

ADI for Reaction-Diffusion Systems

Generated by Doxygen 1.8.6

Wed May 6 2015 14:49:04

Contents

1	Module Index	1
1.1	Modules	1
2	Namespace Index	3
2.1	Namespace List	3
3	Class Index	5
3.1	Class List	5
4	Module Documentation	7
4.1	Tridiagonal matrices.	7
4.1.1	Detailed Description	7
4.2	Return the diagonals.	8
4.2.1	Detailed Description	8
4.2.2	Function Documentation	8
4.2.2.1	getL	8
4.2.2.2	getM	8
4.2.2.3	getU	8
4.3	Diagonals of the tridiagonal matrix.	9
4.3.1	Detailed Description	9
5	Namespace Documentation	11
5.1	PeriodicTriDiagMatrixSolver Namespace Reference	11
5.1.1	Detailed Description	11
5.1.2	Function Documentation	11
5.1.2.1	solve	11
5.2	TriDiagMatrixSolver Namespace Reference	11
5.2.1	Detailed Description	11
5.2.2	Function Documentation	12
5.2.2.1	solve	12
6	Class Documentation	13
6.1	Coin Struct Reference	13

6.2	ColorProfile Struct Reference	13
6.3	ColorTree Struct Reference	14
6.4	GrayScott Class Reference	14
6.4.1	Constructor & Destructor Documentation	14
6.4.1.1	GrayScott	14
6.4.1.2	~GrayScott	14
6.4.2	Member Function Documentation	14
6.4.2.1	getCurrStep	14
6.4.2.2	getDt	15
6.4.2.3	getTime	15
6.4.2.4	getU	15
6.4.2.5	run	15
6.4.2.6	size	15
6.4.2.7	step	15
6.5	GSViewer Class Reference	16
6.5.1	Detailed Description	16
6.5.2	Constructor & Destructor Documentation	16
6.5.2.1	GSViewer	16
6.5.3	Member Function Documentation	16
6.5.3.1	visualize	16
6.6	Hash Struct Reference	16
6.7	HuffmanTree Struct Reference	17
6.8	LodePNGColorMode Struct Reference	17
6.9	LodePNGCompressSettings Struct Reference	17
6.10	LodePNGDecoderSettings Struct Reference	18
6.11	LodePNGDecompressSettings Struct Reference	18
6.12	LodePNGEncoderSettings Struct Reference	18
6.13	LodePNGInfo Struct Reference	19
6.14	LodePNGState Struct Reference	19
6.15	LodePNGTime Struct Reference	20
6.16	TriDiagMatrix Class Reference	20
6.16.1	Constructor & Destructor Documentation	20
6.16.1.1	TriDiagMatrix	20
6.16.1.2	TriDiagMatrix	20
6.16.2	Member Function Documentation	20
6.16.2.1	size	20
6.16.3	Friends And Related Function Documentation	21
6.16.3.1	operator<<	21
6.17	ucvector Struct Reference	21
6.18	uivector Struct Reference	21

Chapter 1

Module Index

1.1 Modules

Here is a list of all modules:

Tridiagonal matrices.	7
Return the diagonals.	8
Diagonals of the tridiagonal matrix.	9

Chapter 2

Namespace Index

2.1 Namespace List

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

PeriodicTriDiagMatrixSolver	11
TriDiagMatrixSolver	11

Chapter 3

Class Index

3.1 Class List

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

Coin	13
ColorProfile	13
ColorTree	14
GrayScott	14
GSViewer	16
Hash	16
HuffmanTree	17
LodePNGColorMode	17
LodePNGCompressSettings	17
LodePNGDecoderSettings	18
LodePNGDecompressSettings	18
LodePNGEncoderSettings	18
LodePNGInfo	19
LodePNGState	19
LodePNGTime	20
TriDiagMatrix	20
ucvector	21
uivector	21

Chapter 4

Module Documentation

4.1 Tridiagonal matrices.

4.1.1 Detailed Description

These matrices don't depend on the time step or the diffusing quantities and are thus constant.

4.2 Return the diagonals.

Functions

- `std::vector< double > TriDiagMatrix::getL () const`
- `std::vector< double > TriDiagMatrix::getM () const`
- `std::vector< double > TriDiagMatrix::getU () const`

4.2.1 Detailed Description

4.2.2 Function Documentation

4.2.2.1 `std::vector<double> TriDiagMatrix::getL () const` `[inline]`

Return the lower diagonal

4.2.2.2 `std::vector<double> TriDiagMatrix::getM () const` `[inline]`

Return the middle diagonal

4.2.2.3 `std::vector<double> TriDiagMatrix::getU () const` `[inline]`

Return the upper diagonal

4.3 Diagonals of the tridiagonal matrix.

4.3.1 Detailed Description

The diagonals all have the same length ($n_{_}$), but have 0 values where they are outside of the matrix. The indices determine the row.

| m0 u0 0 | | l1 m1 u1 | | 0 l2 m2 |

i.e.: $l_{_}[0]$ and $u_{_}[2]$ are 0.

Chapter 5

Namespace Documentation

5.1 PeriodicTriDiagMatrixSolver Namespace Reference

Functions

- void [solve](#) (int *n*, const [TriDiagMatrix](#) &*mat*, const std::vector< double > &*rhs*, double **result*, unsigned int *inc*)

5.1.1 Detailed Description

Solver for a tridiagonal matrix system.

5.1.2 Function Documentation

- 5.1.2.1 void PeriodicTriDiagMatrixSolver::solve (int *n*, const TriDiagMatrix & *mat*, const std::vector< double > & *rhs*, double * *result*, unsigned int *inc*)

Solve a tridiagonal matrix system.

Parameters

<i>n</i>	number of elements in the result
<i>mat</i>	tridiagonal matrix
<i>rhs</i>	right-hand side of the system
<i>result</i>	vector for the result, pointer to the first element
<i>inc</i>	increment for the elements of the result

5.2 TriDiagMatrixSolver Namespace Reference

Functions

- void [solve](#) (int *n*, const [TriDiagMatrix](#) &*mat*, const std::vector< double > &*rhs*, double **result*, unsigned int *inc*)

5.2.1 Detailed Description

Solver for a tridiagonal matrix system.

5.2.2 Function Documentation

5.2.2.1 `void TriDiagMatrixSolver::solve (int n, const TriDiagMatrix & mat, const std::vector< double > & rhs, double * result, unsigned int inc)`

Solve a tridiagonal matrix system using the Thomas algorithm.

Parameters

<i>n</i>	number of elements in the result
<i>mat</i>	tridiagonal matrix
<i>rhs</i>	right-hand side of the system
<i>result</i>	vector for the result, pointer to the first element
<i>inc</i>	increment for the elements of the result

Chapter 6

Class Documentation

6.1 Coin Struct Reference

Public Attributes

- [uivector](#) **symbols**
- float **weight**

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

- `lodepng.cpp`

6.2 ColorProfile Struct Reference

Public Attributes

- unsigned char **sixteenbit**
- unsigned char **sixteenbit_done**
- unsigned char **colored**
- unsigned char **colored_done**
- unsigned char **key**
- unsigned short **key_r**
- unsigned short **key_g**
- unsigned short **key_b**
- unsigned char **alpha**
- unsigned char **alpha_done**
- unsigned **numcolors**
- [ColorTree](#) **tree**
- unsigned char * **palette**
- unsigned **maxnumcolors**
- unsigned char **numcolors_done**
- unsigned **greybits**
- unsigned char **greybits_done**

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

- `lodepng.cpp`

6.3 ColorTree Struct Reference

Public Attributes

- [ColorTree](#) * **children** [16]
- int **index**

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

- lodepng.cpp

6.4 GrayScott Class Reference

Public Member Functions

- [GrayScott](#) (int *N*, double *L*, double *dt*, double *Du*, double *Dv*, double *F*, double *k*, int *nSteps*, std::string *pngname*)
- [~GrayScott](#) ()
- void [run](#) ()
- void [step](#) ()
- int [size](#) () const
- std::vector< double > [getU](#) () const
- int [getCurrStep](#) () const
- double [getDt](#) () const
- double [getTime](#) () const

6.4.1 Constructor & Destructor Documentation

6.4.1.1 `GrayScott::GrayScott (int N, double L, double dt, double Du, double Dv, double F, double k, int nSteps, std::string pngname)`

Construct a new simulation object.

Parameters

<i>N</i>	number of grid cells in one dimension
<i>L</i>	length of the domain in one dimension
<i>dt</i>	time step
<i>Du</i>	diffusion coefficient for u
<i>Dv</i>	diffusion coefficient for v
<i>F</i>	model parameter
<i>k</i>	model parameter
<i>nSteps</i>	number of steps in the simulation

6.4.1.2 `GrayScott::~~GrayScott ()`

Destructor

6.4.2 Member Function Documentation

6.4.2.1 `int GrayScott::getCurrStep () const` `[inline]`

Get the current step in the simulation.

Returns

the current step.

6.4.2.2 double GrayScott::getDt () const [inline]

Get the time step for the simulation.

Returns

the timestep

6.4.2.3 double GrayScott::getTime () const [inline]

Get the time that has passed.

Returns

time

6.4.2.4 std::vector<double> GrayScott::getU () const [inline]

Get the field U of the simulation.

Returns

the field U

6.4.2.5 void GrayScott::run ()

Run the simulation.

6.4.2.6 int GrayScott::size () const [inline]

Return the size of the system in one dimension.

Returns

number of grid cells in one dimension.

6.4.2.7 void GrayScott::step ()

Perform one simulation step.

Public because of the visualization

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

- grayscott.hpp
- grayscott.cpp

6.5 GSViewer Class Reference

```
#include <gsviewer.hpp>
```

Public Member Functions

- [GSViewer](#) (int argc, char *argv[])
- void [visualize](#) ([GrayScott](#) *simulation)

6.5.1 Detailed Description

Viewer for the Gray-Scott Reaction Diffusion simulation.

This class implements a viewer for the Gray-Scott Reaction Diffusion simulation. It visualizes the field U as the simulation is running using OpenGL.

6.5.2 Constructor & Destructor Documentation

6.5.2.1 GSViewer::GSViewer (int argc, char * argv[])

Construct a Gray-Scott viewer.

The constructor initializes glut.

Parameters

<i>argc</i>	argument from the main function
<i>argv</i>	argument from the main function

6.5.3 Member Function Documentation

6.5.3.1 void GSViewer::visualize (GrayScott * simulation)

Run the visualization.

The visualization function will run the the simulation and visualize the field U. It initializes the window and will run the glutMainLoop.

Parameters

<i>simulation</i>	the simulation that has to be run and visualized
-------------------	--

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

- gsviewer.hpp
- gsviewer.cpp

6.6 Hash Struct Reference

Public Attributes

- int * **head**
- unsigned short * **chain**
- int * **val**
- int * **headz**

- unsigned short * **chainz**
- unsigned short * **zeros**

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

- lodepng.cpp

6.7 HuffmanTree Struct Reference

Public Attributes

- unsigned * **tree2d**
- unsigned * **tree1d**
- unsigned * **lengths**
- unsigned **maxbitlen**
- unsigned **numcodes**

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

- lodepng.cpp

6.8 LodePNGColorMode Struct Reference

Public Attributes

- LodePNGColorType **colortype**
- unsigned **bitdepth**
- unsigned char * **palette**
- size_t **palettesize**
- unsigned **key_defined**
- unsigned **key_r**
- unsigned **key_g**
- unsigned **key_b**

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

- lodepng.h

6.9 LodePNGCompressSettings Struct Reference

Public Attributes

- unsigned **btype**
- unsigned **use_lz77**
- unsigned **window_size**
- unsigned **minmatch**
- unsigned **nicematch**
- unsigned **lazymatching**
- unsigned(* **custom_zlib**)(unsigned char **, size_t *, const unsigned char *, size_t, const [LodePNGCompressSettings](#) *)

- unsigned(* **custom_deflate**)(unsigned char **, size_t *, const unsigned char *, size_t, const [LodePNGCompressSettings](#) *)
- const void * **custom_context**

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

- lodepng.h

6.10 LodePNGDecoderSettings Struct Reference

Public Attributes

- [LodePNGDecompressSettings](#) **zlibsettings**
- unsigned **ignore_crc**
- unsigned **fix_png**
- unsigned **color_convert**
- unsigned **read_text_chunks**
- unsigned **remember_unknown_chunks**

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

- lodepng.h

6.11 LodePNGDecompressSettings Struct Reference

Public Attributes

- unsigned **ignore_adler32**
- unsigned(* **custom_zlib**)(unsigned char **, size_t *, const unsigned char *, size_t, const [LodePNGDecompressSettings](#) *)
- unsigned(* **custom_inflate**)(unsigned char **, size_t *, const unsigned char *, size_t, const [LodePNGDecompressSettings](#) *)
- const void * **custom_context**

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

- lodepng.h

6.12 LodePNGEncoderSettings Struct Reference

Public Attributes

- [LodePNGCompressSettings](#) **zlibsettings**
- LodePNGAutoConvert **auto_convert**
- unsigned **filter_palette_zero**
- LodePNGFilterStrategy **filter_strategy**
- const unsigned char * **predefined_filters**
- unsigned **force_palette**
- unsigned **add_id**
- unsigned **text_compression**

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

- lodepng.h

6.13 LodePNGInfo Struct Reference

Public Attributes

- unsigned **compression_method**
- unsigned **filter_method**
- unsigned **interlace_method**
- [LodePNGColorMode](#) **color**
- unsigned **background_defined**
- unsigned **background_r**
- unsigned **background_g**
- unsigned **background_b**
- size_t **text_num**
- char ** **text_keys**
- char ** **text_strings**
- size_t **itext_num**
- char ** **itext_keys**
- char ** **itext_langtags**
- char ** **itext_transkeys**
- char ** **itext_strings**
- unsigned **time_defined**
- [LodePNGTime](#) **time**
- unsigned **phys_defined**
- unsigned **phys_x**
- unsigned **phys_y**
- unsigned **phys_unit**
- unsigned char * **unknown_chunks_data** [3]
- size_t **unknown_chunks_size** [3]

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

- `lodepng.h`

6.14 LodePNGState Struct Reference

Public Attributes

- [LodePNGDecoderSettings](#) **decoder**
- [LodePNGEncoderSettings](#) **encoder**
- [LodePNGColorMode](#) **info_raw**
- [LodePNGInfo](#) **info_png**
- unsigned **error**

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

- `lodepng.h`

6.15 LodePNGTime Struct Reference

Public Attributes

- unsigned **year**
- unsigned **month**
- unsigned **day**
- unsigned **hour**
- unsigned **minute**
- unsigned **second**

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

- lodepng.h

6.16 TriDiagMatrix Class Reference

Public Member Functions

- [TriDiagMatrix](#) ()
- [TriDiagMatrix](#) (int *N*, double *l*, double *m*, double *u*)
- int [size](#) () const
- std::vector< double > [getL](#) () const
- std::vector< double > [getM](#) () const
- std::vector< double > [getU](#) () const

Friends

- std::ostream & [operator<<](#) (std::ostream &os, const [TriDiagMatrix](#) &matrix)

6.16.1 Constructor & Destructor Documentation

6.16.1.1 TriDiagMatrix::TriDiagMatrix ()

Default constructor

6.16.1.2 TriDiagMatrix::TriDiagMatrix (int *N*, double *l*, double *m*, double *u*)

Construct an object of the type [TriDiagMatrix](#)

Parameters

<i>N</i>	size of the matrix
<i>l</i>	value on the lower diagonal
<i>m</i>	value on the middle diagonal
<i>u</i>	value on the upper diagonal

6.16.2 Member Function Documentation

6.16.2.1 int TriDiagMatrix::size () const [inline]

Return the size of the matrix in one dimension.

Returns

the matrix size in one dimension

6.16.3 Friends And Related Function Documentation**6.16.3.1** `std::ostream& operator<< (std::ostream & os, const TriDiagMatrix & matrix)` [*friend*]

Print the matrix to the stream *os*.

Parameters

<i>os</i>	stream to print the matrix to
<i>matrix</i>	matrix

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

- tridiagmatrix.hpp
- tridiagmatrix.cpp

6.17 ucvector Struct Reference**Public Attributes**

- unsigned char * **data**
- size_t **size**
- size_t **allocsize**

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

- lodepng.cpp

6.18 uivector Struct Reference**Public Attributes**

- unsigned * **data**
- size_t **size**
- size_t **allocsize**

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

- lodepng.cpp

Index

- ~GrayScott
 - GrayScott, [14](#)
- Coin, [13](#)
- ColorProfile, [13](#)
- ColorTree, [14](#)
- Diagonals of the tridiagonal matrix., [9](#)
- GSViewer, [16](#)
 - GSViewer, [16](#)
 - GSViewer, [16](#)
 - visualize, [16](#)
- getCurrStep
 - GrayScott, [14](#)
- getDt
 - GrayScott, [15](#)
- getL
 - Return the diagonals., [8](#)
- getM
 - Return the diagonals., [8](#)
- getTime
 - GrayScott, [15](#)
- getU
 - GrayScott, [15](#)
 - Return the diagonals., [8](#)
- GrayScott, [14](#)
 - ~GrayScott, [14](#)
 - getCurrStep, [14](#)
 - getDt, [15](#)
 - getTime, [15](#)
 - getU, [15](#)
 - GrayScott, [14](#)
 - GrayScott, [14](#)
 - run, [15](#)
 - size, [15](#)
 - step, [15](#)
- Hash, [16](#)
- HuffmanTree, [17](#)
- LodePNGColorMode, [17](#)
- LodePNGCompressSettings, [17](#)
- LodePNGDecoderSettings, [18](#)
- LodePNGDecompressSettings, [18](#)
- LodePNGEncoderSettings, [18](#)
- LodePNGInfo, [19](#)
- LodePNGState, [19](#)
- LodePNGTime, [20](#)
- operator<<
 - TriDiagMatrix, [21](#)
- PeriodicTriDiagMatrixSolver, [11](#)
 - solve, [11](#)
- Return the diagonals., [8](#)
 - getL, [8](#)
 - getM, [8](#)
 - getU, [8](#)
- run
 - GrayScott, [15](#)
- size
 - GrayScott, [15](#)
 - TriDiagMatrix, [20](#)
- solve
 - PeriodicTriDiagMatrixSolver, [11](#)
 - TriDiagMatrixSolver, [12](#)
- step
 - GrayScott, [15](#)
- TriDiagMatrix, [20](#)
 - operator<<, [21](#)
 - size, [20](#)
 - TriDiagMatrix, [20](#)
 - TriDiagMatrix, [20](#)
- TriDiagMatrixSolver, [11](#)
 - solve, [12](#)
- Tridiagonal matrices., [7](#)
- ucvector, [21](#)
- uivector, [21](#)
- visualize
 - GSViewer, [16](#)