swe1d

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Chapter 3

File Index

3.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 4

Class Documentation

4.1 tools::Args Class Reference

`#include <args.h>`

Public Member Functions

- **Args** (int argc, char **argv)
- unsigned int **size** ()
- unsigned int **timeSteps** ()
- unsigned int **scenario** ()

4.1.1 Detailed Description

Parse command line arguments

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

- src/tools/args.h

4.2 writer::ConsoleWriter Class Reference

`#include <ConsoleWriter.h>`

Public Member Functions

- **ConsoleWriter** (std::ostream &ostream=std::cout)
- void write (const T time, const T *h, const T *hu, unsigned int size)

4.2.1 Detailed Description

A simple writer class, that writes h and hu to stdout (or another ostream)

4.2.2 Member Function Documentation

4.2.2.1 void writer::ConsoleWriter::write (const T *time*, const T * *h*, const T * *hu*, unsigned int *size*) [inline]

Writes all values (without boundary values) to the ostream

Parameters

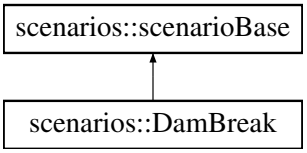
size	Number of cells (without boundary values)

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

- src/writer/ConsoleWriter.h

4.3 scenarios::DamBreak Class Reference

Inheritance diagram for scenarios::DamBreak:



Public Member Functions

- DamBreak (unsigned int size)
- T getHeight (unsigned int pos)
- T getMomentum (unsigned int pos)
- T getCellSize ()

Additional Inherited Members

4.3.1 Constructor & Destructor Documentation

4.3.1.1 scenarios::DamBreak::DamBreak (unsigned int *size*) [inline]

Constructor for the scenario

Parameters

size	The amount of cells which are simulated

4.3.2 Member Function Documentation

4.3.2.1 T scenarios::DamBreak::getCellSize ( ) [inline], [virtual]

Returns

Cell size of one cell (= domain size/number of cells)

Reimplemented from scenarios::scenarioBase.

4.3.2.2 T scenarios::DamBreak::getHeight (unsigned int *pos*) [inline], [virtual]

Parameters

pos	The index of the cell

Returns

Initial water height at pos

Reimplemented from scenarios::scenarioBase.

4.3.2.3 T scenarios::DamBreak::getMomentum (unsigned int *pos*) [inline], [virtual]

Parameters

pos	The index of the cell

Returns

Initial Momentum

Reimplemented from scenarios::scenarioBase.

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

- src/scenarios/dambreak.h

4.4 solver::FWave< T > Class Template Reference

`#include <FWave.hpp>`

Public Member Functions

- FWave ()
- void computeNetUpdates (T i_h_l, T i_h_r, T i_hu_l, T i_hu_r, T i_b_l, T i_b_r, T &o_h_l, T &o_h_r, T &o_hu_l, T &o_hu_r, T &o_max_ws)

4.4.1 Detailed Description

template<typename T>class solver::FWave< T >

Simple solver used to compute net udates for a given set of height, momentum and bathymetry values

4.4.2 Constructor & Destructor Documentation

4.4.2.1 template<typename T> solver::FWave< T >::FWave ( ) [inline]

The default constructor just setting gravity

4.4.3 Member Function Documentation

4.4.3.1 template<typename T> void solver::FWave< T >::computeNetUpdates (T *i_h_l*, T *i_h_r*, T *i_hu_l*, T *i_hu_r*, T *i_b_l*, T *i_b_r*, T & *o_h_l*, T & *o_h_r*, T & *o_hu_l*, T & *o_hu_r*, T & *o_max_ws*) [inline]

Computes the next timesteps net updates

Parameters

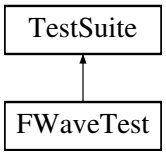
i_h_l	the height on the left cell of the edge
i_h_r	the height on the right cell of the edge
i_hu_l	the momentum on the left cell of the edge
i_hu_r	the momentum on the right cell of the edge
i_b_l	the bathymetry on the left cell of the edge
i_b_r	the bathymetry on the right cell of the edge
o_h_l	output: the height update for the left cell
o_h_r	output: the height update for the right cell
o_hu_l	output: the momentum update for the left cell
o_hu_r	output: the momentum update for the right cell
o_max_wd	output: the maximum wavespeed (which is the maximum of the left and right wave speed)

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

- submodules/solver/FWave.hpp

4.5 FWaveTest Class Reference

Inheritance diagram for FWaveTest:



Public Member Functions

- void test_steady_states (void)
- void test_both_lamda_pos_neg (void)

4.5.1 Member Function Documentation

4.5.1.1 void FWaveTest::test_both_lamda_pos_neg (void) [inline]

Tests correctness for [Lambda1 $<$ 0 && Lambda 2 $<$ 0] and [Lambda1 $>$ 0 && Lambda 2 $>$ 0]

4.5.1.2 void FWaveTest::test_steady_states (void) [inline]

Tests 10000 steady states

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

- CxxTests/FWave_testsuite.t.h

4.6 tools::Logger Class Reference

Public Types

- enum **Level** { **INFO**, **WARNING**, **ERROR** }

Public Member Functions

- void **setOutputStream** (std::ostream &output)
- void **log** (std::string &message, Level level=INFO)
- void **log** (const char *message, Level level=INFO)
- void **info** (std::string &message)
- void **info** (const char *message)
- std::ostream & **info** ()
- void **warning** (std::string &message)
- void **warning** (const char *message)
- std::ostream & **warning** ()
- void **error** (std::string &message)
- void **error** (const char *message)
- template<typename T >
  Logger & operator<< (T value)
- Logger & operator<< (std::ostream &(*func)(std::ostream &))

Static Public Attributes

- static Logger **logger**

4.6.1 Member Function Documentation

4.6.1.1 template<typename T > Logger& tools::Logger::operator<< (T *value*) [inline]

Can be used to print arbitrary info messages. Does not append std::endl.

4.6.1.2 Logger& tools::Logger::operator<< (std::ostream &(*)(std::ostream &) *func*) [inline]

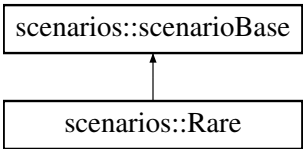
Allow to print std::endl

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

- src/tools/logger.h
- src/tools/logger.cpp

4.7 scenarios::Rare Class Reference

Inheritance diagram for scenarios::Rare:



Public Member Functions

- Rare (unsigned int size)
- T getHeight (unsigned int pos)
- T getMomentum (unsigned int pos)

Additional Inherited Members

4.7.1 Constructor & Destructor Documentation

4.7.1.1 scenarios::Rare::Rare (unsigned int *size*) [inline]

Constructor for the scenario

Parameters

size	The amount of cells which are simulated

4.7.2 Member Function Documentation

4.7.2.1 T scenarios::Rare::getHeight (unsigned int *pos*) [inline], [virtual]

Returns the initial height at a given cell

Parameters

pos	The index of the cell

Returns

The height of the specified cell

Reimplemented from scenarios::scenarioBase.

4.7.2.2 T scenarios::Rare::getMomentum (unsigned int *pos*) [inline], [virtual]

Returns the initial momentum at a given cell

Parameters

pos	The index of the cell

Returns

The momentum at the specified cell

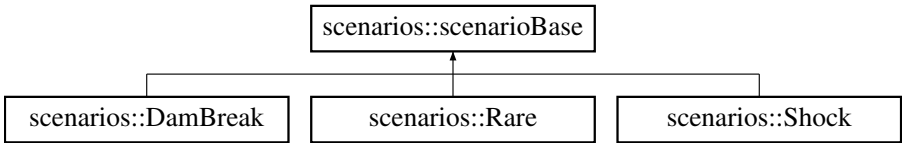
Reimplemented from scenarios::scenarioBase.

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

- src/scenarios/rare.h

4.8 scenarios::scenarioBase Class Reference

Inheritance diagram for scenarios::scenarioBase:



Public Member Functions

- scenarioBase (unsigned int size)
- virtual T getHeight (unsigned int pos)
- virtual T getMomentum (unsigned int pos)
- virtual T getCellSize ()

Protected Attributes

- const unsigned int m_size

4.8.1 Constructor & Destructor Documentation

4.8.1.1 scenarios::scenarioBase::scenarioBase (unsigned int *size*) [inline]

Constructor for the scenario

Parameters

size	The amount of cells which are simulated

4.8.2 Member Function Documentation

4.8.2.1 virtual T scenarios::scenarioBase::getCellSize ( ) [inline], [virtual]

Returns the width of each cell

Returns

Width of one cell

Reimplemented in scenarios::DamBreak.

4.8.2.2 virtual T scenarios::scenarioBase::getHeight (unsigned int *pos*) [inline], [virtual]

Returns the initial height at a given cell

Parameters

pos	The index of the cell

Returns

The height of the specified cell

Reimplemented in scenarios::DamBreak, scenarios::Shock, and scenarios::Rare.

4.8.2.3 virtual T scenarios::scenarioBase::getMomentum (unsigned int *pos*) [inline], [virtual]

Returns the initial momentum at a given cell

Parameters

pos	The index of the cell

Returns

The momentum at the specified cell

Reimplemented in scenarios::DamBreak, scenarios::Shock, and scenarios::Rare.

4.8.3 Member Data Documentation

4.8.3.1 const unsigned int scenarios::scenarioBase::m_size [protected]

Number of cells

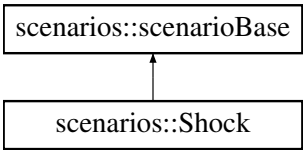
The documentation for this class was generated from the following file:

- src/scenarios/scenario.h

4.9 scenarios::Shock Class Reference

`#include <schock.h>`

Inheritance diagram for scenarios::Shock:



Public Member Functions

- Shock (unsigned int size)
- T getHeight (unsigned int pos)
- T getMomentum (unsigned int pos)

Additional Inherited Members

4.9.1 Detailed Description

This class offers the setup for a shock-shock scenario. The water walls are located at the outer sides (facing inwards) with a distance of one quarter of the whole amount of cells to the edges

4.9.2 Constructor & Destructor Documentation

4.9.2.1 scenarios::Shock::Shock (unsigned int *size*) [inline]

Constructor for the scenario

Parameters

size	The amount of cells which are simulated

4.9.3 Member Function Documentation

4.9.3.1 T scenarios::Shock::getHeight (unsigned int *pos*) [inline], [virtual]

Returns the initial height at a given cell

Parameters

pos	The index of the cell

Returns

The height of the specified cell

Reimplemented from scenarios::scenarioBase.

4.9.3.2 T scenarios::Shock::getMomentum (unsigned int *pos*) [inline], [virtual]

Returns the initial momentum at a given cell

Parameters

pos	The index of the cell

Returns

The momentum at the specified cell

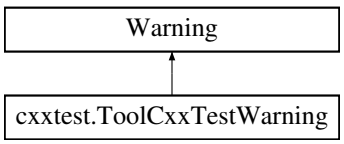
Reimplemented from scenarios::scenarioBase.

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

- src/scenarios/schock.h

4.10 cxxtest.ToolCxxTestWarning Class Reference

Inheritance diagram for cxxtest.ToolCxxTestWarning:



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

- site_scons/site_tools/cxxtest.py

4.11 writer::VtkWriter Class Reference

```
#include <VtkWriter.h>
```

Public Member Functions

- **VtkWriter** (const std::string &basename="swe1d", const T cellSize=1)
- void write (const T time, const T *h, const T *hu, unsigned int size)

4.11.1 Detailed Description

A writer class that generates vtk files

4.11.2 Member Function Documentation

4.11.2.1 void writer::VtkWriter::write (const T *time*, const T * *h*, const T * *hu*, unsigned int *size*) [inline]

Writes all values to vtk file

Parameters

size	Number of cells (without boundary values)

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

- src/writer/VtkWriter.h

4.12 WavePropagation Class Reference

```
#include <WavePropagation.h>
```

Public Member Functions

- WavePropagation (T *h, T *hu, unsigned int size, T cellSize)
- T computeNumericalFluxes ()
- void updateUnknowns (T dt)
- void setOutflowBoundaryConditions ()

4.12.1 Detailed Description

Allocated variables: unknowns h,hu are defined on grid indices [0,..,n+1] (done by the caller) -> computational domain is [1,..,nx] -> plus ghost cell layer

net-updates are defined for edges with indices [0,..,n]

A left/right net update with index (i-1) is located on the edge between cells with index (i-1) and (i):

```
*   (i-1)   *    (i)    *
```

```
    *
   ***
  *****
    *
    *


NetUpdatesLeft(i-1)
          or
NetUpdatesRight(i-1)
```

4.12.2 Constructor & Destructor Documentation

4.12.2.1 WavePropagation::WavePropagation (T * *h*, T * *hu*, unsigned int *size*, T *cellSize*) [inline]

Parameters

size	Domain size (= number of cells) without ghost cells
cellSize	Size of one cell

4.12.3 Member Function Documentation

4.12.3.1 T WavePropagation::computeNumericalFluxes ( )

Computes the net-updates from the unknowns

Returns

The maximum possible time step

4.12.3.2 void WavePropagation::setOutflowBoundaryConditions ( )

Updates h and hu according to the outflow condition to both boundaries

4.12.3.3 void WavePropagation::updateUnknowns (T *dt*)

Update the unknowns with the already computed net-updates

Parameters

dt	Time step size

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

- src/WavePropagation.h
- src/WavePropagation.cpp

Chapter 5

File Documentation

5.1 src/main.cpp File Reference

```
#include "types.h"
#include "WavePropagation.h"
#include "writer/ConsoleWriter.h"
#include "writer/VtkWriter.h"
#include "tools/args.h"
#include <cstring>
```

Functions

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

5.1.1 Detailed Description

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5.2 src/scenarios/dambreak.h File Reference

```
#include "./../types.h"
#include "scenario.h"
```

Classes

- class scenarios::DamBreak

5.2.1 Detailed Description

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5.3 src/tools/args.cpp File Reference

```
#include "args.h"
```

5.3.1 Detailed Description

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5.4 src/tools/args.h File Reference

```
#include "logger.h"
#include <getopt.h>
#include <cstdlib>
#include <iostream>
#include <sstream>
#include "./../scenarios/dambreak.h"
#include "./../scenarios/schock.h"
#include "./../scenarios/rare.h"
```

Classes

- class tools::Args

5.4.1 Detailed Description

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5.5 src/tools/logger.cpp File Reference

```
#include "logger.h"
```

5.5.1 Detailed Description

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5.6 src/tools/logger.h File Reference

```
#include <cstdlib>
#include <iostream>
```

Classes

- class tools::Logger

5.6.1 Detailed Description

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5.7 src/types.h File Reference

Typedefs

- typedef float **T**

5.7.1 Detailed Description

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5.8 src/WavePropagation.cpp File Reference

```
#include "WavePropagation.h"
```

5.8.1 Detailed Description

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5.9 src/WavePropagation.h File Reference

```
#include "types.h"
#include "solvers/FWave.hpp"
```

Classes

- class WavePropagation

5.9.1 Detailed Description

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5.10 src/writer/ConsoleWriter.h File Reference

```
#include "./../types.h"
#include <iostream>
```

Classes

- class writer::ConsoleWriter

5.10.1 Detailed Description

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5.11 src/writer/VtkWriter.h File Reference

```
#include "./../types.h"
#include <cassert>
#include <fstream>
#include <sstream>
#include <string>
```

Classes

- class writer::VtkWriter

5.11.1 Detailed Description

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