AutoCell

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Chapter 1

Presentation

What is AutoCell

The purpose of this project is to create a Cellular Automate Simulator.

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

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

Cell 9
CellHandler 13
CellHandler::iterator 26
QDialog
    CreationDialog 22
QMainWindow
    MainWindow 30

Chapter 3

Class Index

3.1 Class List

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

Cell
: Contains the state, the next state and the neighbours 9

CellHandler
: Cell container and cell generator 13

CreationDialog
: Automaton creation dialog box 22

CellHandler::iterator
: Implementation of iterator design pattern 26

MainWindow
: Simulation window 30

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

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cellhandler.cpp 44
cellhandler.h 49
creationdialog.cpp 50
creationdialog.h 52
main.cpp 53
mainwindow.cpp 53
mainwindow.h 56

Chapter 5

Class Documentation

5.1 Cell Class Reference

Contains the state, the next state and the neighbours.

`#include <cell.h>`

Public Member Functions

- Cell (unsigned int state=0)

  Constructs a cell with the state given. State 0 is dead state.
- void setState (unsigned int state)

  Set temporary state.
- void validState ()

  Validate temporary state.
- void forceState (unsigned int state)

  Force the state change.
- unsigned int getState () const

  Access current cell state.
- bool addNeighbour (const Cell *neighbour)

  Add a new neighbour to the Cell.
- QVector< const Cell * > getNeighbours () const

  Access neighbours list.

Private Attributes

- unsigned int m_state

  Current state.
- unsigned int m_nextState

  Temporary state, before validation.
- QVector< const Cell * > m_neighbours

  Cell's neighbours.

5.1.1 Detailed Description

Contains the state, the next state and the neighbours.

Definition at line 10 of file cell.h.

5.1.2 Constructor & Destructor Documentation

5.1.2.1 Cell()

```
Cell::Cell (
            unsigned int state = 0 )
```

Constructs a cell with the state given. State 0 is dead state.

Parameters

state	Cell state, dead state by default

Definition at line 8 of file cell.cpp.

5.1.3 Member Function Documentation

5.1.3.1 addNeighbour()

```
bool Cell::addNeighbour (
            const Cell * neighbour )
```

Add a new neighbour to the Cell.

Parameters

neighbour	New neighbour

Returns

False if the neighbour already exists

Definition at line 64 of file cell.cpp.

References m_neighbours.

5.1.3.2 forceState()

```
void Cell::forceState (
            unsigned int state )
```

Force the state change.

Is equivalent to setState followed by validState

Parameters

state	New state

Definition at line 45 of file cell.cpp.

References m_nextState, and m_state.

5.1.3.3 getNeighbours()

```
QVector< const Cell * > Cell::getNeighbours ( ) const
```

Access neighbours list.

Definition at line 75 of file cell.cpp.

References m_neighbours.

5.1.3.4 getState()

```
unsigned int Cell::getState ( ) const
```

Access current cell state.

Definition at line 53 of file cell.cpp.

References m_state.

5.1.3.5 setState()

```
void Cell::setState (
            unsigned int state )
```

Set temporary state.

To change current cell state, use setState(unsigned int state) then validState().

Parameters

state	New state

Definition at line 22 of file cell.cpp.

References m_nextState.

5.1.3.6 validState()

```
void Cell::validState ( )
```

Validate temporary state.

To change current cell state, use setState(unsigned int state) then validState().

Definition at line 33 of file cell.cpp.

References m_nextState, and m_state.

5.1.4 Member Data Documentation

5.1.4.1 m_neighbours

```
QVector<const Cell*> Cell::m_neighbours  [private]
```

Cell's neighbours.

Definition at line 27 of file cell.h.

Referenced by addNeighbour(), and getNeighbours().

5.1.4.2 m_nextState

```
unsigned int Cell::m_nextState  [private]
```

Temporary state, before validation.

Definition at line 25 of file cell.h.

Referenced by forceState(), setState(), and validState().

5.1.4.3 m_state

```
unsigned int Cell::m_state  [private]
```

Current state.

Definition at line 24 of file cell.h.

Referenced by forceState(), getState(), and validState().

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

- cell.h
- cell.cpp

5.2 CellHandler Class Reference

Cell container and cell generator.

```
#include <cellhandler.h>
```

Classes

- class iterator

  Implementation of iterator design pattern.

Public Types

- enum generationTypes { empty, random, symetric }

  Type of random generation.

Public Member Functions

- CellHandler (const QString filename)

  Construct all the cells from the json file given.
- CellHandler (const QVector< unsigned int > dimensions, generationTypes type=empty, unsigned int stateMax=1, unsigned int density=20)

  Construct a CellHandler of the given dimension.
- virtual ~CellHandler ()

  Destroys all cells in the CellHandler.
- Cell * getCell (const QVector< unsigned int > position) const

  Access the cell to the given position.
- QVector< unsigned int > getDimensions ()

  Accessor of m_dimensions.
- void nextStates ()

  Valid the state of all cells.
- bool save (QString filename)

  Save the CellHandler current configuration in the file given.
- void generate (generationTypes type, unsigned int stateMax=1, unsigned short density=50)

  Replace Cell values by random values (symetric or not)
- void print (std::ostream &stream)

  Print in the given stream the CellHandler.
- iterator begin ()

  Give the iterator which corresponds to the current CellHandler.
- bool end ()

  End condition of the iterator.

Private Member Functions

- bool load (const QJsonObject &json)

  Load the config file in the CellHandler.
- void foundNeighbours ()

  Set the neighbours of each cells.
- void positionIncrement (QVector< unsigned int > &pos, unsigned int value=1) const

  Increment the QVector given by the value choosen.
- QVector< QVector< unsigned int > > * getListNeighboursPositionsRecursive (const QVector< unsigned int > position, unsigned int dimension, QVector< unsigned int > lastAdd) const

  Recursive function which browse the position possibilities tree.
- QVector< QVector< unsigned int > > & getListNeighboursPositions (const QVector< unsigned int > position) const

  Prepare the call of the recursive version of itself.

Private Attributes

- QVector< unsigned int > m_dimensions

  Vector of x dimensions.
- QMap< QVector< unsigned int >, Cell *> m_cells

  Map of cells, with a x dimensions vector as key.

5.2.1 Detailed Description

Cell container and cell generator.

Generate cells from a json file.

Definition at line 18 of file cellhandler.h.

5.2.2 Member Enumeration Documentation

5.2.2.1 generationTypes

```
enum CellHandler::generationTypes
```

Type of random generation.

Enumerator

empty	Only empty cells.
random	Random cells.
symetric	Random cells but with vertical symetry (on the 1st dimension component)

Definition at line 63 of file cellhandler.h.

5.2.3 Constructor & Destructor Documentation

5.2.3.1 CellHandler() [1/2]

```
CellHandler::CellHandler (
            const QString filename )
```

Construct all the cells from the json file given.

The size of "cells" array must be the product of all dimensions (60 in the following example). Typical Json file:

```
{
"dimensions":"3x4x5",
"cells":[0,1,4,4,2,5,3,4,2,4,
         4,2,5,0,0,0,0,0,0,0,
         2,4,1,1,1,1,1,2,1,1,
         0,0,0,0,0,0,2,2,2,2,
         3,4,5,1,2,0,9,0,0,0,
         1,2,0,0,0,0,1,2,3,2]
}
```

Parameters

filename	Json file which contains the description of all the cells

Exceptions

QString	Unreadable file
QString	Empty file
QString	Not valid file

Definition at line 27 of file cellhandler.cpp.

References foundNeighbours(), and load().

5.2.3.2 CellHandler() [2/2]

```
CellHandler::CellHandler (
            const QVector< unsigned int > dimensions,
            generationTypes type = empty,
            unsigned int stateMax = 1,
            unsigned int density = 20 )
```

Construct a CellHandler of the given dimension.

If generationTypes is given, the CellHandler won't be empty.

Parameters

dimensions	Dimensions of the CellHandler
type	Generation type, empty by default
stateMax	Generate states between 0 and stateMax
density	Average (%) of non-zeros

Definition at line 67 of file cellhandler.cpp.

References empty, generate(), m_cells, m_dimensions, and positionIncrement().

5.2.3.3 ~CellHandler()

```
CellHandler::~CellHandler ( )  [virtual]
```

Destroys all cells in the CellHandler.

Definition at line 98 of file cellhandler.cpp.

References m_cells.

5.2.4 Member Function Documentation

5.2.4.1 begin()

```
CellHandler::iterator CellHandler::begin ( )
```

Give the iterator which corresponds to the current CellHandler.

Definition at line 263 of file cellhandler.cpp.

Referenced by print(), save(), and MainWindow::updateBoard().

5.2.4.2 end()

```
bool CellHandler::end ( )
```

End condition of the iterator.

See iterator::operator!=(bool finished) for further information.

Definition at line 273 of file cellhandler.cpp.

Referenced by print(), save(), and MainWindow::updateBoard().

5.2.4.3 foundNeighbours()

```
void CellHandler::foundNeighbours ( )  [private]
```

Set the neighbours of each cells.

Careful, this is in O(n*3^d), with n the number of cells and d the number of dimensions

Definition at line 368 of file cellhandler.cpp.

References getListNeighboursPositions(), m_cells, m_dimensions, and positionIncrement().

Referenced by CellHandler().

5.2.4.4 generate()

```
void CellHandler::generate (
            CellHandler::generationTypes type,
            unsigned int stateMax = 1,
            unsigned short density = 50 )
```

Replace Cell values by random values (symetric or not)

Parameters

type	Type of random generation
stateMax	Generate states between 0 and stateMax
density	Average (%) of non-zeros

Definition at line 183 of file cellhandler.cpp.

References m_cells, m_dimensions, positionIncrement(), random, and symetric.

Referenced by CellHandler().

5.2.4.5 getCell()

```
Cell * CellHandler::getCell (
            const QVector< unsigned int > position ) const
```

Access the cell to the given position.

Definition at line 109 of file cellhandler.cpp.

References m_cells.

5.2.4.6 getDimensions()

```
QVector< unsigned int > CellHandler::getDimensions ( )
```

Accessor of m_dimensions.

Definition at line 117 of file cellhandler.cpp.

References m_dimensions.

Referenced by MainWindow::openFile().

5.2.4.7 getListNeighboursPositions()

```
QVector< QVector< unsigned int > > & CellHandler::getListNeighboursPositions (
            const QVector< unsigned int > position ) const  [private]
```

Prepare the call of the recursive version of itself.

Parameters

position	Position of the central cell (x1,x2,x3,..,xn)

Returns

List of positions

Definition at line 429 of file cellhandler.cpp.

References getListNeighboursPositionsRecursive().

Referenced by foundNeighbours().

5.2.4.8 getListNeighboursPositionsRecursive()

```
QVector< QVector< unsigned int > > * CellHandler::getListNeighboursPositionsRecursive (
            const QVector< unsigned int > position,
            unsigned int dimension,
            QVector< unsigned int > lastAdd ) const  [private]
```

Recursive function which browse the position possibilities tree.

Careful, the complexity is in O(3^dimension)
Piece of the tree:

```
            x_d -1
           /
x_(d-1)-1/_ x_d
         \
          \
            x_d +1

            x_d -1
           /
x_(d-1)  /_ x_d
         \
          \
            x_d +1

            x_d -1
           /
x_(d-1)+1/ x_d
         \
          \
            x_d +1
```

The path in the tree to reach the leaf give the position

Parameters

position	Position of the cell
dimension	Current working dimension (number of the digit). Dimension = 2 <=> working on x2 coordinates on (x1, x2, x3, ..., xn) vector
lastAdd	Last position added. Like the father node of the new tree

Returns

List of position

Definition at line 471 of file cellhandler.cpp.

References m_dimensions.

Referenced by getListNeighboursPositions().

5.2.4.9 load()

```
bool CellHandler::load (
            const QJsonObject & json )  [private]
```

Load the config file in the CellHandler.

Exemple of a way to print cell states :

```
QVector<unsigned int> position;
for (unsigned short i = 0; i < m_dimensions.size(); i++)
{
     position.push_back(0);
}
for (unsigned int j = 0; j < m_cells.size(); j++)
{
     std::cout << m_cells.value(position)->getState() << " ";
     position.replace(0, position.at(0)+1);
     for (unsigned short i = 0; i < m_dimensions.size(); i++)
     {
         if (position.at(i) >= m_dimensions.at(i))
         {
             position.replace(i, 0);
             std::cout << std::endl;
             if (i + 1 != m_dimensions.size())
                 position.replace(i+1, position.at(i+1)+1);
         }

     }
}
```

Parameters

json	Json Object which contains the grid configuration

Returns

False if the Json Object is not correct

Definition at line 309 of file cellhandler.cpp.

References m_cells, m_dimensions, and positionIncrement().

Referenced by CellHandler().

5.2.4.10 nextStates()

```
void CellHandler::nextStates ( )
```

Valid the state of all cells.

Definition at line 126 of file cellhandler.cpp.

References m_cells.

Referenced by MainWindow::nextState().

5.2.4.11 positionIncrement()

```
void CellHandler::positionIncrement (
            QVector< unsigned int > & pos,
            unsigned int value = 1 ) const  [private]
```

Increment the QVector given by the value choosen.

Careful, when the position reach the maximum, it goes to zero without leaving the function

Parameters

pos	Position to increment
value	Value to add, 1 by default

Definition at line 399 of file cellhandler.cpp.

References m_dimensions.

Referenced by CellHandler(), foundNeighbours(), generate(), and load().

5.2.4.12 print()

```
void CellHandler::print (
            std::ostream & stream )
```

Print in the given stream the CellHandler.

Parameters

stream	Stream to print into

Definition at line 249 of file cellhandler.cpp.

References begin(), and end().

5.2.4.13 save()

```
bool CellHandler::save (
            QString filename )
```

Save the CellHandler current configuration in the file given.

Parameters

filename	Path to the file

Returns

False if there was a problem

Exceptions

QString	Impossible to open the file

Definition at line 142 of file cellhandler.cpp.

References begin(), end(), and m_dimensions.

Referenced by MainWindow::saveToFile().

5.2.5 Member Data Documentation

5.2.5.1 m_cells

```
QMap<QVector<unsigned int>, Cell* > CellHandler::m_cells  [private]
```

Map of cells, with a x dimensions vector as key.

Definition at line 93 of file cellhandler.h.

Referenced by CellHandler(), foundNeighbours(), generate(), getCell(), load(), nextStates(), and ~CellHandler().

5.2.5.2 m_dimensions

```
QVector<unsigned int> CellHandler::m_dimensions  [private]
```

Vector of x dimensions.

Definition at line 92 of file cellhandler.h.

Referenced by CellHandler(), foundNeighbours(), generate(), getDimensions(), getListNeighboursPositionsRecursive(), CellHandler::iterator::iterator(), load(), positionIncrement(), and save().

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

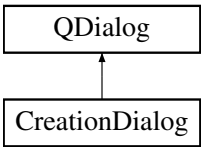
- cellhandler.h
- cellhandler.cpp

5.3 CreationDialog Class Reference

Automaton creation dialog box.

```
#include <creationdialog.h>
```

Inheritance diagram for CreationDialog:



Public Slots

- void processSettings ()

Signals

- void settingsFilled (const QVector< unsigned int > dimensions, CellHandler::generationTypes type=Cell↩ Handler::generationTypes::empty, unsigned int stateMax=1, unsigned int density=20)

Public Member Functions

- CreationDialog (QWidget *parent=0)

Private Member Functions

- QGroupBox * createGenButtons ()

  Creates radio buttons to select cell generation type.

Private Attributes

- QLineEdit * m_dimensionsEdit
- QSpinBox * m_densityBox
- QSpinBox * m_stateMaxBox
- QPushButton * m_doneBt
- QGroupBox * m_groupBox
- QRadioButton * m_empGen
- QRadioButton * m_randGen
- QRadioButton * m_symGen

5.3.1 Detailed Description

Automaton creation dialog box.

Allow the user to input settings to create an automaton

Definition at line 13 of file creationdialog.h.

5.3.2 Constructor & Destructor Documentation

5.3.2.1 CreationDialog()

```
CreationDialog::CreationDialog (
            QWidget * parent = 0 )
```

Definition at line 5 of file creationdialog.cpp.

References createGenButtons(), m_densityBox, m_dimensionsEdit, m_doneBt, m_stateMaxBox, and processSettings().

5.3.3 Member Function Documentation

5.3.3.1 createGenButtons()

```
CreationDialog::createGenButtons ( )  [private]
```

Creates radio buttons to select cell generation type.

Validates user settings and sends them to MainWindow.

Definition at line 49 of file creationdialog.cpp.

References m_empGen, m_groupBox, m_randGen, and m_symGen.

Referenced by CreationDialog().

5.3.3.2 processSettings

```
void CreationDialog::processSettings ( )  [slot]
```

Definition at line 70 of file creationdialog.cpp.

References m_densityBox, m_dimensionsEdit, m_randGen, m_stateMaxBox, m_symGen, and settingsFilled().

Referenced by CreationDialog().

5.3.3.3 settingsFilled

```
void CreationDialog::settingsFilled (
            const QVector< unsigned int > dimensions,
            CellHandler::generationTypes type = CellHandler::generationTypes::empty,
            unsigned int stateMax = 1,
            unsigned int density = 20 )  [signal]
```

Referenced by processSettings().

5.3.4 Member Data Documentation

5.3.4.1 m_densityBox

```
QSpinBox* CreationDialog::m_densityBox  [private]
```

Definition at line 30 of file creationdialog.h.

Referenced by CreationDialog(), and processSettings().

5.3.4.2 m_dimensionsEdit

```
QLineEdit* CreationDialog::m_dimensionsEdit  [private]
```

Definition at line 29 of file creationdialog.h.

Referenced by CreationDialog(), and processSettings().

5.3.4.3 m_doneBt

```
QPushButton* CreationDialog::m_doneBt  [private]
```

Definition at line 32 of file creationdialog.h.

Referenced by CreationDialog().

5.3.4.4 m_empGen

```
QRadioButton* CreationDialog::m_empGen  [private]
```

Definition at line 35 of file creationdialog.h.

Referenced by createGenButtons().

5.3.4.5 m_groupBox

```
QGroupBox* CreationDialog::m_groupBox  [private]
```

Definition at line 34 of file creationdialog.h.

Referenced by createGenButtons().

5.3.4.6 m_randGen

```
QRadioButton* CreationDialog::m_randGen  [private]
```

Definition at line 36 of file creationdialog.h.

Referenced by createGenButtons(), and processSettings().

5.3.4.7 m_stateMaxBox

```
QSpinBox* CreationDialog::m_stateMaxBox  [private]
```

Definition at line 31 of file creationdialog.h.

Referenced by CreationDialog(), and processSettings().

5.3.4.8 m_symGen

```
QRadioButton* CreationDialog::m_symGen  [private]
```

Definition at line 37 of file creationdialog.h.

Referenced by createGenButtons(), and processSettings().

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

- creationdialog.h
- creationdialog.cpp

5.4 CellHandler::iterator Class Reference

Implementation of iterator design pattern.

```
#include <cellhandler.h>
```

Public Member Functions

- iterator (const CellHandler *handler)

  Construct an initial iterator to browse the CellHandler.
- iterator & operator++ ()

  Increment the current position and handle dimension changes.
- Cell * operator-> () const

  Get the current cell.
- Cell * operator* () const
- bool operator!= (bool finished) const
- unsigned int changedDimension () const

  Return the number of dimensions we change.

Private Attributes

- const CellHandler * m_handler

  CellHandler to go through.
- QVector< unsigned int > m_position

  Current position of the iterator.
- bool m_finished = false

  If we reach the last position.
- QVector< unsigned int > m_zero

  Nul vector of the good dimension (depend of m_handler)
- unsigned int m_changedDimension

  Save the number of dimension change.

Friends

- class CellHandler

5.4.1 Detailed Description

Implementation of iterator design pattern.

Example of use:

```
CellHandler handler("file.atc");
for (CellHandler::iterator it = handler.begin(); it != handler.end(); ++it)
{
     for (unsigned int i = 0; i < it.changedDimension(); i++)
         std::cout << std::endl;
     std::cout << it->getState() << " ";
}
```

This code will print each cell states and go to a new line when there is a change of dimension. So if there is 3 dimensions, there will be a empty line between 2D groups.

Definition at line 37 of file cellhandler.h.

5.4.2 Constructor & Destructor Documentation

5.4.2.1 iterator()

```
CellHandler::iterator::iterator (
             const CellHandler * handler )
```

Construct an initial iterator to browse the CellHandler.

Parameters

handler	CellHandler to browse

Definition at line 511 of file cellhandler.cpp.

References CellHandler::m_dimensions, m_position, and m_zero.

5.4.3 Member Function Documentation

5.4.3.1 changedDimension()

```
unsigned int CellHandler::iterator::changedDimension ( ) const
```

Return the number of dimensions we change.

For example, if we were at the (3,4,4) cell, and we incremented the position, we are now at (4,0,0), and changed↩ Dimension return 2 (because of the 2 zeros).

Definition at line 572 of file cellhandler.cpp.

5.4.3.2 operator"!=()

```
bool CellHandler::iterator::operator!= (
            bool finished ) const  [inline]
```

Definition at line 47 of file cellhandler.h.

References m_finished.

5.4.3.3 operator∗()

```
Cell * CellHandler::iterator::operator* ( ) const
```

Definition at line 561 of file cellhandler.cpp.

5.4.3.4 operator++()

```
CellHandler::iterator & CellHandler::iterator::operator++ ( )
```

Increment the current position and handle dimension changes.

Definition at line 525 of file cellhandler.cpp.

5.4.3.5 operator->()

```
Cell * CellHandler::iterator::operator-> ( ) const
```

Get the current cell.

Definition at line 553 of file cellhandler.cpp.

5.4.4 Friends And Related Function Documentation

5.4.4.1 CellHandler

```
friend class CellHandler  [friend]
```

Definition at line 39 of file cellhandler.h.

5.4.5 Member Data Documentation

5.4.5.1 m_changedDimension

```
unsigned int CellHandler::iterator::m_changedDimension  [private]
```

Save the number of dimension change.

Definition at line 57 of file cellhandler.h.

5.4.5.2 m_finished

```
bool CellHandler::iterator::m_finished = false  [private]
```

If we reach the last position.

Definition at line 55 of file cellhandler.h.

Referenced by operator!=().

5.4.5.3 m_handler

```
const CellHandler* CellHandler::iterator::m_handler  [private]
```

CellHandler to go through.

Definition at line 53 of file cellhandler.h.

5.4.5.4 m_position

```
QVector<unsigned int> CellHandler::iterator::m_position  [private]
```

Current position of the iterator.

Definition at line 54 of file cellhandler.h.

Referenced by iterator().

5.4.5.5 m_zero

```
QVector<unsigned int> CellHandler::iterator::m_zero  [private]
```

Nul vector of the good dimension (depend of m_handler)

Definition at line 56 of file cellhandler.h.

Referenced by iterator().

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

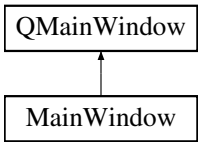
- cellhandler.h
- cellhandler.cpp

5.5 MainWindow Class Reference

Simulation window.

```
#include <mainwindow.h>
```

Inheritance diagram for MainWindow:



Public Slots

- void openFile ()

  Opens a file browser for the user to select automaton files and creates an automaton.
- void saveToFile ()

  Allows user to select a location and saves automaton's state and settings.
- void openCreationWindow ()

  Opens the automaton creation window.
- void setCellHandler (const QVector< unsigned int > dimensions, CellHandler::generationTypes type=CellHandler::generationTypes::empty, unsigned int stateMax=1, unsigned int density=20)

  Creates a new cellHandler with the provided arguments and updates the board with the created cellHandler.
- void forward ()

  Skips the number of steps chosen by the user and sets the automaton on the last one.

Public Member Functions

- MainWindow (QWidget *parent=nullptr)

Private Member Functions

- void createIcons ()

  Creates Icons for the MainWindow.
- void createActions ()

  Creates and connects QActions and associated buttons for the MainWindow.
- void createToolBar ()

  Creates the toolBar for the MainWindow.
- void createBoard ()

  Creates the Automaton board.
- void updateBoard ()

  Updates cells on the board with the cellHandler's cells states.
- void nextState (int n)

  Shows the nth next state of the automaton on the board.

Private Attributes

- CellHandler * m_cellHandler
- QIcon m_fastBackwardIcon

  Icons.
- QIcon m_fastForwardIcon
- QIcon m_playIcon
- QIcon m_pauseIcon
- QIcon m_newIcon
- QIcon m_saveIcon
- QIcon m_openIcon
- QIcon m_resetIcon
- QAction * m_playPause

  Actions.
- QAction * m_nextState
- QAction * m_previousState
- QAction * m_fastForward

- QAction * m_fastBackward
- QAction * m_openAutomaton
- QAction * m_saveAutomaton
- QAction * m_newAutomaton
- QAction * m_resetAutomaton
- QToolButton * m_playPauseBt

  Buttons.
- QToolButton * m_nextStateBt
- QToolButton * m_previousStateBt
- QToolButton * m_fastForwardBt
- QToolButton * m_fastBackwardBt
- QToolButton * m_openAutomatonBt
- QToolButton * m_saveAutomatonBt
- QToolButton * m_newAutomatonBt
- QToolButton * m_resetBt
- QSpinBox * m_jumpSpeed
- QLabel * m_speedLabel

  Simulation speed input.
- QToolBar * m_toolBar
- QTableWidget * m_Board

  Toolbar containing the buttons.
- unsigned int m_boardHSize = 25

  Board showing the automaton's current state.
- unsigned int m_boardVSize = 25
- unsigned int m_cellSize = 30

5.5.1 Detailed Description

Simulation window.

Displays the automaton's current state as a board and contains user interaction components.

Definition at line 16 of file mainwindow.h.

5.5.2 Constructor & Destructor Documentation

5.5.2.1 MainWindow()

```
MainWindow::MainWindow (
            QWidget * parent = nullptr )  [explicit]
```

Definition at line 3 of file mainwindow.cpp.

References createActions(), createBoard(), createIcons(), createToolBar(), and m_cellHandler.

5.5.3 Member Function Documentation

5.5.3.1 createActions()

```
void MainWindow::createActions ( )  [private]
```

Creates and connects QActions and associated buttons for the MainWindow.

Definition at line 52 of file mainwindow.cpp.

References forward(), m_fastBackward, m_fastBackwardBt, m_fastBackwardIcon, m_fastForward, m_fastForwardBt, m_fastForwardIcon, m_newAutomaton, m_newAutomatonBt, m_newIcon, m_openAutomaton, m_openAutomatonBt, m_openIcon, m_playIcon, m_playPause, m_playPauseBt, m_resetAutomaton, m_resetBt, m_resetIcon, m_saveAutomaton, m_saveAutomatonBt, m_saveIcon, openCreationWindow(), openFile(), and saveToFile().

Referenced by MainWindow().

5.5.3.2 createBoard()

```
void MainWindow::createBoard ( )  [private]
```

Creates the Automaton board.

Definition at line 132 of file mainwindow.cpp.

References m_Board, m_boardHSize, m_boardVSize, and m_cellSize.

Referenced by MainWindow(), openFile(), and setCellHandler().

5.5.3.3 createIcons()

```
void MainWindow::createIcons ( )  [private]
```

Creates Icons for the MainWindow.

Definition at line 22 of file mainwindow.cpp.

References m_fastBackwardIcon, m_fastForwardIcon, m_newIcon, m_openIcon, m_pauseIcon, m_playIcon, m_resetIcon, and m_saveIcon.

Referenced by MainWindow().

5.5.3.4 createToolBar()

```
void MainWindow::createToolBar ( )  [private]
```

Creates the toolBar for the MainWindow.

Definition at line 98 of file mainwindow.cpp.

References m_fastBackwardBt, m_fastForwardBt, m_jumpSpeed, m_newAutomatonBt, m_openAutomatonBt, m_playPauseBt, m_resetBt, m_saveAutomatonBt, m_speedLabel, and m_toolBar.

Referenced by MainWindow().

5.5.3.5 forward

```
void MainWindow::forward ( )  [slot]
```

Skips the number of steps chosen by the user and sets the automaton on the last one.

Definition at line 276 of file mainwindow.cpp.

References m_jumpSpeed, and nextState().

Referenced by createActions().

5.5.3.6 nextState()

```
void MainWindow::nextState (
            int n )  [private]
```

Shows the nth next state of the automaton on the board.

Definition at line 234 of file mainwindow.cpp.

References m_cellHandler, CellHandler::nextStates(), and updateBoard().

Referenced by forward().

5.5.3.7 openCreationWindow

```
void MainWindow::openCreationWindow ( )  [slot]
```

Opens the automaton creation window.

Definition at line 201 of file mainwindow.cpp.

References setCellHandler().

Referenced by createActions().

5.5.3.8 openFile

```
void MainWindow::openFile ( )  [slot]
```

Opens a file browser for the user to select automaton files and creates an automaton.

Definition at line 160 of file mainwindow.cpp.

References createBoard(), CellHandler::getDimensions(), m_boardHSize, m_boardVSize, m_cellHandler, and updateBoard().

Referenced by createActions().

5.5.3.9 saveToFile

```
void MainWindow::saveToFile ( )  [slot]
```

Allows user to select a location and saves automaton's state and settings.

Definition at line 183 of file mainwindow.cpp.

References m_cellHandler, and CellHandler::save().

Referenced by createActions().

5.5.3.10 setCellHandler

```
void MainWindow::setCellHandler (
            const QVector< unsigned int > dimensions,
            CellHandler::generationTypes type = CellHandler::generationTypes::empty,
            unsigned int stateMax = 1,
            unsigned int density = 20 )  [slot]
```

Creates a new cellHandler with the provided arguments and updates the board with the created cellHandler.

Definition at line 214 of file mainwindow.cpp.

References createBoard(), m_boardHSize, m_boardVSize, m_cellHandler, and updateBoard().

Referenced by openCreationWindow().

5.5.3.11 updateBoard()

```
void MainWindow::updateBoard ( )  [private]
```

Updates cells on the board with the cellHandler's cells states.

Definition at line 250 of file mainwindow.cpp.

References CellHandler::begin(), CellHandler::end(), m_Board, and m_cellHandler.

Referenced by nextState(), openFile(), and setCellHandler().

5.5.4 Member Data Documentation

5.5.4.1 m_Board

```
QTableWidget* MainWindow::m_Board  [private]
```

Toolbar containing the buttons.

Definition at line 60 of file mainwindow.h.

Referenced by createBoard(), and updateBoard().

5.5.4.2 m_boardHSize

```
unsigned int MainWindow::m_boardHSize = 25  [private]
```

Board showing the automaton's current state.

Board size settings

Definition at line 63 of file mainwindow.h.

Referenced by createBoard(), openFile(), and setCellHandler().

5.5.4.3 m_boardVSize

```
unsigned int MainWindow::m_boardVSize = 25  [private]
```

Definition at line 64 of file mainwindow.h.

Referenced by createBoard(), openFile(), and setCellHandler().

5.5.4.4 m_cellHandler

```
CellHandler* MainWindow::m_cellHandler  [private]
```

Definition at line 20 of file mainwindow.h.

Referenced by MainWindow(), nextState(), openFile(), saveToFile(), setCellHandler(), and updateBoard().

5.5.4.5 m_cellSize

```
unsigned int MainWindow::m_cellSize = 30  [private]
```

Definition at line 65 of file mainwindow.h.

Referenced by createBoard().

5.5.4.6 m_fastBackward

```
QAction* MainWindow::m_fastBackward  [private]
```

Definition at line 37 of file mainwindow.h.

Referenced by createActions().

5.5.4.7 m_fastBackwardBt

```
QToolButton* MainWindow::m_fastBackwardBt  [private]
```

Definition at line 48 of file mainwindow.h.

Referenced by createActions(), and createToolBar().

5.5.4.8 m_fastBackwardIcon

```
QIcon MainWindow::m_fastBackwardIcon  [private]
```

Icons.

Definition at line 23 of file mainwindow.h.

Referenced by createActions(), and createIcons().

5.5.4.9 m_fastForward

```
QAction* MainWindow::m_fastForward  [private]
```

Definition at line 36 of file mainwindow.h.

Referenced by createActions().

5.5.4.10 m_fastForwardBt

```
QToolButton* MainWindow::m_fastForwardBt  [private]
```

Definition at line 47 of file mainwindow.h.

Referenced by createActions(), and createToolBar().

5.5.4.11 m_fastForwardIcon

```
QIcon MainWindow::m_fastForwardIcon  [private]
```

Definition at line 24 of file mainwindow.h.

Referenced by createActions(), and createIcons().

5.5.4.12 m_jumpSpeed

```
QSpinBox* MainWindow::m_jumpSpeed  [private]
```

Definition at line 55 of file mainwindow.h.

Referenced by createToolBar(), and forward().

5.5.4.13 m_newAutomaton

```
QAction* MainWindow::m_newAutomaton  [private]
```

Definition at line 40 of file mainwindow.h.

Referenced by createActions().

5.5.4.14 m_newAutomatonBt

```
QToolButton* MainWindow::m_newAutomatonBt  [private]
```

Definition at line 51 of file mainwindow.h.

Referenced by createActions(), and createToolBar().

5.5.4.15 m_newIcon

```
QIcon MainWindow::m_newIcon  [private]
```

Definition at line 27 of file mainwindow.h.

Referenced by createActions(), and createIcons().

5.5.4.16 m_nextState

```
QAction* MainWindow::m_nextState  [private]
```

Definition at line 34 of file mainwindow.h.

5.5.4.17 m_nextStateBt

```
QToolButton* MainWindow::m_nextStateBt  [private]
```

Definition at line 45 of file mainwindow.h.

5.5.4.18 m_openAutomaton

```
QAction* MainWindow::m_openAutomaton  [private]
```

Definition at line 38 of file mainwindow.h.

Referenced by createActions().

5.5.4.19 m_openAutomatonBt

```
QToolButton* MainWindow::m_openAutomatonBt  [private]
```

Definition at line 49 of file mainwindow.h.

Referenced by createActions(), and createToolBar().

5.5.4.20 m_openIcon

```
QIcon MainWindow::m_openIcon  [private]
```

Definition at line 29 of file mainwindow.h.

Referenced by createActions(), and createIcons().

5.5.4.21 m_pauseIcon

```
QIcon MainWindow::m_pauseIcon  [private]
```

Definition at line 26 of file mainwindow.h.

Referenced by createIcons().

5.5.4.22 m_playIcon

```
QIcon MainWindow::m_playIcon  [private]
```

Definition at line 25 of file mainwindow.h.

Referenced by createActions(), and createIcons().

5.5.4.23 m_playPause

```
QAction* MainWindow::m_playPause  [private]
```

Actions.

Definition at line 33 of file mainwindow.h.

Referenced by createActions().

5.5.4.24 m_playPauseBt

```
QToolButton* MainWindow::m_playPauseBt  [private]
```

Buttons.

Definition at line 44 of file mainwindow.h.

Referenced by createActions(), and createToolBar().

5.5.4.25 m_previousState

```
QAction* MainWindow::m_previousState  [private]
```

Definition at line 35 of file mainwindow.h.

5.5.4.26 m_previousStateBt

```
QToolButton* MainWindow::m_previousStateBt  [private]
```

Definition at line 46 of file mainwindow.h.

5.5.4.27 m_resetAutomaton

```
QAction* MainWindow::m_resetAutomaton  [private]
```

Definition at line 41 of file mainwindow.h.

Referenced by createActions().

5.5.4.28 m_resetBt

```
QToolButton* MainWindow::m_resetBt  [private]
```

Definition at line 52 of file mainwindow.h.

Referenced by createActions(), and createToolBar().

5.5.4.29 m_resetIcon

```
QIcon MainWindow::m_resetIcon  [private]
```

Definition at line 30 of file mainwindow.h.

Referenced by createActions(), and createIcons().

5.5.4.30 m_saveAutomaton

```
QAction* MainWindow::m_saveAutomaton  [private]
```

Definition at line 39 of file mainwindow.h.

Referenced by createActions().

5.5.4.31 m_saveAutomatonBt

```
QToolButton* MainWindow::m_saveAutomatonBt  [private]
```

Definition at line 50 of file mainwindow.h.

Referenced by createActions(), and createToolBar().

5.5.4.32 m_saveIcon

```
QIcon MainWindow::m_saveIcon  [private]
```

Definition at line 28 of file mainwindow.h.

Referenced by createActions(), and createIcons().

5.5.4.33 m_speedLabel

```
QLabel* MainWindow::m_speedLabel  [private]
```

Simulation speed input.

Definition at line 56 of file mainwindow.h.

Referenced by createToolBar().

5.5.4.34 m_toolBar

```
QToolBar* MainWindow::m_toolBar  [private]
```

Definition at line 58 of file mainwindow.h.

Referenced by createToolBar().

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

- mainwindow.h
- mainwindow.cpp

Chapter 6

File Documentation

6.1 cell.cpp File Reference

```
#include "cell.h"
```

6.2 cell.cpp

```
00001 #include "cell.h"
00002
00008 Cell::Cell(unsigned int state):
00009     m_state(state), m_nextState(state)
00010 {
00011
00012 }
00013
00022 void Cell::setState(unsigned int state)
00023 {
00024     m_nextState = state;
00025 }
00026
00033 void Cell::validState()
00034 {
00035     m_state = m_nextState;
00036 }
00037
00045 void Cell::forceState(unsigned int state)
00046 {
00047     m_state = m_nextState = state;
00048 }
00049
00053 unsigned int Cell::getState() const
00054 {
00055     return m_state;
00056 }
00057
00064 bool Cell::addNeighbour(const Cell* neighbour)
00065 {
00066     if (m_neighbours.count(neighbour))
00067         return false;
00068     m_neighbours.push_back(neighbour);
00069     return true;
00070 }
00071
00075 QVector<const Cell*> Cell::getNeighbours() const
00076 {
00077     return m_neighbours;
00078 }
```

6.3 cell.h File Reference

```
#include <QVector>
#include <QDebug>
```

Classes

- class Cell

  Contains the state, the next state and the neighbours.

6.4 cell.h

```
00001 #ifndef CELL_H
00002 #define CELL_H
00003
00004 #include <QVector>
00005 #include <QDebug>
00006
00010 class Cell
00011 {
00012 public:
00013     Cell(unsigned int state = 0);
00014
00015     void setState(unsigned int state);
00016     void validState();
00017     void forceState(unsigned int state);
00018     unsigned int getState() const;
00019
00020     bool addNeighbour(const Cell* neighbour);
00021     QVector<const Cell*> getNeighbours() const;
00022
00023 private:
00024     unsigned int m_state;
00025     unsigned int m_nextState;
00026
00027     QVector<const Cell*> m_neighbours;
00028 };
00029
00030 #endif // CELL_H
```

6.5 cellhandler.cpp File Reference

```
#include <iostream>
#include "cellhandler.h"
```

6.6 cellhandler.cpp

```
00001 #include <iostream>
00002 #include "cellhandler.h"
00003
00004
00027 CellHandler::CellHandler(const QString filename)
00028 {
00029     QFile loadFile(filename);
00030     if (!loadFile.open(QIODevice::ReadOnly | QIODevice::Text)) {
00031         qWarning("Couldn't open given file.");
00032         throw QString(QObject::tr("Couldn't open given file"));
00033     }
00034
```

```
00035     QJsonParseError parseErr;
00036     QJsonDocument loadDoc(QJsonDocument::fromJson(loadFile.readAll(), &parseErr));
00037
00038
00039
00040     if (loadDoc.isNull() || loadDoc.isEmpty()) {
00041         qWarning() << "Could not read data : ";
00042         qWarning() << parseErr.errorString();
00043     }
00044
00045     // Loadding of the json file
00046     if (!load(loadDoc.object()))
00047     {
00048         qWarning("File not valid");
00049         throw QString(QObject::tr("File not valid"));
00050     }
00051
00052     foundNeighbours();
00053
00054
00055 }
00056
00067 CellHandler::CellHandler(const QVector<unsigned int> dimensions,
      generationTypes type, unsigned int stateMax, unsigned int density)
00068 {
00069     m_dimensions = dimensions;
00070     QVector<unsigned int> position;
00071     unsigned int size = 1;
00072
00073     // Set position vector to 0
00074
00075     for (unsigned short i = 0; i < m_dimensions.size(); i++)
00076     {
00077         position.push_back(0);
00078         size *= m_dimensions.at(i);
00079     }
00080
00081
00082     // Creation of cells
00083     for (unsigned int j = 0; j < size; j++)
00084     {
00085         m_cells.insert(position, new Cell(0));
00086
00087         positionIncrement(position);
00088     }
00089
00090     if (type != empty)
00091         generate(type, stateMax, density);
00092
00093 }
00094
00098 CellHandler::~CellHandler()
00099 {
00100     for (QMap<QVector<unsigned int>, Cell* >::iterator it = m_cells.begin(); it !=
      m_cells.end(); ++it)
00101     {
00102         delete it.value();
00103     }
00104 }
00105
00109 Cell *CellHandler::getCell(const QVector<unsigned int> position) const
00110 {
00111     return m_cells.value(position);
00112 }
00113
00117 QVector<unsigned int> CellHandler::getDimensions()
00118 {
00119     return m_dimensions;
00120 }
00121
00126 void CellHandler::nextStates()
00127 {
00128     for (QMap<QVector<unsigned int>, Cell* >::iterator it = m_cells.begin(); it !=
      m_cells.end(); ++it)
00129     {
00130         it.value()->validState();
00131     }
00132 }
00133
00142 bool CellHandler::save(QString filename)
00143 {
00144     QFile saveFile(filename);
00145     if (!saveFile.open(QIODevice::WriteOnly)) {
00146         qWarning("Couldn't create or open given file.");
00147         throw QString(QObject::tr("Couldn't create or open given file"));
00148     }
00149
```

```
00150     QJsonObject json;
00151     QString stringDimension;
00152     // Creation of the dimension string
00153     for (unsigned int i = 0; i < m_dimensions.size(); i++)
00154     {
00155         if (i != 0)
00156             stringDimension.push_back("x");
00157         stringDimension.push_back(QString::number(m_dimensions.at(i)));
00158     }
00159     json["dimensions"] = QJsonValue(stringDimension);
00160
00161     QJsonArray cells;
00162     for (CellHandler::iterator it = begin(); it != end(); ++it)
00163     {
00164         cells.append(QJsonValue((int)it->getState()));
00165     }
00166     json["cells"] = cells;
00167
00168
00169     QJsonDocument saveDoc(json);
00170     saveFile.write(saveDoc.toJson());
00171
00172     saveFile.close();
00173     return true;
00174 }
00175
00183 void CellHandler::generate(CellHandler::generationTypes
      type, unsigned int stateMax, unsigned short density)
00184 {
00185     if (type == random)
00186     {
00187         QVector<unsigned int> position;
00188         for (unsigned short i = 0; i < m_dimensions.size(); i++)
00189         {
00190             position.push_back(0);
00191         }
00192         QRandomGenerator generator((float)qrand()*(float)time_t()/RAND_MAX);
00193         for (unsigned int j = 0; j < m_cells.size(); j++)
00194         {
00195             unsigned int state = 0;
00196             // 0 have (1-density)% of chance of being generate
00197             if (generator.generateDouble()*100.0 < density)
00198                 state = (float)(generator.generateDouble()*stateMax) +1;
00199             if (state > stateMax)
00200                 state = stateMax;
00201             m_cells.value(position)->forceState(state);
00202
00203             positionIncrement(position);
00204         }
00205     }
00206     else if (type == symetric)
00207     {
00208         QVector<unsigned int> position;
00209         for (unsigned short i = 0; i < m_dimensions.size(); i++)
00210         {
00211             position.push_back(0);
00212         }
00213
00214         QRandomGenerator generator((float)qrand()*(float)time_t()/RAND_MAX);
00215         QVector<unsigned int> savedStates;
00216         for (unsigned int j = 0; j < m_cells.size(); j++)
00217         {
00218             if (j % m_dimensions.at(0) == 0)
00219                 savedStates.clear();
00220             if (j % m_dimensions.at(0) < (m_dimensions.at(0)+1) / 2)
00221             {
00222                 unsigned int state = 0;
00223                 // 0 have (1-density)% of chance of being generate
00224                 if (generator.generateDouble()*100.0 < density)
00225                     state = (float)(generator.generateDouble()*stateMax) +1;
00226                 if (state > stateMax)
00227                     state = stateMax;
00228                 savedStates.push_back(state);
00229                 m_cells.value(position)->forceState(state);
00230             }
00231             else
00232             {
00233                 unsigned int i = savedStates.size() - (j % m_dimensions.at(0) - (
      m_dimensions.at(0)-1)/2 + (m_dimensions.at(0) % 2 == 0 ? 0 : 1));
00234                 m_cells.value(position)->forceState(savedStates.at(i));
00235             }
00236             positionIncrement(position);
00237
00238
00239         }
00240
00241     }
```

```
00242 }
00243
00249 void CellHandler::print(std::ostream &stream)
00250 {
00251     for (iterator it = begin(); it != end(); ++it)
00252     {
00253         for (unsigned int d = 0; d < it.changedDimension(); d++)
00254             stream << std::endl;
00255         stream << it->getState() << " ";
00256     }
00257
00258 }
00259
00263 CellHandler::iterator CellHandler::begin()
00264 {
00265     return iterator(this);
00266 }
00267
00273 bool CellHandler::end()
00274 {
00275     return true;
00276 }
00277
00309 bool CellHandler::load(const QJsonObject &json)
00310 {
00311     if (!json.contains("dimensions") || !json["dimensions"].isString())
00312         return false;
00313
00314     // RegExp to validate dimensions field format : "10x10"
00315     QRegExpValidator dimensionValidator(QRegExp("([0-9]*x?)*"));
00316     QString stringDimensions = json["dimensions"].toString();
00317     int pos= 0;
00318     if (dimensionValidator.validate(stringDimensions, pos) != QRegExpValidator::Acceptable)
00319         return false;
00320
00321     // Split of dimensions field : "10x10" => "10", "10"
00322     QRegExp rx("x");
00323     QStringList list = json["dimensions"].toString().split(rx, QString::SkipEmptyParts);
00324
00325     unsigned int product = 1;
00326     // Dimensions construction
00327     for (unsigned int i = 0; i < list.size(); i++)
00328     {
00329         product = product * list.at(i).toInt();
00330         m_dimensions.push_back(list.at(i).toInt());
00331     }
00332     if (!json.contains("cells") || !json["cells"].isArray())
00333         return false;
00334
00335     QJsonArray cells = json["cells"].toArray();
00336     if (cells.size() != product)
00337         return false;
00338
00339     QVector<unsigned int> position;
00340     // Set position vector to 0
00341     for (unsigned short i = 0; i < m_dimensions.size(); i++)
00342     {
00343         position.push_back(0);
00344     }
00345
00346     // Creation of cells
00347     for (unsigned int j = 0; j < cells.size(); j++)
00348     {
00349         if (!cells.at(j).isDouble())
00350             return false;
00351         if (cells.at(j).toDouble() < 0)
00352             return false;
00353         m_cells.insert(position, new Cell(cells.at(j).toDouble()));
00354
00355         positionIncrement(position);
00356     }
00357
00358     return true;
00359
00360 }
00361
00368 void CellHandler::foundNeighbours()
00369 {
00370     QVector<unsigned int> currentPosition;
00371     // Set position vector to 0
00372     for (unsigned short i = 0; i < m_dimensions.size(); i++)
00373     {
00374         currentPosition.push_back(0);
00375     }
00376     // Modification of all the cells
00377     for (unsigned int j = 0; j < m_cells.size(); j++)
00378     {
```

```
00379         // Get the list of the neighbours positions
00380         // This function is recursive
00381         QVector<QVector<unsigned int> > listPosition(getListNeighboursPositions(
      currentPosition));
00382 
00383         // Adding neighbours
00384         for (unsigned int i = 0; i < listPosition.size(); i++)
00385             m_cells.value(currentPosition)->addNeighbour(m_cells.value(listPosition.at(i)));
00386 
00387         positionIncrement(currentPosition);
00388     }
00389 }
00390 
00399 void CellHandler::positionIncrement(QVector<unsigned int> &pos, unsigned int
      value) const
00400 {
00401     pos.replace(0, pos.at(0) + value); // adding the value to the first digit
00402 
00403     // Carry management
00404     for (unsigned short i = 0; i < m_dimensions.size(); i++)
00405     {
00406         if (pos.at(i) >= m_dimensions.at(i) && pos.at(i) <
      m_dimensions.at(i)*2)
00407         {
00408             pos.replace(i, 0);
00409             if (i + 1 != m_dimensions.size())
00410                 pos.replace(i+1, pos.at(i+1)+1);
00411         }
00412         else if (pos.at(i) >= m_dimensions.at(i))
00413         {
00414             pos.replace(i, pos.at(i) - m_dimensions.at(i));
00415             if (i + 1 != m_dimensions.size())
00416                 pos.replace(i+1, pos.at(i+1)+1);
00417             i--;
00418         }
00419 
00420     }
00421 }
00422 
00429 QVector<QVector<unsigned int> >& CellHandler::getListNeighboursPositions
      (const QVector<unsigned int> position) const
00430 {
00431     QVector<QVector<unsigned int> > *list = getListNeighboursPositionsRecursive
      (position, position.size(), position);
00432     // We remove the position of the cell
00433     list->removeAll(position);
00434     return *list;
00435 }
00436 
00471 QVector<QVector<unsigned int> >*
      CellHandler::getListNeighboursPositionsRecursive(const
      QVector<unsigned int> position, unsigned int dimension, QVector<unsigned int> lastAdd) const
00472 {
00473     if (dimension == 0) // Stop condition
00474     {
00475         QVector<QVector<unsigned int> > *list = new QVector<QVector<unsigned int> >;
00476         return list;
00477     }
00478     QVector<QVector<unsigned int> > *listPositions = new QVector<QVector<unsigned int> >;
00479 
00480     QVector<unsigned int> modifiedPosition(lastAdd);
00481 
00482     // "x_d - 1" tree
00483     if (modifiedPosition.at(dimension-1) != 0) // Avoid "negative" position
00484         modifiedPosition.replace(dimension-1, position.at(dimension-1) - 1);
00485     listPositions->append(*getListNeighboursPositionsRecursive(position,
       dimension -1, modifiedPosition));
00486     if (!listPositions->count(modifiedPosition))
00487         listPositions->push_back(modifiedPosition);
00488 
00489     // "x_d" tree
00490     modifiedPosition.replace(dimension-1, position.at(dimension-1));
00491     listPositions->append(*getListNeighboursPositionsRecursive(position,
       dimension -1, modifiedPosition));
00492     if (!listPositions->count(modifiedPosition))
00493         listPositions->push_back(modifiedPosition);
00494 
00495     // "x_d + 1" tree
00496     if (modifiedPosition.at(dimension -1) + 1 < m_dimensions.at(dimension-1)) // Avoid position
       out of the cell space
00497         modifiedPosition.replace(dimension-1, position.at(dimension-1) +1);
00498     listPositions->append(*getListNeighboursPositionsRecursive(position,
       dimension -1, modifiedPosition));
00499     if (!listPositions->count(modifiedPosition))
00500         listPositions->push_back(modifiedPosition);
00501 
00502     return listPositions;
```

```
00503
00504 }
00505
00511 CellHandler::iterator::iterator(const CellHandler *handler):
00512         m_handler(handler), m_changedDimension(0)
00513 {
00514     // Initialisation of m_position
00515     for (unsigned short i = 0; i < handler->m_dimensions.size(); i++)
00516     {
00517         m_position.push_back(0);
00518     }
00519     m_zero = m_position;
00520 }
00521
00525 CellHandler::iterator &CellHandler::iterator::operator++
      ()
00526 {
00527     m_position.replace(0, m_position.at(0) + 1); // adding the value to the first digit
00528
00529     m_changedDimension = 0;
00530     // Carry management
00531     for (unsigned short i = 0; i < m_handler->m_dimensions.size(); i++)
00532     {
00533         if (m_position.at(i) >= m_handler->m_dimensions.at(i))
00534         {
00535             m_position.replace(i, 0);
00536             m_changedDimension++;
00537             if (i + 1 != m_handler->m_dimensions.size())
00538                 m_position.replace(i+1, m_position.at(i+1)+1);
00539         }
00540
00541     }
00542     // If we return to zero, we have finished
00543     if (m_position == m_zero)
00544         m_finished = true;
00545
00546     return *this;
00547
00548 }
00549
00553 Cell *CellHandler::iterator::operator->() const
00554 {
00555     return m_handler->m_cells.value(m_position);
00556 }
00557
00561 Cell *CellHandler::iterator::operator*() const
00562 {
00563     return m_handler->m_cells.value(m_position);
00564 }
00565
00572 unsigned int CellHandler::iterator::changedDimension() const
00573 {
00574     return m_changedDimension;
00575 }
00576
```

6.7 cellhandler.h File Reference

```
#include <QString>
#include <QFile>
#include <QJsonDocument>
#include <QtWidgets>
#include <QMap>
#include <QRegExpValidator>
#include "cell.h"
```

Classes

- class CellHandler

  Cell container and cell generator.
- class CellHandler::iterator

  Implementation of iterator design pattern.

6.8 cellhandler.h

```
00001 #ifndef CELLHANDLER_H
00002 #define CELLHANDLER_H
00003
00004 #include <QString>
00005 #include <QFile>
00006 #include <QJsonDocument>
00007 #include <QtWidgets>
00008 #include <QMap>
00009 #include <QRegExpValidator>
00010
00011 #include "cell.h"
00012
00018 class CellHandler
00019 {
00020 public:
00037     class iterator
00038     {
00039         friend class CellHandler;
00040     public:
00041         iterator(const CellHandler* handler);
00042
00043         iterator& operator++();
00044         Cell* operator->() const;
00045         Cell* operator*() const;
00046
00047         bool operator!=(bool finished) const { return (m_finished != finished); }
00048         unsigned int changedDimension() const;
00049
00050
00051
00052     private:
00053         const CellHandler *m_handler;
00054         QVector<unsigned int> m_position;
00055         bool m_finished = false;
00056         QVector<unsigned int> m_zero;
00057         unsigned int m_changedDimension;
00058     };
00059
00063     enum generationTypes {
00064         empty,
00065         random,
00066         symetric
00067     };
00068
00069     CellHandler(const QString filename);
00070     CellHandler(const QVector<unsigned int> dimensions,
      generationTypes type = empty, unsigned int stateMax = 1, unsigned int density = 20);
00071     virtual ~CellHandler();
00072
00073     Cell* getCell(const QVector<unsigned int> position) const;
00074     QVector<unsigned int> getDimensions();
00075     void nextStates();
00076
00077     bool save(QString filename);
00078
00079     void generate(generationTypes type, unsigned int stateMax = 1, unsigned short
      density = 50);
00080     void print(std::ostream &stream);
00081
00082     iterator begin();
00083     bool end();
00084
00085 private:
00086     bool load(const QJsonObject &json);
00087     void foundNeighbours();
00088     void positionIncrement(QVector<unsigned int> &pos, unsigned int value = 1) const;
00089     QVector<QVector<unsigned int> > *getListNeighboursPositionsRecursive
      (const QVector<unsigned int> position, unsigned int dimension, QVector<unsigned int> lastAdd) const;
00090     QVector<QVector<unsigned int> > &getListNeighboursPositions(const
      QVector<unsigned int> position) const;
00091
00092     QVector<unsigned int> m_dimensions;
00093     QMap<QVector<unsigned int>, Cell* > m_cells;
00094 };
00095
00096 #endif // CELLHANDLER_H
```

6.9 creationdialog.cpp File Reference

```
#include "creationdialog.h"
```

```
#include <iostream>
```

6.10 creationdialog.cpp

```
00001 #include "creationdialog.h"
00002 #include <iostream>
00003
00004
00005 CreationDialog::CreationDialog(QWidget *parent)
00006 {
00007     QLabel *m_dimLabel= new QLabel(tr("Write your dimensions and their size, separated by a comma.\n"
00008                             "For instance, '25,25 ' will create a 2-dimensional 25x25 Automaton. "));
00009     QLabel *m_densityLabel = new QLabel(tr("Density :"));
00010     QLabel *m_stateMaxLabel = new QLabel(tr("Max state :"));
00011     m_densityBox = new QSpinBox();
00012     m_stateMaxBox = new QSpinBox();
00013
00014     QHBoxLayout *densityLayout = new QHBoxLayout();
00015     densityLayout->addWidget(m_densityLabel);
00016     densityLayout->addWidget(m_densityBox);
00017
00018     QHBoxLayout *stateMaxLayout = new QHBoxLayout();
00019     stateMaxLayout->addWidget(m_stateMaxLabel);
00020     stateMaxLayout->addWidget(m_stateMaxBox);
00021
00022     m_dimensionsEdit = new QLineEdit;
00023     QRegExp rgx("([0-9]+,)*");
00024     QRegExpValidator *v = new QRegExpValidator(rgx, this);
00025     m_dimensionsEdit->setValidator(v);
00026     m_doneBt = new QPushButton(tr("Done !"));
00027
00028     QVBoxLayout *layout = new QVBoxLayout;
00029
00030     QGroupBox *grpBox = createGenButtons();
00031
00032     layout->addWidget(m_dimLabel);
00033     layout->addWidget(m_dimensionsEdit);
00034     layout->addLayout(densityLayout);
00035     layout->addLayout(stateMaxLayout);
00036     layout->addWidget(grpBox);
00037     layout->addWidget(m_doneBt);
00038     setLayout(layout);
00039
00040     connect(m_doneBt, SIGNAL(clicked(bool)), this, SLOT(processSettings()));
00041
00042 }
00043
00049 QGroupBox *CreationDialog::createGenButtons(){
00050     m_groupBox = new QGroupBox(tr("Cell generation settings"));
00051     m_empGen = new QRadioButton(tr("&Empty Board"));
00052     m_randGen = new QRadioButton(tr("&Random"));
00053     m_symGen = new QRadioButton(tr("&Symmetrical"));
00054
00055     QVBoxLayout *layout = new QVBoxLayout;
00056     layout->addWidget(m_empGen);
00057     layout->addWidget(m_randGen);
00058     layout->addWidget(m_symGen);
00059
00060     m_groupBox->setLayout(layout);
00061
00062     return m_groupBox;
00063 }
00064
00070 void CreationDialog::processSettings(){
00071     QString dimensions = m_dimensionsEdit->text();
00072     if(dimensions.length() == 0){
00073         QMessageBox messageBox;
00074         messageBox.critical(0,"Error","You must specify valid dimensions !");
00075         messageBox.setFixedSize(500,200);
00076     }
00077     else{
00078         CellHandler::generationTypes genType;
00079         if(m_randGen == NULL)std::cout << "Radio button null line 68 \n" << std::flush;
00080         if(m_symGen->isChecked()) genType = CellHandler::generationTypes::symetric;
00081         else if(m_randGen->isChecked()) genType = CellHandler::generationTypes::random;
00082         else genType = CellHandler::generationTypes::empty;
00083         QStringList dimList = m_dimensionsEdit->text().split(",");
00084         QVector<unsigned int> dimensions;
00085         for(int i = 0; i < dimList.size(); i++) dimensions.append(dimList.at(i).toInt());
00086
```

```
00087         emit settingsFilled(dimensions, genType, m_stateMaxBox->value(),
      m_densityBox->value());
00088         this->close();
00089     }
00090
00091 }
00092
```

6.11 creationdialog.h File Reference

```
#include <QtWidgets>
#include "cellhandler.h"
```

Classes

- class CreationDialog

  Automaton creation dialog box.

6.12 creationdialog.h

```
00001 #ifndef CREATIONDIALOG_H
00002 #define CREATIONDIALOG_H
00003
00004 #include <QtWidgets>
00005 #include "cellhandler.h"
00006
00013 class CreationDialog : public QDialog
00014 {
00015     Q_OBJECT
00016
00017 public:
00018     CreationDialog(QWidget *parent = 0);
00019
00020 signals:
00021     void settingsFilled(const QVector<unsigned int> dimensions,
00022                         CellHandler::generationTypes type =
      CellHandler::generationTypes::empty,
00023                         unsigned int stateMax = 1, unsigned int density = 20);
00024
00025 public slots:
00026     void processSettings();
00027
00028 private:
00029     QLineEdit *m_dimensionsEdit;
00030     QSpinBox *m_densityBox;
00031     QSpinBox *m_stateMaxBox;
00032     QPushButton *m_doneBt;
00033
00034     QGroupBox *m_groupBox;
00035     QRadioButton *m_empGen;
00036     QRadioButton *m_randGen;
00037     QRadioButton *m_symGen;
00038
00039     QGroupBox *createGenButtons();
00040
00041
00042
00043
00044
00045
00046 };
00047
00048 #endif // CREATEDIALOG_H
```

6.13 main.cpp File Reference

```
#include <QApplication>
#include <QDebug>
#include "cell.h"
#include "mainwindow.h"
```

Functions

- int main (int argc, char ∗argv[ ])

6.13.1 Function Documentation

6.13.1.1 main()

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

Definition at line 6 of file main.cpp.

6.14 main.cpp

```
00001 #include <QApplication>
00002 #include <QDebug>
00003 #include "cell.h"
00004 #include "mainwindow.h"
00005
00006 int main(int argc, char * argv[])
00007 {
00008     QApplication app(argc, argv);
00009     QApplication::setAttribute(Qt::AA_UseHighDpiPixmaps);
00010     MainWindow w;
00011     w.show();
00012     return app.exec();
00013 }
```

6.15 mainwindow.cpp File Reference

```
#include "mainwindow.h"
#include <iostream>
```

6.16 mainwindow.cpp

```
00001 #include "mainwindow.h"
00002 #include <iostream>
00003 MainWindow::MainWindow(QWidget *parent) : QMainWindow(parent)
00004 {
00005     createIcons();
00006     createActions();
00007     createToolBar();
00008     createBoard();
00009 
00010 
00011     setMinimumSize(500,500);
00012     setWindowTitle("AutoCell");
00013 
00014     m_cellHandler = NULL;
00015 }
00016 
00022 void MainWindow::createIcons(){
00023     QPixmap fastBackwardPm(":/icons/icons/fast-backward.svg");
00024     QPixmap fastBackwardHoveredPm(":/icons/icons/fast-backward-full.svg");
00025     QPixmap fastForwardPm(":/icons/icons/fast-forward.svg");
00026     QPixmap fastForwardHoveredPm(":/icons/icons/fast-forward-full.svg");
00027     QPixmap playPm(":/icons/icons/play.svg");
00028     QPixmap playHoveredPm(":/icons/icons/play-full.svg");
00029     QPixmap newPm(":/icons/icons/new.svg");
00030     QPixmap openPm(":/icons/icons/open.svg");
00031     QPixmap savePm(":/icons/icons/save.svg");
00032     QPixmap pausePm(":/icons/icons/pause.svg");
00033     QPixmap resetPm(":/icons/icons/reset.svg");
00034 
00035     m_fastBackwardIcon.addPixmap(fastBackwardPm, QIcon::Normal, QIcon::Off);
00036     m_fastBackwardIcon.addPixmap(fastBackwardHoveredPm, QIcon::Active, QIcon::Off);
00037     m_fastForwardIcon.addPixmap(fastForwardPm, QIcon::Normal, QIcon::Off);
00038     m_fastForwardIcon.addPixmap(fastForwardHoveredPm, QIcon::Active, QIcon::Off);
00039     m_playIcon.addPixmap(playPm, QIcon::Normal, QIcon::Off);
00040     m_playIcon.addPixmap(playHoveredPm, QIcon::Active, QIcon::Off);
00041     m_pauseIcon.addPixmap(pausePm, QIcon::Normal, QIcon::Off);
00042     m_newIcon.addPixmap(newPm, QIcon::Normal, QIcon::Off);
00043     m_saveIcon.addPixmap(savePm, QIcon::Normal, QIcon::Off);
00044     m_openIcon.addPixmap(openPm, QIcon::Normal, QIcon::Off);
00045     m_resetIcon.addPixmap(resetPm, QIcon::Normal, QIcon::Off);
00046 }
00047 
00052 void MainWindow::createActions(){
00053     m_fastBackward = new QAction(m_fastBackwardIcon, tr("&fast backward"),
      this);
00054     m_fastForward = new QAction(m_fastForwardIcon, tr("&fast forward"), this)
      ;
00055     m_playPause = new QAction(m_playIcon, tr("Play"), this);
00056     m_saveAutomaton = new QAction(m_saveIcon, tr("Save automaton"), this);
00057     m_newAutomaton = new QAction(m_newIcon, tr("New automaton"), this);
00058     m_openAutomaton = new QAction(m_openIcon, tr("Open automaton"), this);
00059     m_resetAutomaton = new QAction(m_resetIcon, tr("Reset automaton"), this);
00060 
00061 
00062 
00063     m_fastBackwardBt = new QToolButton();
00064     m_fastForwardBt = new QToolButton();
00065     m_playPauseBt = new QToolButton();
00066     m_saveAutomatonBt = new QToolButton();
00067     m_newAutomatonBt = new QToolButton();
00068     m_openAutomatonBt = new QToolButton();
00069     m_resetBt = new QToolButton();
00070 
00071     m_fastBackwardBt->setDefaultAction(m_fastBackward);
00072     m_fastForwardBt->setDefaultAction(m_fastForward);
00073     m_playPauseBt->setDefaultAction(m_playPause);
00074     m_saveAutomatonBt->setDefaultAction(m_saveAutomaton);
00075     m_newAutomatonBt->setDefaultAction(m_newAutomaton);
00076     m_openAutomatonBt->setDefaultAction(m_openAutomaton);
00077     m_resetBt->setDefaultAction(m_resetAutomaton);
00078 
00079     m_fastBackwardBt->setIconSize(QSize(30,30));
00080     m_fastForwardBt->setIconSize(QSize(30,30));
00081     m_playPauseBt->setIconSize(QSize(30,30));
00082     m_saveAutomatonBt->setIconSize(QSize(30,30));
00083     m_newAutomatonBt->setIconSize(QSize(30,30));
00084     m_openAutomatonBt->setIconSize(QSize(30,30));
00085     m_resetBt->setIconSize(QSize(30,30));
00086 
00087     connect(m_openAutomatonBt, SIGNAL(clicked(bool)), this, SLOT(
      openFile()));
00088     connect(m_newAutomatonBt, SIGNAL(clicked(bool)), this, SLOT(
      openCreationWindow()));
00089     connect(m_saveAutomatonBt, SIGNAL(clicked(bool)), this, SLOT(
```

```
    saveToFile()));
00090     connect(m_fastForwardBt, SIGNAL(clicked(bool)), this, SLOT(
    forward()));
00091
00092 }
00093
00098 void MainWindow::createToolBar(){
00099     m_toolBar = new QToolBar(this);
00100     QLabel *m_speedLabel = new QLabel(tr("Speed : "));
00101     m_jumpSpeed = new QSpinBox(this);
00102     m_jumpSpeed->setValue(1);
00103     m_speedLabel->setFixedWidth(50);
00104     m_jumpSpeed->setFixedWidth(40);
00105     m_toolBar->setMovable(false);
00106
00107     QHBoxLayout *tbLayout = new QHBoxLayout(this);
00108     tbLayout->addWidget(m_newAutomatonBt, Qt::AlignCenter);
00109     tbLayout->addWidget(m_openAutomatonBt, Qt::AlignCenter);
00110     tbLayout->addWidget(m_saveAutomatonBt, Qt::AlignCenter);
00111     tbLayout->addWidget(m_fastBackwardBt, Qt::AlignCenter);
00112     tbLayout->addWidget(m_playPauseBt, Qt::AlignCenter);
00113     tbLayout->addWidget(m_fastForwardBt, Qt::AlignCenter);
00114     tbLayout->addWidget(m_speedLabel, Qt::AlignCenter);
00115     tbLayout->addWidget(m_jumpSpeed, Qt::AlignCenter);
00116     tbLayout->addWidget(m_resetBt, Qt::AlignCenter);
00117
00118
00119     tbLayout->setAlignment(Qt::AlignCenter);
00120     QWidget* wrapper = new QWidget();
00121     wrapper->setLayout(tbLayout);
00122     m_toolBar->addWidget(wrapper);
00123     addToolBar(m_toolBar);
00124
00125
00126 }
00127
00132 void MainWindow::createBoard(){
00133     m_Board = new QTableWidget(m_boardVSize, m_boardHSize, this);
00134         m_Board->setFixedSize(m_boardHSize*m_cellSize,
    m_boardVSize*m_cellSize);
00135         //setMinimumSize(m_boardHSize*m_cellSize,100+m_boardVSize*m_cellSize);
00136         m_Board->horizontalHeader()->setVisible(false);
00137         m_Board->verticalHeader()->setVisible(false);
00138         m_Board->setVerticalScrollBarPolicy(Qt::ScrollBarAlwaysOff);
00139         m_Board->setHorizontalScrollBarPolicy(Qt::ScrollBarAlwaysOff);
00140         m_Board->setEditTriggers(QAbstractItemView::NoEditTriggers);
00141         for(unsigned int col = 0; col < m_boardHSize; ++col)
00142             m_Board->setColumnWidth(col, m_cellSize);
00143         for(unsigned int row = 0; row < m_boardVSize; ++row) {
00144             m_Board->setRowHeight(row, m_cellSize);
00145             for(unsigned int col = 0; col < m_boardHSize; ++col) {
00146                 m_Board->setItem(row, col, new QTableWidgetItem(""));
00147                 m_Board->item(row, col)->setBackgroundColor("white");
00148                 m_Board->item(row, col)->setTextColor("black");
00149             }
00150         }
00151      QScrollArea *scrollArea = new QScrollArea(this);
00152      scrollArea->setWidget(m_Board);
00153      setCentralWidget(scrollArea);
00154 }
00155
00156
00160 void MainWindow::openFile(){
00161     QString fileName = QFileDialog::getOpenFileName(this, tr("Open Cell file"), ".",
00162                                                     tr("Automaton cell files (*.atc)"));
00163     if(!fileName.isEmpty()){
00164         m_cellHandler = new CellHandler(fileName);
00165         QVector<unsigned int> dimensions = m_cellHandler->
    getDimensions();
00166         if(dimensions.size() > 1){
00167             m_boardVSize = dimensions[0];
00168             m_boardHSize = dimensions[1];
00169         }
00170         else{
00171             m_boardVSize = 1;
00172             m_boardHSize = dimensions[0];
00173         }
00174         createBoard();
00175         updateBoard();
00176     }
00177 }
00178
00179
00183 void MainWindow::saveToFile(){
00184     if(m_cellHandler != NULL){
00185         QString fileName = QFileDialog::getSaveFileName(this, tr("Save Automaton"),
00186                                                         ".", tr("Automaton Cells file (*.atc"));
```

```
00187         m_cellHandler->save(fileName);
00188
00189     }
00190     else{
00191         QMessageBox msgBox;
00192         msgBox.critical(0,"Error","Please create or import an Automaton first !");
00193         msgBox.setFixedSize(500,200);
00194     }
00195 }
00196
00201 void MainWindow::openCreationWindow(){
00202     CreationDialog *window = new CreationDialog(this);
00203     connect(window, SIGNAL(settingsFilled(QVector<uint>,
      CellHandler::generationTypes,uint,uint)),
00204             this, SLOT(setCellHandler(QVector<uint>,
      CellHandler::generationTypes,uint,uint)));
00205     window->show();
00206 }
00207
00214 void MainWindow::setCellHandler(const QVector<unsigned int> dimensions,
00215                                 CellHandler::generationTypes type,
00216                                 unsigned int stateMax, unsigned int density){
00217     m_cellHandler = new CellHandler(dimensions, type, stateMax, density);
00218     if(dimensions.size() > 1){
00219         m_boardVSize = dimensions[0];
00220         m_boardHSize = dimensions[1];
00221     }
00222     else{
00223         m_boardVSize = 1;
00224         m_boardHSize = dimensions[0];
00225     }
00226     createBoard();
00227     updateBoard();
00228 }
00229
00234 void MainWindow::nextState(int n){
00235     if(m_cellHandler == NULL){
00236         QMessageBox msgBox;
00237         msgBox.critical(0,"Error","Please create or import an Automaton first !");
00238         msgBox.setFixedSize(500,200);
00239     }
00240     else{
00241         for(unsigned int i = 0; i < n; i++) m_cellHandler->
      nextStates();
00242         updateBoard();
00243     }
00244 }
00245
00250 void MainWindow::updateBoard(){
00251     if(m_cellHandler == NULL){
00252         QMessageBox msgBox;
00253         msgBox.critical(0,"Error","Please create or import an Automaton first !");
00254         msgBox.setFixedSize(500,200);
00255     }
00256     else{
00257         int i = 0;
00258         int j = 0;
00259         for (CellHandler::iterator it = m_cellHandler->
      begin(); it != m_cellHandler->end() && it.changedDimension() < 2; ++it){
00260                 if(it.changedDimension() > 0){
00261                     i = 0;
00262                     j++;
00263                     std::cout << std::endl;
00264                 }
00265                 m_Board->item(i,j)->setText(QString::number(it->getState()));
00266                 i++;
00267         }
00268     }
00269
00270 }
00271
00276 void MainWindow::forward(){
00277     nextState(m_jumpSpeed->value());
00278 }
```

6.17 mainwindow.h File Reference

```
#include <QMainWindow>
#include <QtWidgets>
#include "cellhandler.h"
```

```
#include "creationdialog.h"
```

Classes

- class MainWindow

  Simulation window.

6.18 mainwindow.h

```
00001 #ifndef MAINWINDOW_H
00002 #define MAINWINDOW_H
00003
00004 #include <QMainWindow>
00005 #include <QtWidgets>
00006 #include "cellhandler.h"
00007 #include "creationdialog.h"
00008
00009
00016 class MainWindow : public QMainWindow
00017 {
00018     Q_OBJECT
00019
00020     CellHandler *m_cellHandler;
00021
00023     QIcon m_fastBackwardIcon;
00024     QIcon m_fastForwardIcon;
00025     QIcon m_playIcon;
00026     QIcon m_pauseIcon;
00027     QIcon m_newIcon;
00028     QIcon m_saveIcon;
00029     QIcon m_openIcon;
00030     QIcon m_resetIcon;
00031
00033     QAction *m_playPause;
00034     QAction *m_nextState;
00035     QAction *m_previousState;
00036     QAction *m_fastForward;
00037     QAction *m_fastBackward;
00038     QAction *m_openAutomaton;
00039     QAction *m_saveAutomaton;
00040     QAction *m_newAutomaton;
00041     QAction *m_resetAutomaton;
00042
00044     QToolButton *m_playPauseBt;
00045     QToolButton *m_nextStateBt;
00046     QToolButton *m_previousStateBt;
00047     QToolButton *m_fastForwardBt;
00048     QToolButton *m_fastBackwardBt;
00049     QToolButton *m_openAutomatonBt;
00050     QToolButton *m_saveAutomatonBt;
00051     QToolButton *m_newAutomatonBt;
00052     QToolButton *m_resetBt;
00053
00054
00055     QSpinBox *m_jumpSpeed;
00056     QLabel *m_speedLabel;
00057
00058     QToolBar *m_toolBar;
00059
00060     QTableWidget *m_Board;
00061
00063     unsigned int m_boardHSize = 25;
00064     unsigned int m_boardVSize = 25;
00065     unsigned int m_cellSize = 30;
00066
00067     void createIcons();
00068     void createActions();
00069     void createToolBar();
00070     void createBoard();
00071
00072
00073     void updateBoard();
00074     void nextState(int n);
00075
00076
```

```
00077 public:
00078     explicit MainWindow(QWidget *parent = nullptr);
00079
00080
00081 signals:
00082
00083 public slots:
00084     void openFile();
00085     void saveToFile();
00086     void openCreationWindow();
00087     void setCellHandler(const QVector<unsigned int> dimensions,
00088                         CellHandler::generationTypes type =
      CellHandler::generationTypes::empty,
00089                         unsigned int stateMax = 1, unsigned int density = 20);
00090     void forward();
00091
00092 };
00093
00094 #endif // MAINWINDOW_H
```

6.19 presentation.md File Reference

6.20 presentation.md

```
00001 \page Presentation
00002 # What is AutoCell
00003 The purpose of this project is to create a Cellular Automate Simulator.
00004
00005 \includedoc CellHandler
```

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