Multiscale Modelling - Raport

# Introduction

The goal of this project was to implement the algorithm using cellular automata technique to divide a specific part of material into lattices of finite cells. Algorithm should simulate what happened with the grain during crystallites process in a material at the height temperature.

## User interface

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Rysunek 1 Main window

The graphical user interface has implemented features that allows the user to customize the simulation. The main picture box is a rectangular domain of simulation. Starting with the upper left corner, user has ability to adjust the picture box where the simulation is shown, to fit to the customer requirements. Going to the right side, user can generate passed value of nucleons on the random positions on previously generated domain. Below on the left side there is an inclusion menu where user can pick how many inclusions will be added before the simulation on random position on the domain. There is possibility to choose the shape of inclusions (by default circle but checking the check box user can chose rectangle shape of the inclusions) and specify the range of the radius for circle inclusions and width of rectangle. There is also an additional option, that provide to adding inclusion after the simulation has finished, but in that case, they are placed randomly on the boundaries.

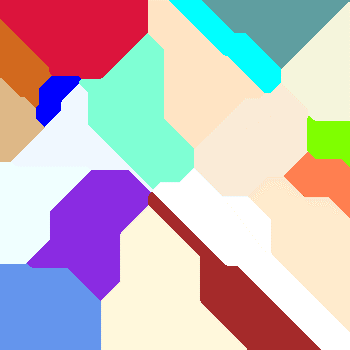
Further to right, there are two buttons which allows user to start the grain growth and reset the hole simulation. Next, we can set an algorithm of CA grain growth algorithm and set probability of shape control algorithm. On the left corner of the settings after simulation user can pick some grains preserve them in original form(substructure) or change them into uniform grain(dual-phase), either way, preventing them from growing. On the other side “Show all boundaries” button gives user a possibility to draw grains boundaries and “Clear grains” button to draw only boundaries.

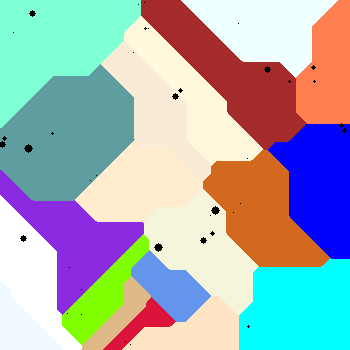
User have also possibility to importing and exporting domain in .csv and .bmp format, options for that are placed in left corner.

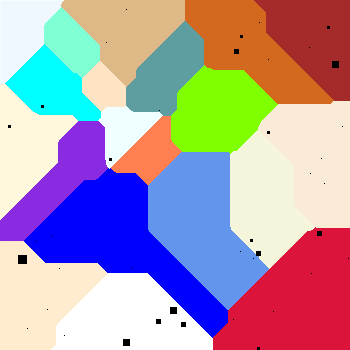
## Example of simulation

### One

* quare inclusions of size 3
* Simple grain growth algorithm
* Substructure selection







Obraz zawierający lego, zabawka

Opis wygenerowany automatycznie