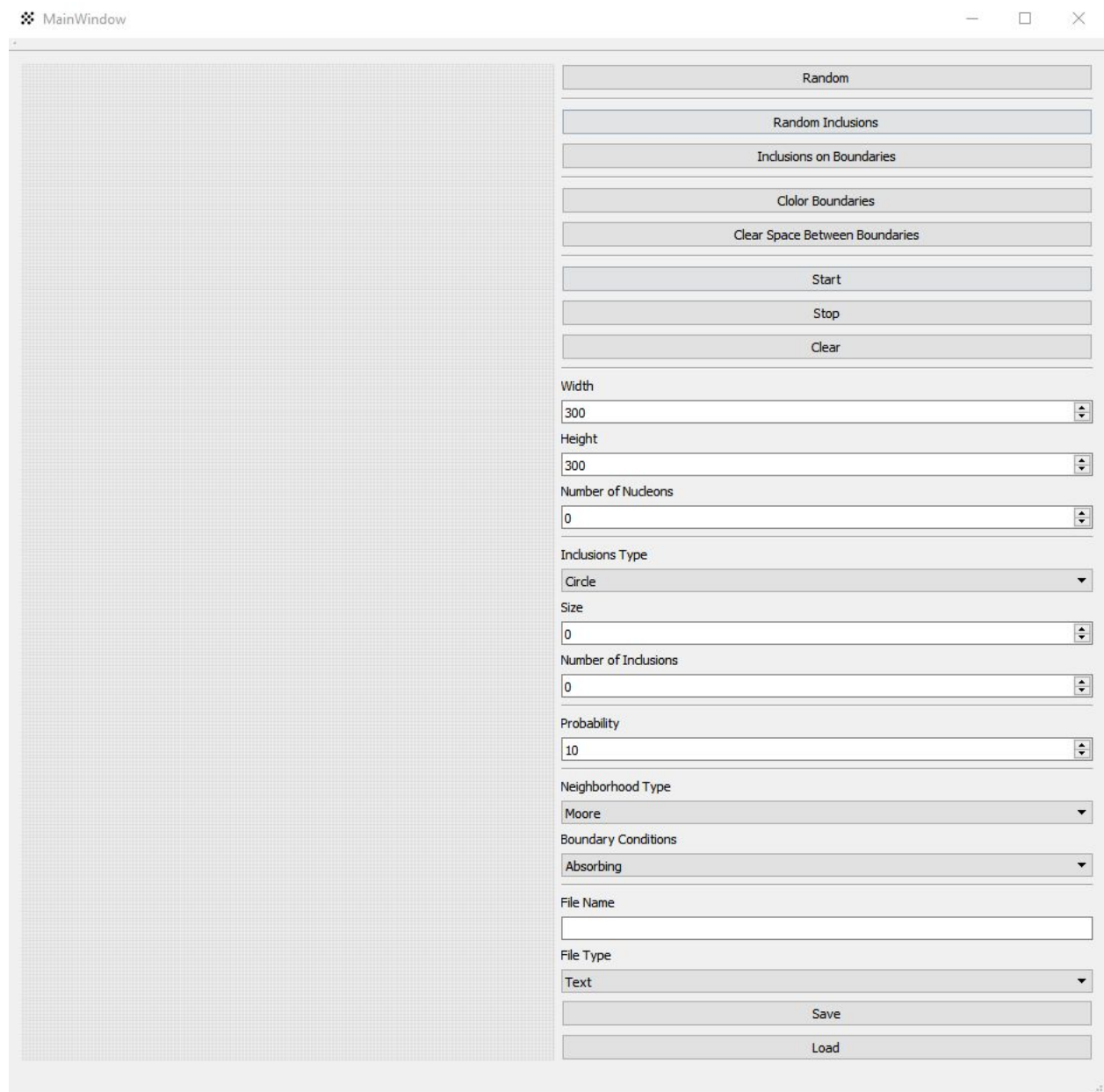


Multiscale modeling - Project Report

GUI DESCRIPTION



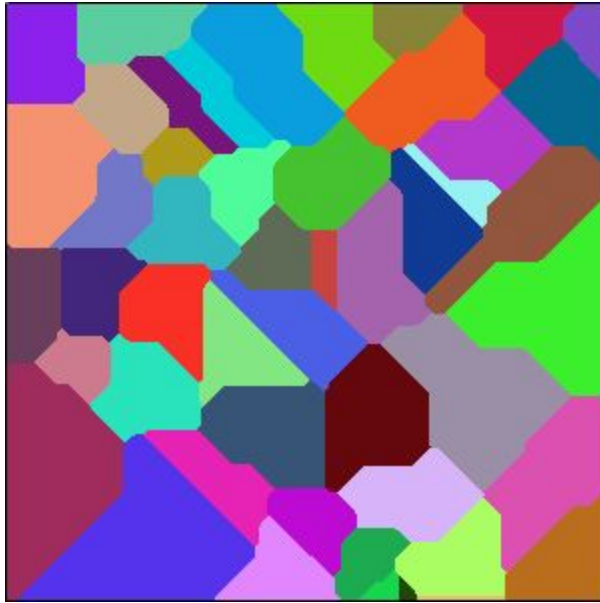
The left part of the interface is the space on which the microstructure is generated.

The right part of the interface is responsible for controlling the application:

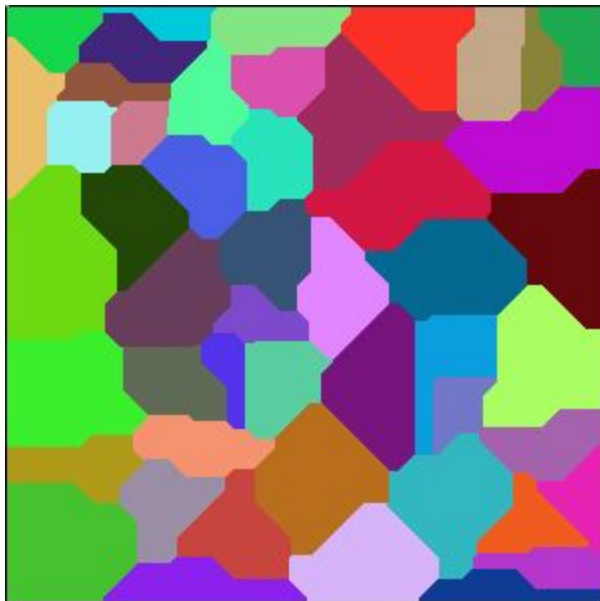
- Random button - generates nucleons in random places of space
- Random Inclusion button - generates inclusions in random places of space
- Inclusions on Boundaries button - generates inclusions on grains boundaries
- Color Boundaries button - colors grains boundaries on black
- Clear Space Between Boundaries button - cleans space between boundaries
- Start button - starts simulations
- Stop button - stops simulations
- Clear button - cleans the space
- Width spin box - sets width of the space (range 1-300)
- Height spin box - sets height of the space (range 1-300)
- Number of Nucleons spin box - sets number of nucleons in simulation
- Inclusion Type combo box - chooses type of inclusions (Circle or Square)
- Size spin box - sets size of inclusions
- Number of Inclusions spin box - sets number of inclusions
- Probability spin box - sets probability for rule 4 in "Extension of Moore" neighborhood type
- Neighborhood Type combo box - chooses type of neighborhood (Moore, von Neuman, Extension of Moore)
- Boundary Conditions combo box - chooses type of boundary conditions (Absorbing or Periodic)
- File Name text field - sets the file name
- File Type combo box - chooses type of file (Text, Bitmap)
- Save button - saves the file
- Load button - reads the file

RESULTS

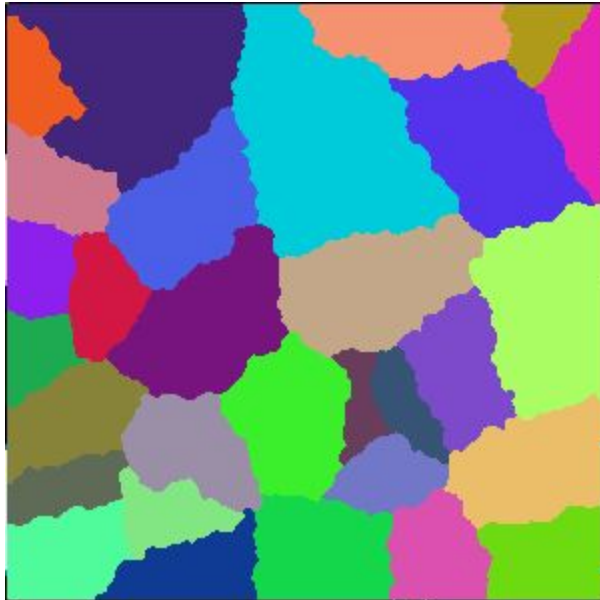
300x300 - Moore Neighborhood - 50 Nucleons



300x300 - von Neuman Neighborhood - 50 Nucleons



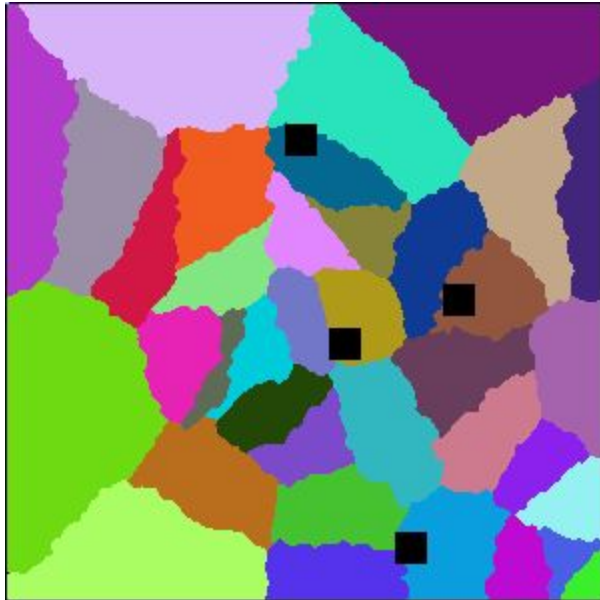
300x300 - Extension of Moore Neighborhood - 50 Nucleons - 10% Probability



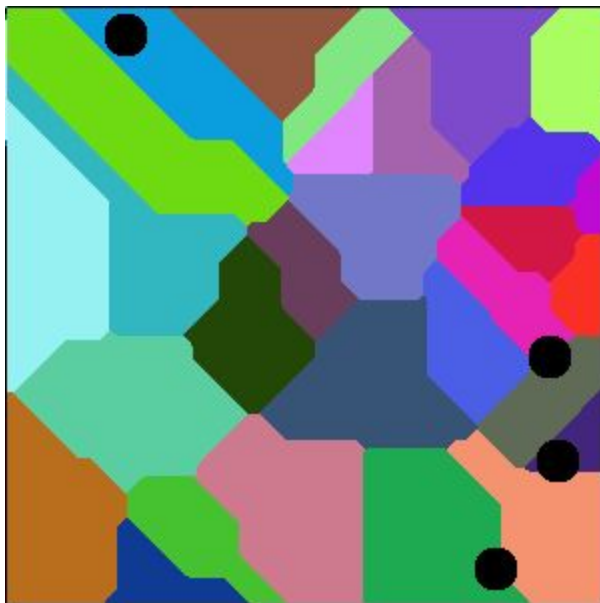
300x300 - Extension of Moore Neighborhood - 50 Nucleons - 10% Probability - Inclusions on Boundaries - Circle Type - Number 5 - Size 10



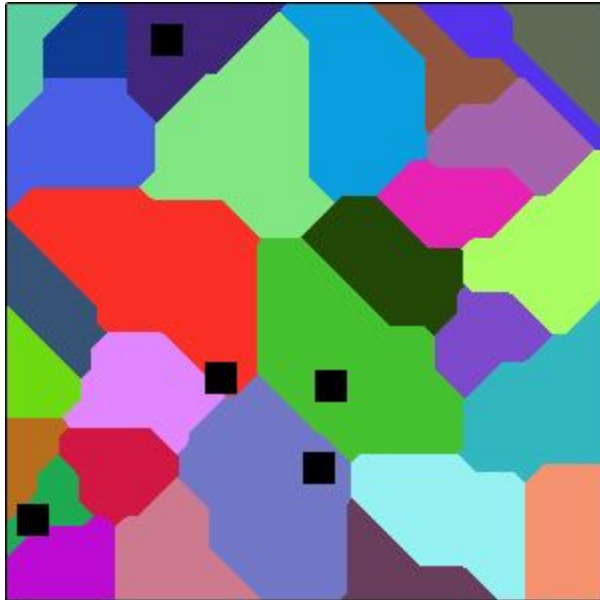
**300x300 - Extension of Moore Neighborhood - 50 Nucleons - 10%
Probability - Inclusions on Boundaries - Square Type - Number 4 - Size 15**



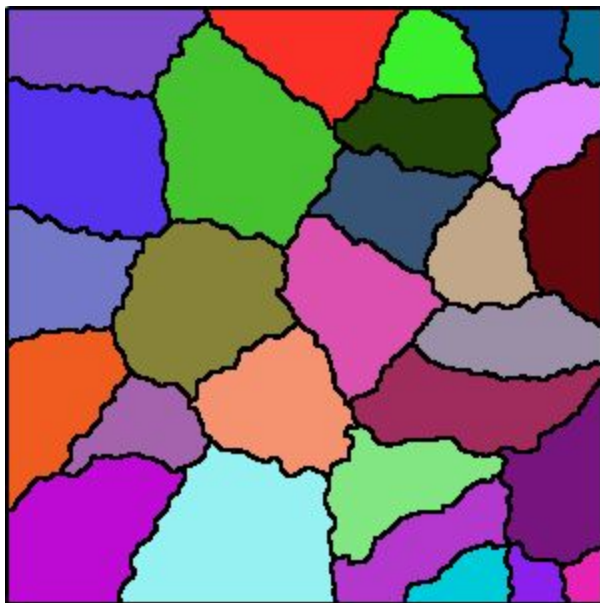
**300x300 - Moore Neighborhood - 30 Nucleons - Random Inclusions -
Circle Type - Number 4 - Size 10**



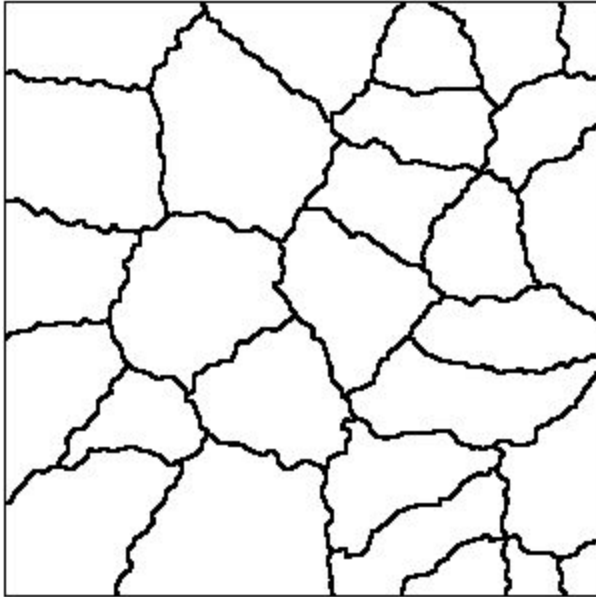
**300x300 - Moore Neighborhood - 30 Nucleons - Random Inclusions -
Square Type - Number 5 - Size 15**



**300x300 - Extension of Moore Neighborhood - 50 Nucleons - 10%
Probability - Color Boundaries**

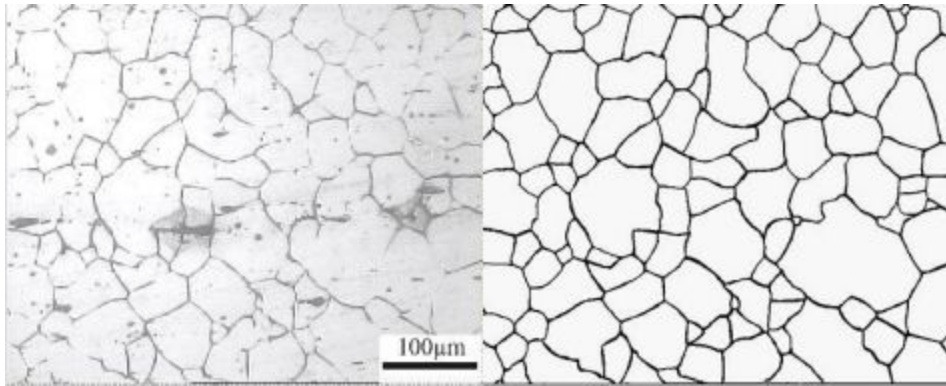


300x300 - Extension of Moore Neighborhood - 50 Nucleons - 10% Probability - Color Boundaries with Clear Space Between Boundaries

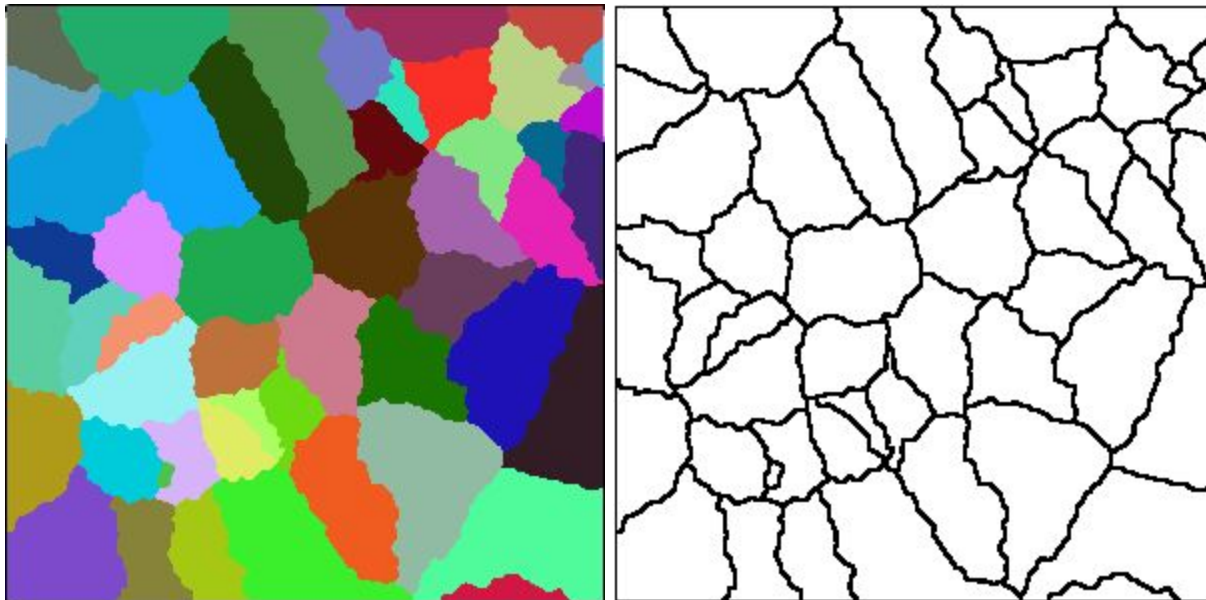


COMPARISON WITH REAL MICROSTRUCTURES

Real



Generated



SUMMARY

During the project the following functionalities were implemented:

- generation of space of given size
- random distribution of a given number of nucleons
- simulation with one of the three types of neighborhood (Moore, von Neuman, Extension of Moore)

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- possibility of choosing the boundary conditions (Absorbing, Periodic)
 - saving simulation results to a txt or bitmap file
 - loading simulation results to a txt or bitmap file
 - selection of the quantity, size and type of inclusions
 - generation of inclusions in random places and at the border of grains
 - ability to color grain boundaries and to clear the space between them