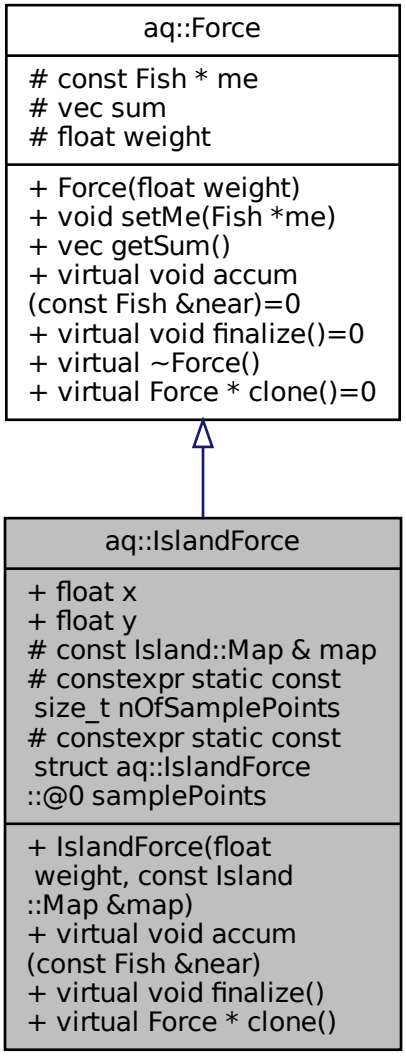
- sf::Sprite **canvasS**
- sf::Texture **canvasT**
- sf::Shader **shader**
- vec **mapSize**
- Map **map**

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

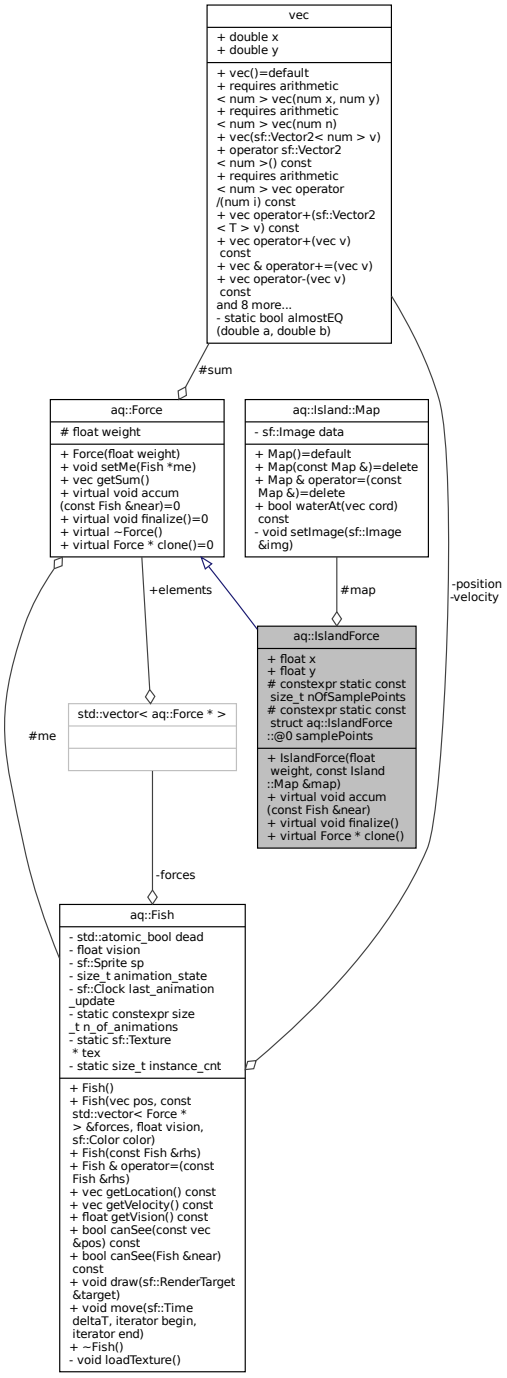
- inc/island.hpp
- src/island.cpp

3.10 aq::IslandForce Class Reference

Inheritance diagram for aq::IslandForce:



Collaboration diagram for aq::IslandForce:



Public Member Functions

- **IslandForce** (float weight, const Island::Map &map)
- virtual void **accum** (const Fish &near)
- virtual void **finalize** ()
- virtual Force ∗ **clone** ()

Protected Attributes

- const Island::Map & **map**

Static Protected Attributes

- constexpr static const size_t **nOfSamplePoints** = 36
- struct {
  float **x**
  float **y**
  } **samplePoints** [nOfSamplePoints]

3.10.1 Member Data Documentation

3.10.1.1

`constexpr { ... } aq::IslandForce::samplePoints[nOfSamplePoints] [static], [protected]`

Initial value:

=

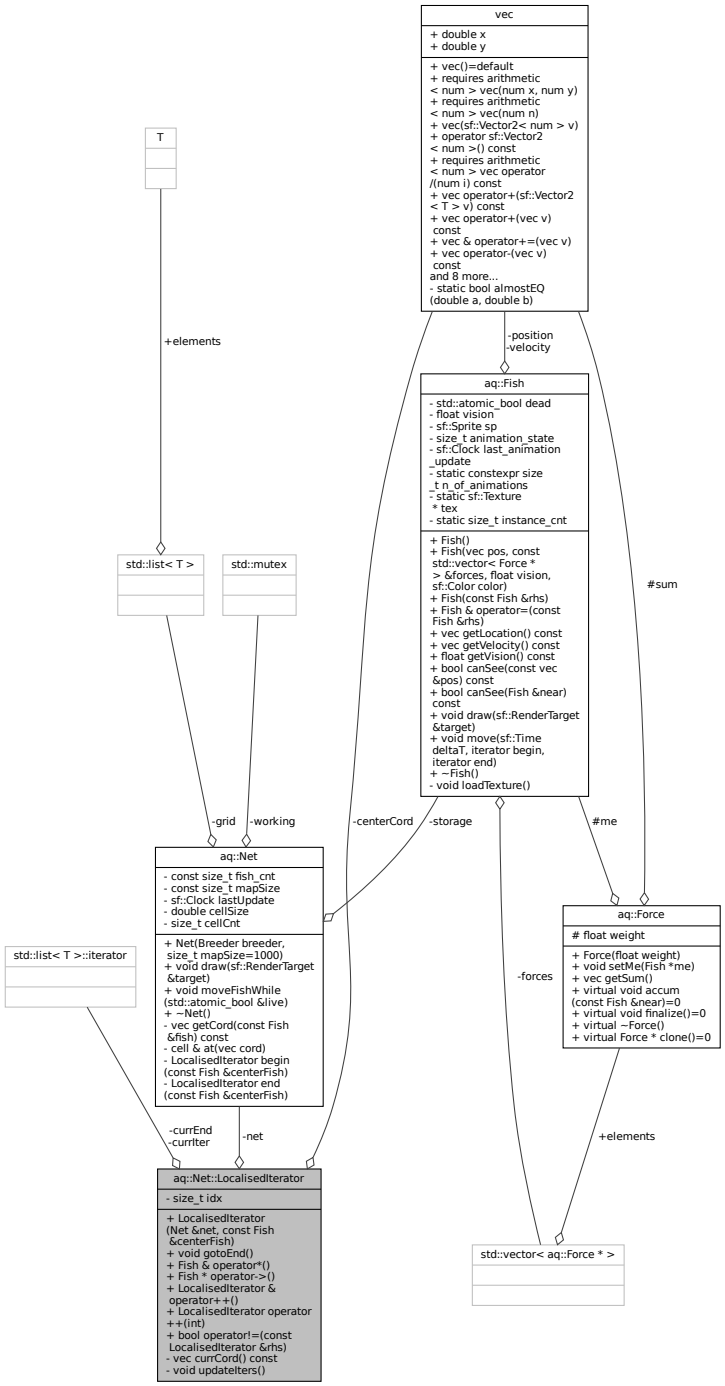
```
 {{1.000, 0.000}, {0.940, 0.342}, {0.766, 0.643}, {0.500, 0.866}, {0.174, 0.985}, {-0.174, 0.985},
{-0.500, 0.866}, {-0.766, 0.643}, {-0.940, 0.342}, {-1.000, 0.000}, {-0.940, -0.342}, {-0.766,
-0.643}, {-0.500, -0.866}, {-0.174, -0.985}, {0.174, -0.985}, {0.500, -0.866}, {0.766, -0.643},
{0.940, -0.342}, {0.667, 0.000}, {0.577, 0.333}, {0.333, 0.577}, {0.000, 0.667}, {-0.333, 0.577},
{-0.577, 0.333}, {-0.667, 0.000}, {-0.577, -0.333}, {-0.333, -0.577}, {-0.000, -0.667}, {0.333,
-0.577}, {0.577, -0.333}, {0.333, 0.000}, {0.167, 0.289}, {-0.167, 0.289}, {-0.333, 0.000}, {-0.167,
-0.289}, {0.167, -0.289}}
```

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

- inc/forces.hpp

3.11 aq::Net::LocalisedIterator Class Reference

Collaboration diagram for aq::Net::LocalisedIterator:



Public Member Functions

- **LocalisedIterator** (Net &net, const Fish &centerFish)
- void **gotoEnd** ()

- Fish & **operator*** ()
- Fish * **operator->** ()
- LocalisedIterator & **operator++** ()
- LocalisedIterator **operator++** (int)
- bool **operator!=** (const LocalisedIterator &rhs)

Private Member Functions

- vec **currCord** () const
- void **updateIters** ()

Private Attributes

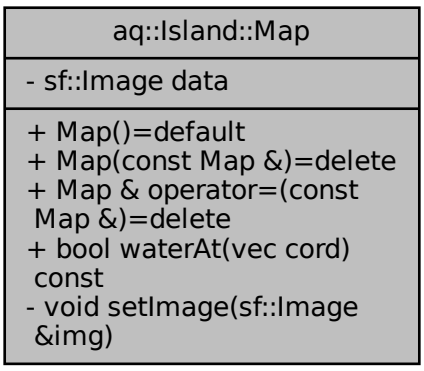
- Net & **net**
- const vec **centerCord**
- cell::iterator **currIter**
- cell::iterator **currEnd**
- size_t **idx** {0}

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

- inc/net.hpp
- src/iter.cpp

3.12 aq::Island::Map Struct Reference

Collaboration diagram for aq::Island::Map:



Public Member Functions

- **Map** (const Map &)=delete
- Map & **operator=** (const Map &)=delete
- bool waterAt (vec cord) const

  Can fish go to cord.

Private Member Functions

- void **setImage** (sf::Image &img)

Private Attributes

- sf::Image **data**

Friends

- class **Island**

3.12.1 Member Function Documentation

3.12.1.1 waterAt()

```
bool Island::Map::waterAt (
            vec cord ) const
```

Can fish go to cord.

Parameters

cord	cord on map

Returns

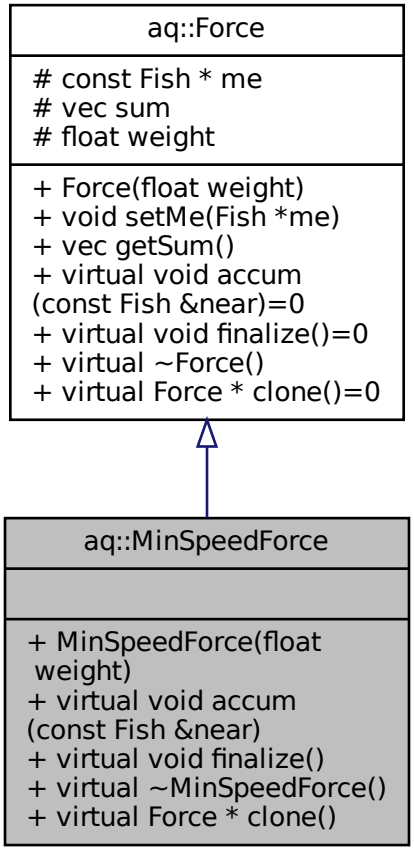
true if water, false is island

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

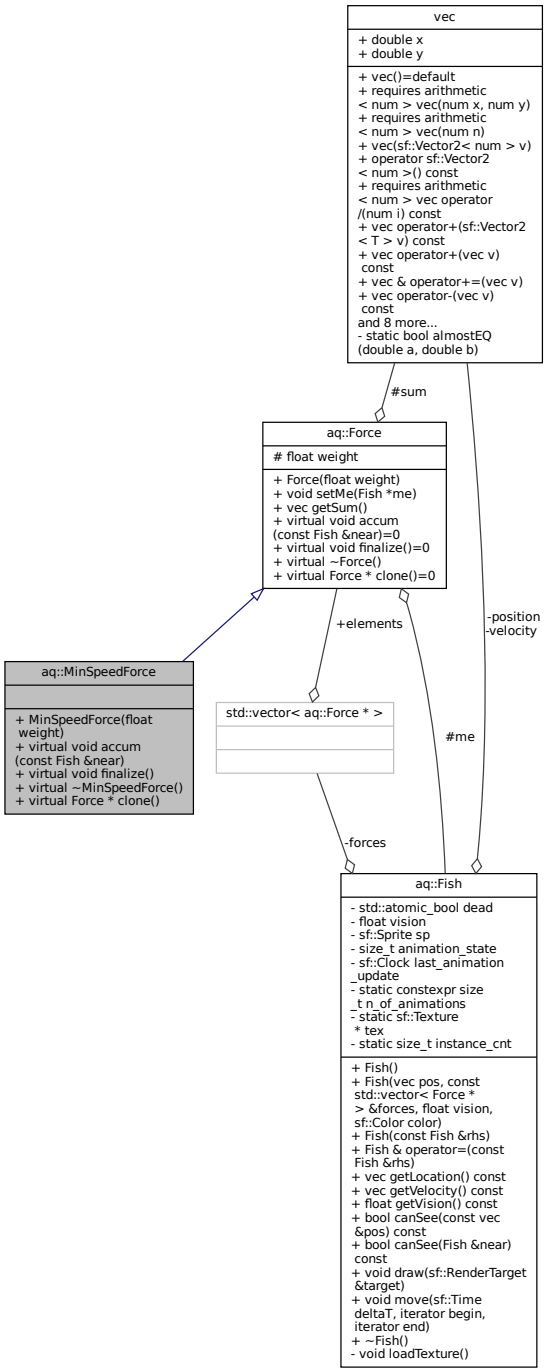
- inc/island.hpp
- src/island.cpp

3.13 aq::MinSpeedForce Class Reference

Inheritance diagram for aq::MinSpeedForce:



Collaboration diagram for aq::MinSpeedForce:



Public Member Functions

- **MinSpeedForce** (float weight)
- virtual void **accum** (const Fish &near)
- virtual void **finalize** ()
- virtual Force ∗ **clone** ()

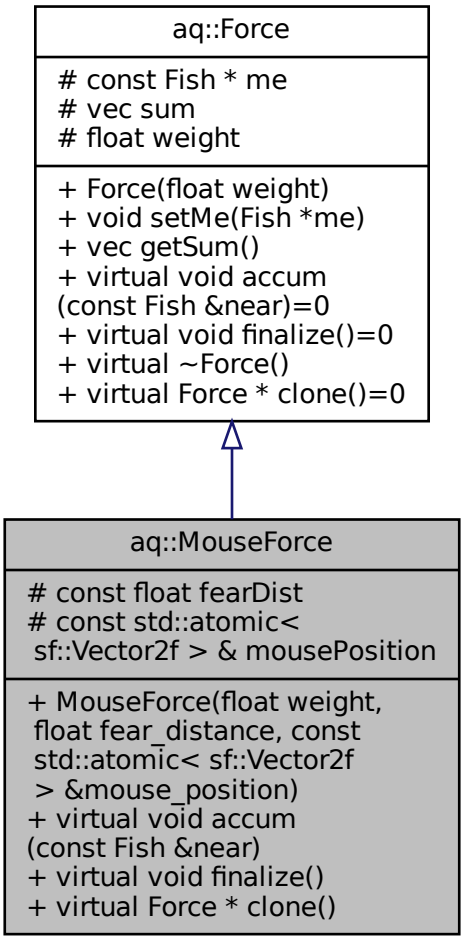
Additional Inherited Members

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

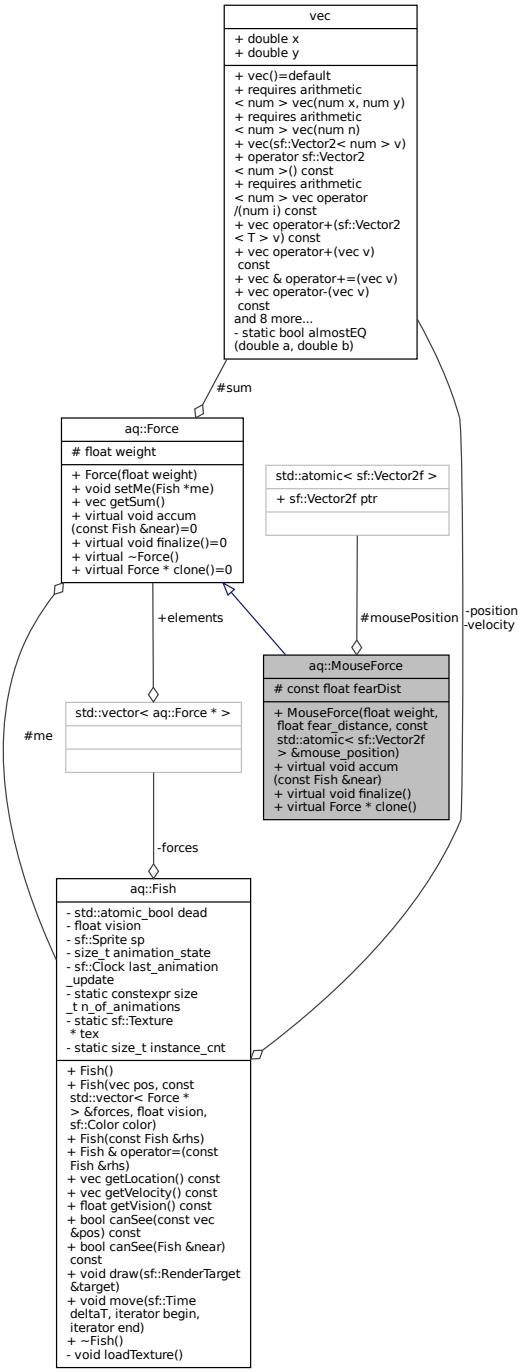
- inc/forces.hpp

3.14 aq::MouseForce Class Reference

Inheritance diagram for aq::MouseForce:



Collaboration diagram for aq::MouseForce:



Public Member Functions

- **MouseForce** (float weight, float fear_distance, const std::atomic< sf::Vector2f > &mouse_position)
- virtual void **accum** (const Fish &near)
- virtual void **finalize** ()
- virtual Force * **clone** ()

Protected Attributes

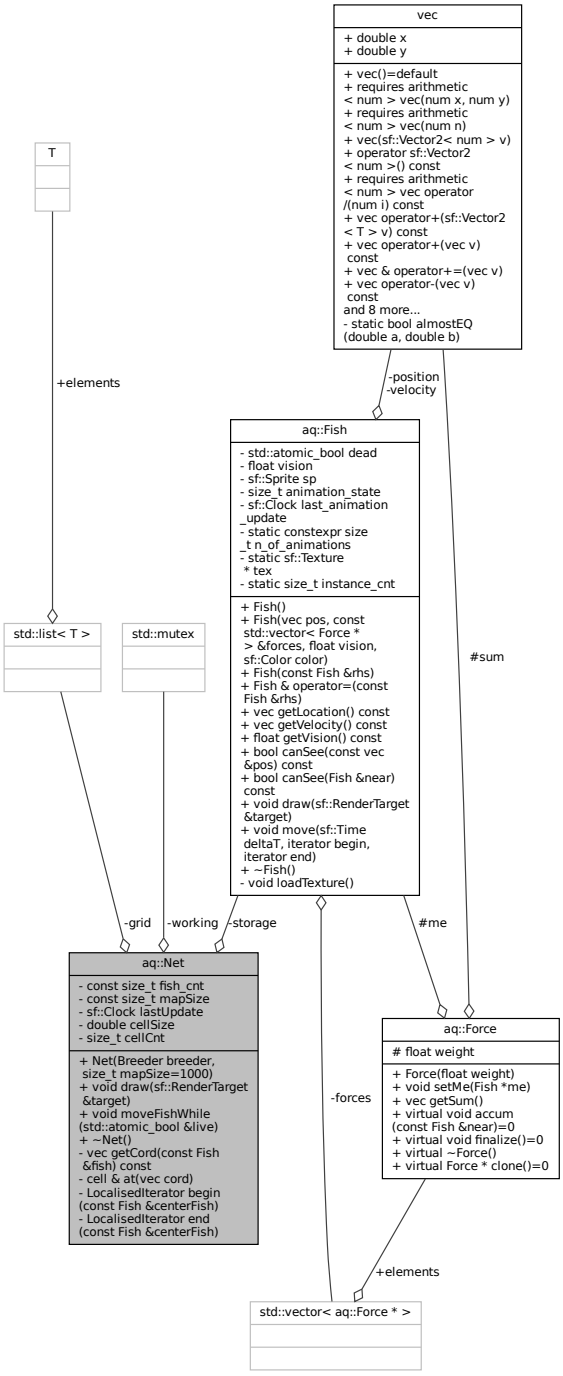
- const float **fearDist**
- const std::atomic< sf::Vector2f > & **mousePosition**

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

- inc/forces.hpp

3.15 aq::Net Class Reference

Collaboration diagram for aq::Net:



Classes

- class LocalisedIterator

Public Types

- typedef std::list< Fish * > **cell**

Public Member Functions

- **Net** (Breeder breeder, size_t mapSize=1000)
- void **draw** (sf::RenderTarget &target)
- void **moveFishWhile** (std::atomic_bool &live)

Private Member Functions

- vec **getCord** (const Fish &fish) const
- cell & **at** (vec cord)
- LocalisedIterator **begin** (const Fish &centerFish)
- LocalisedIterator **end** (const Fish &centerFish)

Private Attributes

- const size_t **fish_cnt**
- Fish * **storage**
- const size_t **mapSize**
- sf::Clock **lastUpdate**
- std::mutex **working**
- cell ** **grid**
- double **cellSize**
- size_t **cellCnt**

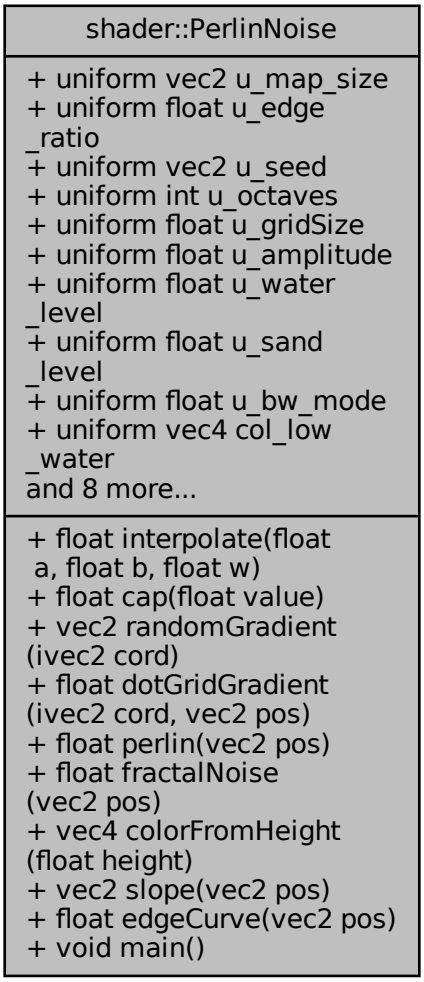
The documentation for this class was generated from the following files:

- inc/net.hpp
- src/net.cpp

3.16 shader::PerlinNoise Class Reference

Simple 2D perlin noise shader.

Collaboration diagram for shader::PerlinNoise:



Public Member Functions

- float interpolate (float a, float b, float w)

  Smoothly interpolates between two values.
- float cap (float value)

  Caps a value between [0, 1].
- vec2 randomGradient (ivec2 cord)

  Computes a pseudo random gradient vector for a given integer coordinate.
- float dotGridGradient (ivec2 cord, vec2 pos)

  Computes the dot product of a random gradient vector and a given position.
- float perlin (vec2 pos)

  2D Perlin noise
- float fractalNoise (vec2 pos)

  Computes a fractal sum of perlin noise.

- vec4 colorFromHeight (float height)

  Computes a color based on the height.
- vec2 **slope** (vec2 pos)
- float **edgeCurve** (vec2 pos)
- void main ()

  Main function.

Public Attributes

- uniform vec2 u_map_size

  Size of the map.
- uniform float u_edge_ratio

  Point where the edge starts to curve up.
- uniform vec2 u_seed

  Seed used as offset.
- uniform int u_octaves

  Number of patterns to sum.
- uniform float u_gridSize

  Size of the grid.
- uniform float u_amplitude

  Start amlitude of the noise.
- uniform float u_water_level

  Threshold for water [0, 1].
- uniform float u_sand_level

  Threshold for sand [0, 1].
- uniform float u_bw_mode

  B&W mask mode toggle, 0 or 1.
- uniform vec4 col_low_water

  Color for deep water.
- uniform vec4 col_high_water

  Color for shallow water.
- uniform vec4 col_low_sand

  Color for low sand.
- uniform vec4 col_high_sand

  Color for high sand.
- uniform vec4 col_low_grass

  Color for low grass.
- uniform vec4 col_high_grass

  Color for high grass.
- uniform vec2 u_resolution

  Size of the window.
- uniform vec2 u_top_left

  Top left corner of the visible area.
- uniform vec2 u_bottom_right

  Bottom right corner of the visible area.

3.16.1 Detailed Description

Simple 2D perlin noise shader.

Code based on the the Perlin noise wikipedia page: https://en.wikipedia.org/wiki/Perlin_noise

Remarks

Fragment-Shader

3.16.2 Member Function Documentation

3.16.2.1 colorFromHeight()

```
vec4 shader::PerlinNoise::colorFromHeight (
            float height )  [inline]
```

Computes a color based on the height.

Parameters

height	in [0, 1]

3.16.2.2 fractalNoise()

```
float shader::PerlinNoise::fractalNoise (
            vec2 pos )  [inline]
```

Computes a fractal sum of perlin noise.

Returns

[0, 1]

3.16.2.3 perlin()

```
float shader::PerlinNoise::perlin (
            vec2 pos )  [inline]
```

2D Perlin noise

Parameters

pos	Position in 2D space

Returns

[-1, 1]

3.16.2.4 randomGradient()

```
vec2 shader::PerlinNoise::randomGradient (
            ivec2 cord )  [inline]
```

Computes a pseudo random gradient vector for a given integer coordinate.

Returns

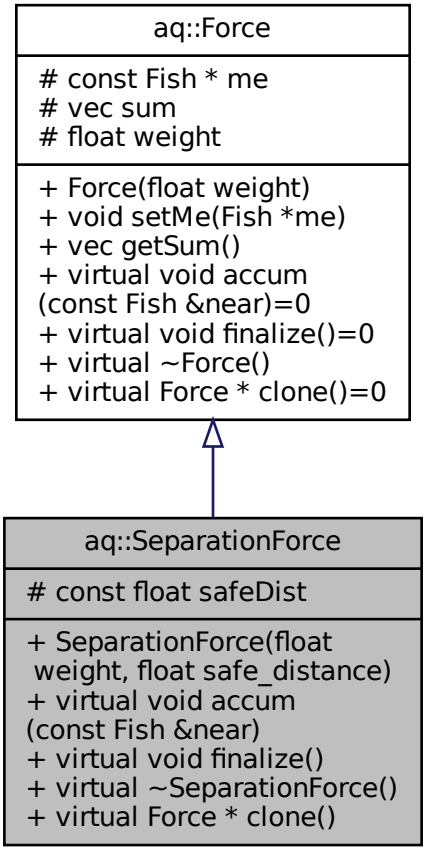
Vector with length 1

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

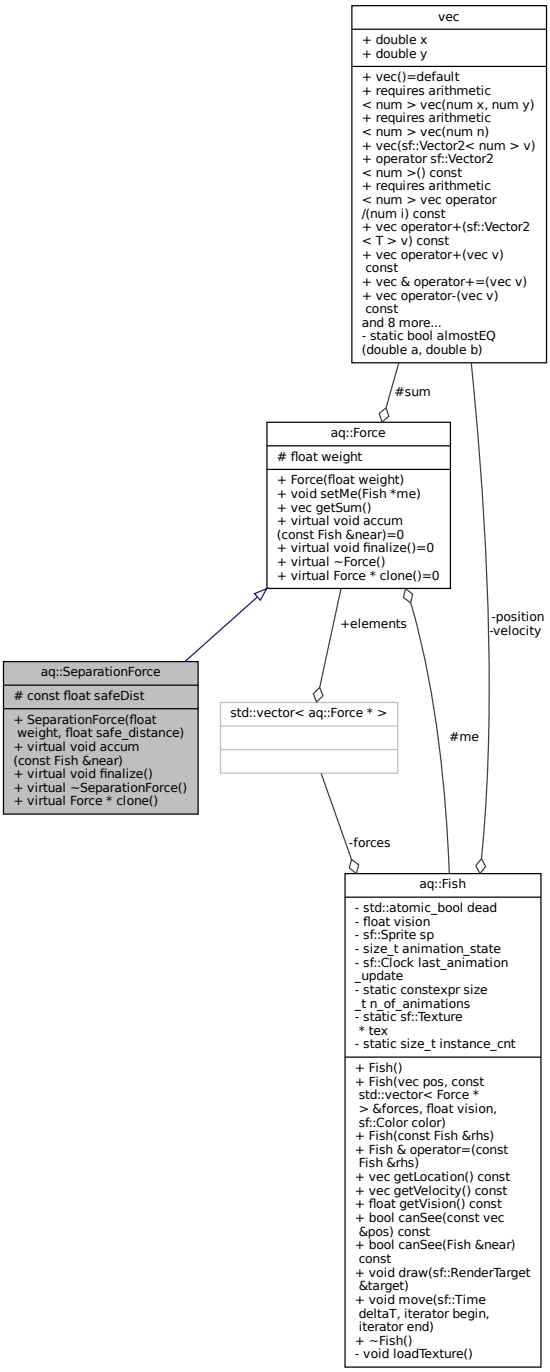
- src/perlin.frag

3.17 aq::SeparationForce Class Reference

Inheritance diagram for aq::SeparationForce:



Collaboration diagram for aq::SeparationForce:



Public Member Functions

- **SeparationForce** (float weight, float safe_distance)
- virtual void **accum** (const Fish &near)
- virtual void **finalize** ()
- virtual Force ∗ **clone** ()

Protected Attributes

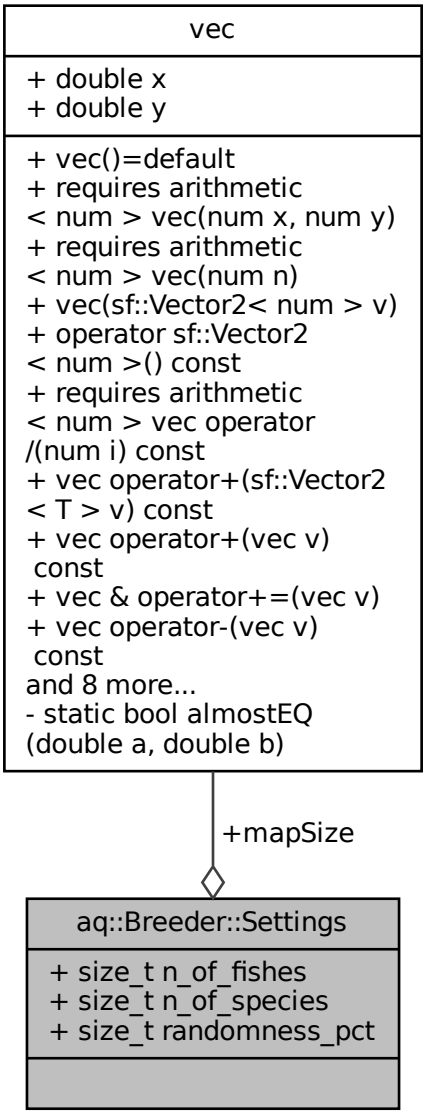
- const float **safeDist**

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

- inc/forces.hpp

3.18 aq::Breeder::Settings Struct Reference

Collaboration diagram for aq::Breeder::Settings:



Public Attributes

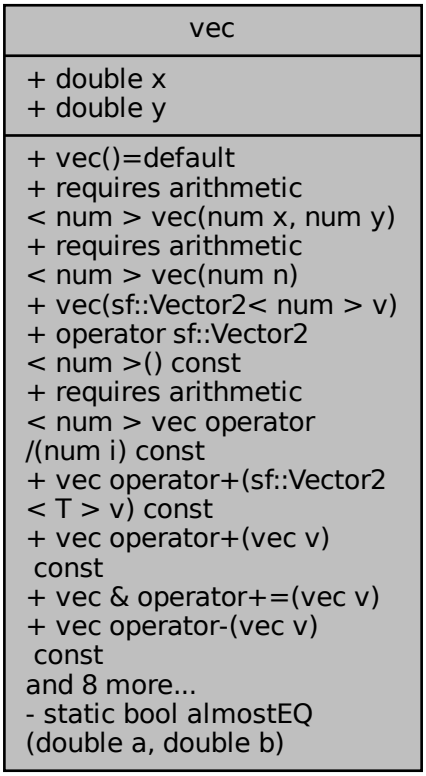
- size_t **n_of_fishes** = 100
- size_t **n_of_species** = 1
- size_t **randomness_pct** = 0
- vec **mapSize**

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

- inc/breeder.hpp

3.19 vec Struct Reference

Collaboration diagram for vec:



Public Member Functions

- template<typename num >
  requires arithmetic< num > **vec** (num x, num y)

- template<typename num >
  requires arithmetic< num > **vec** (num n)
- template<typename num >
  vec (sf::Vector2< num > v)
- template<typename num >
  operator sf::Vector2< **num** > () const
- template<typename num >
  requires arithmetic< num > vec **operator**/ (num i) const
- template<typename T >
  vec **operator+** (sf::Vector2< T > v) const
- vec **operator+** (vec v) const
- vec & **operator+=** (vec v)
- vec **operator-** (vec v) const
- template<typename T >
  vec **operator-** (sf::Vector2< T > v) const
- vec & **operator-=** (vec v)
- bool **operator==** (vec v) const
- bool **operator!=** (vec v) const
- double **len** () const
- vec **norm** () const
- bool **wholeEQ** (vec v) const
- sf::Vector2< ssize_t > **whole** () const

Public Attributes

- double **x** {0}
- double **y** {0}

Static Private Member Functions

- static bool **almostEQ** (double a, double b)

Friends

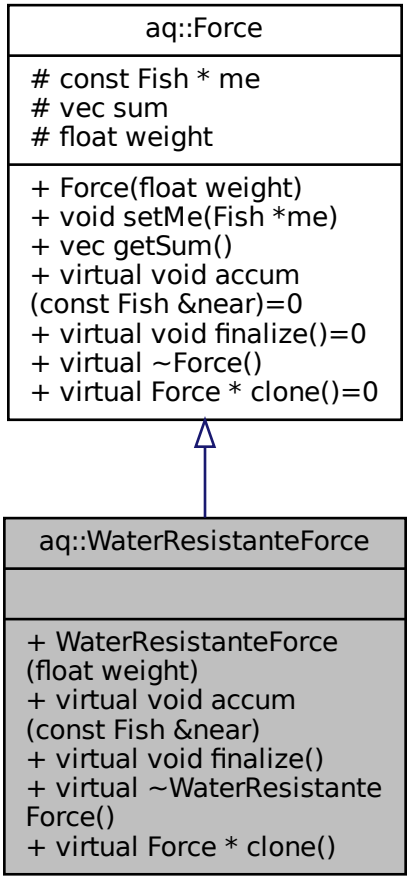
- template<typename num >
  requires arithmetic< num > friend vec **operator**∗ (vec v, num i)
- template<typename num >
  requires arithmetic< num > friend vec **operator**∗ (num i, vec v)
- template<typename T >
  vec **operator+** (sf::Vector2< T > v1, vec v2)
- template<typename T >
  vec **operator-** (sf::Vector2< T > v1, vec v2)

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

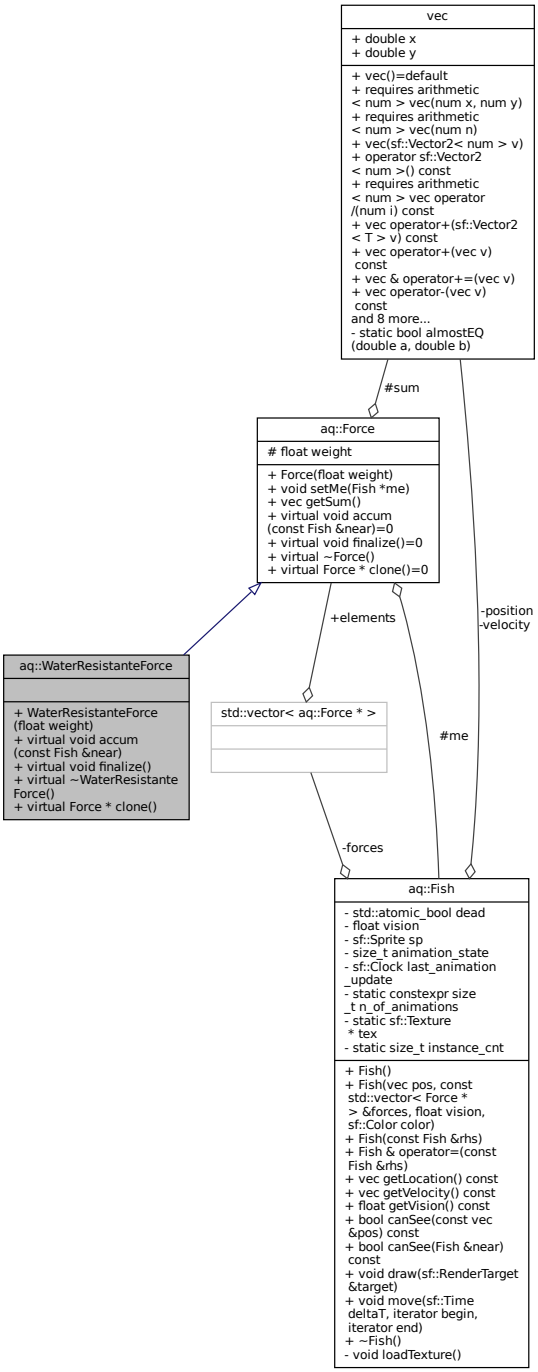
- inc/vec.hpp

3.20 aq::WaterResistanteForce Class Reference

Inheritance diagram for aq::WaterResistanteForce:



Collaboration diagram for aq::WaterResistanteForce:



Public Member Functions

- **WaterResistanteForce** (float weight)
- virtual void **accum** (const Fish &near)
- virtual void **finalize** ()
- virtual Force ∗ **clone** ()

Additional Inherited Members

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

- inc/forces.hpp

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