Report

Multiscale Modelling Application - specification

1. GUI description
2. Output results
3. Comparison with real microstructures
4. Summary

1. <u>GUI description</u>

Multiscale modelling application is a simple grain growth application with GUI. Application is implemented in C# language powered by Microsoft Visual Studio. Frontend interface is designed with Visual Studio tools which are connected with backend logic implemented in C#.
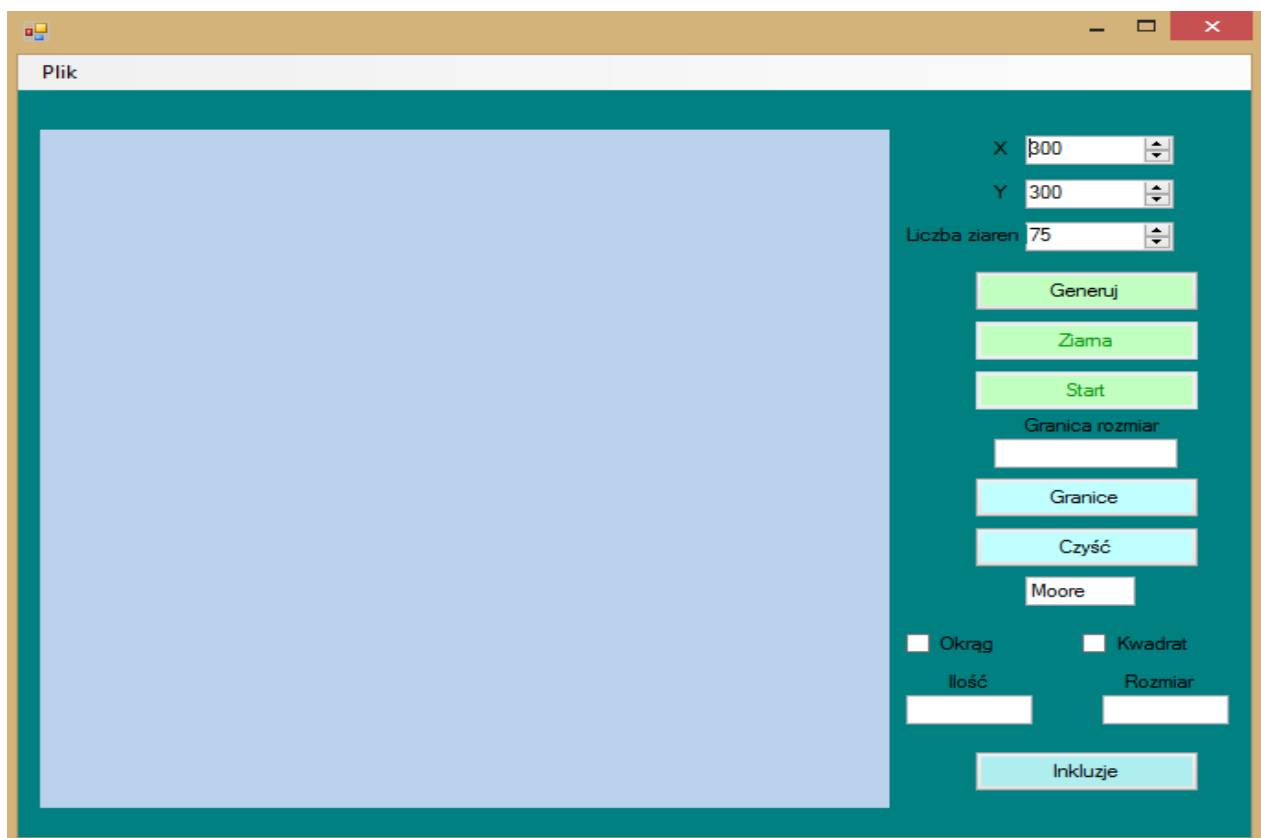

Fig. 1. Graphical User Interface

The structure of main window is splitted for two parts. One is responsible for output(grain growth) display and the second one consists of input fields. All of these fields are required to generate new blank area and launch grain growth simulation to create new microstructure.

Application contains import/export features as well which are splitted for bitmap and text file import/export. Below short descriptions of interface controls inside, from the top:

- X, Y – witdth&height of the space, default set to 300
- „Liczba ziaren" – sets number of grains on the platform
- „Generuj" button – generates new space
- „Ziarna" button – creates grains in new space
- „Start" button – starts simulation
- „Granica rozmiar" textbox – sets the boundries size
- „Granice" button – generates boundaries on simulated grains growth
- „Czyść" button – cleans space between boundaries
- „Moore" textbox – sets Moore neighbourhood in simulation
- „Okrąg" & „Kwadrat" checkboxes set specific type of inclusion
- „Ilość" & „Rozmiar" textboxes set amount and size of inclusions
- „Inkluzje" button – generates inclusions inside simulation

2. Output results

Chapter show some results from the application executions and generated microstructures(short descriptions below pictures).
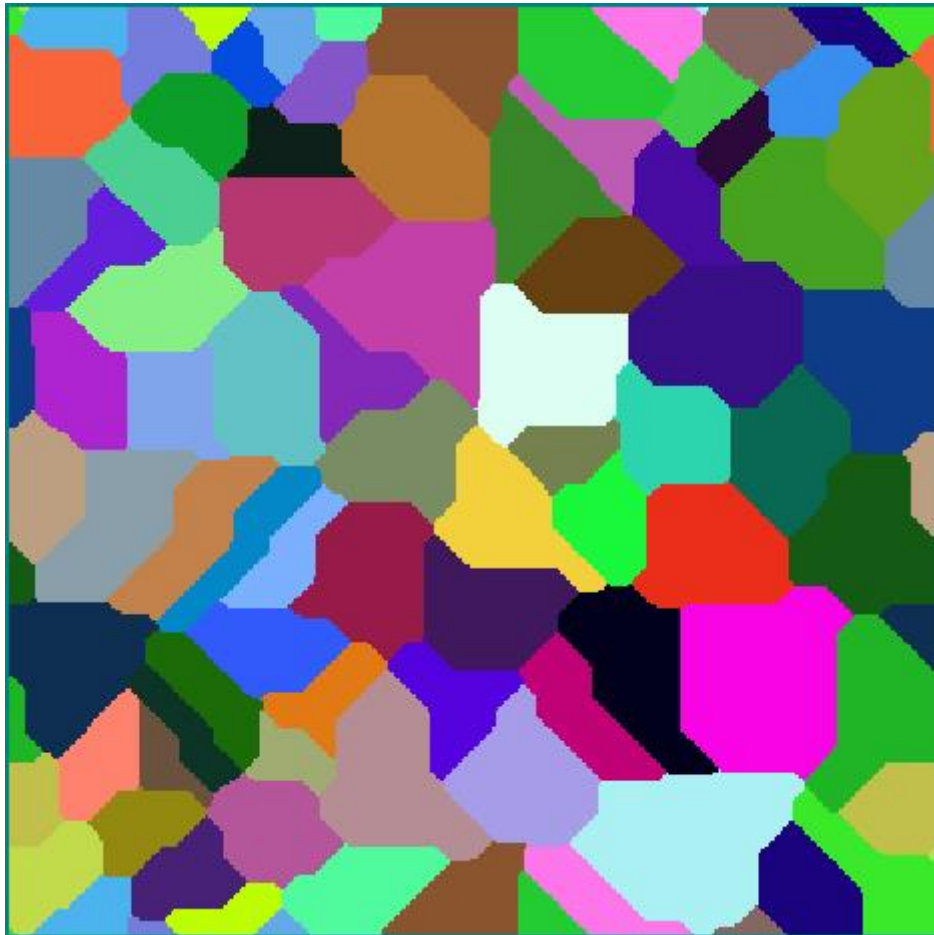

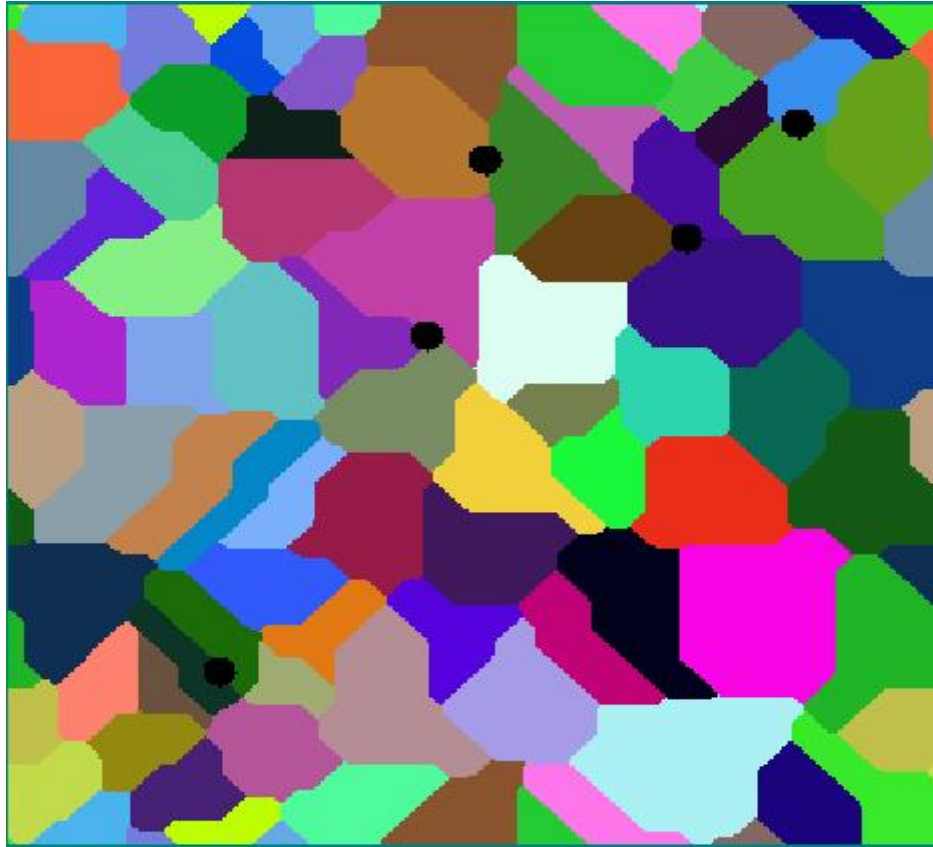Fig. 2. 300x300 – Moore Neighbourhood – 75 nucleons

Fig. 3. 300x300 – Moore Neighbourhood – 75 nucleons with 5 circled inclusions

Fig. 4. 300x300 – Moore Neighbourhood – 75 nucleons with 5 squared inclusions
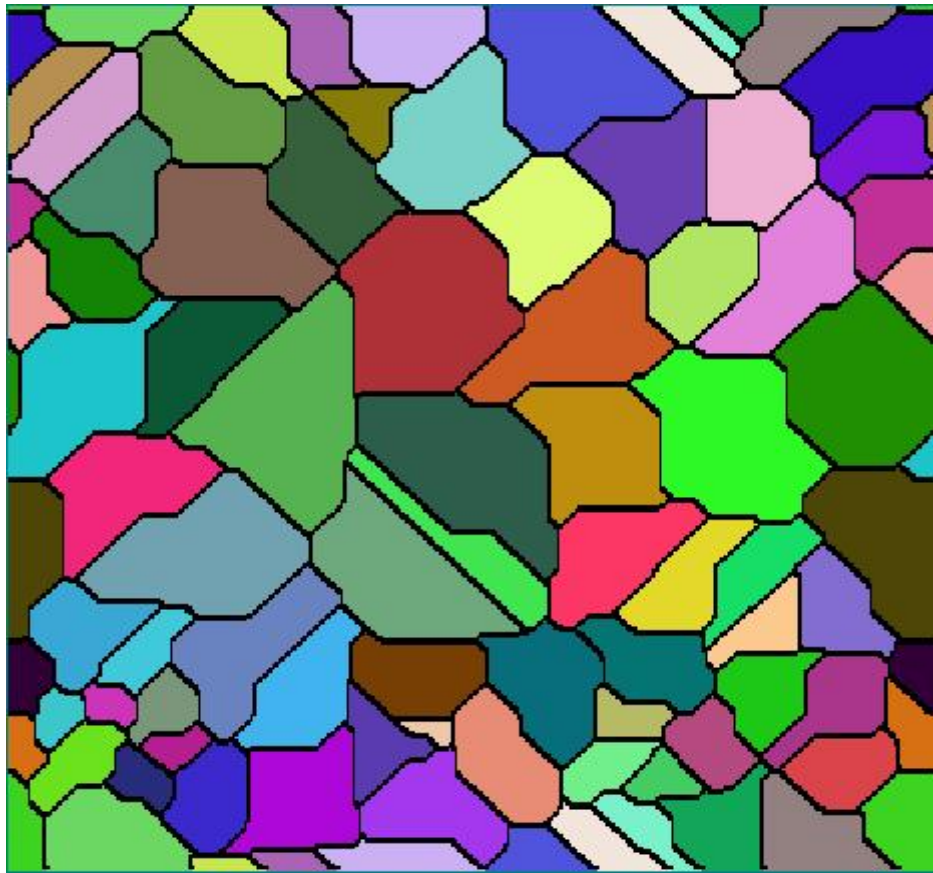
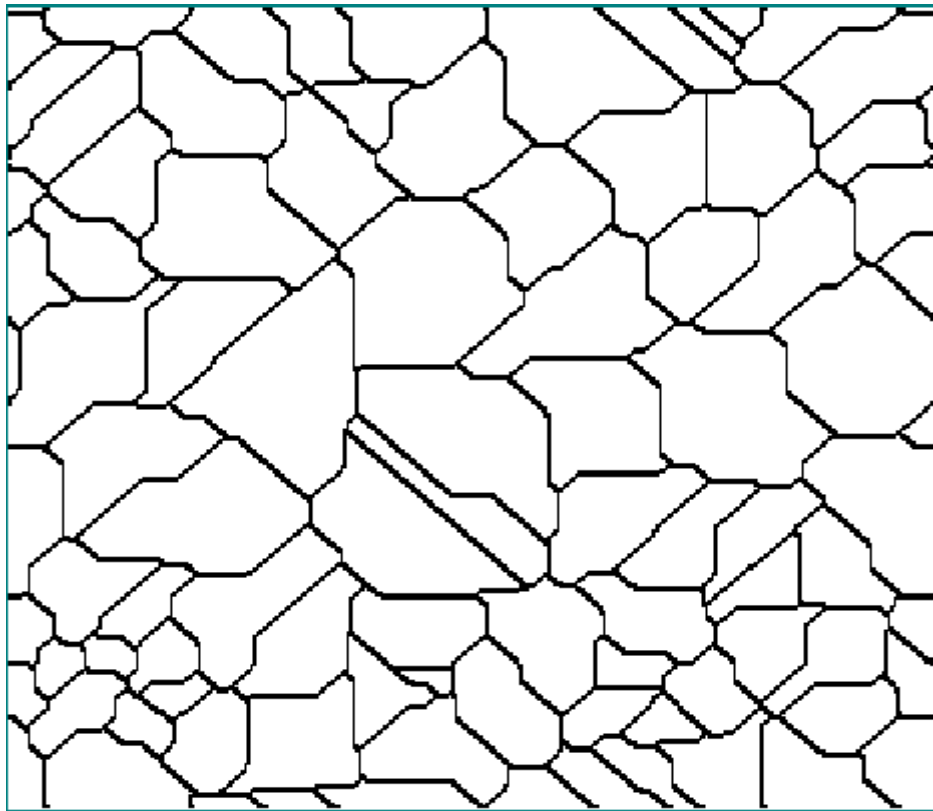Fig. 5. 300x300 – Moore Neighbourhood – 75 nucleons with boundaries

Fig. 6. 300x300 – Moore Neighbourhood – 75 nucleons with boundaries with cleared spaces

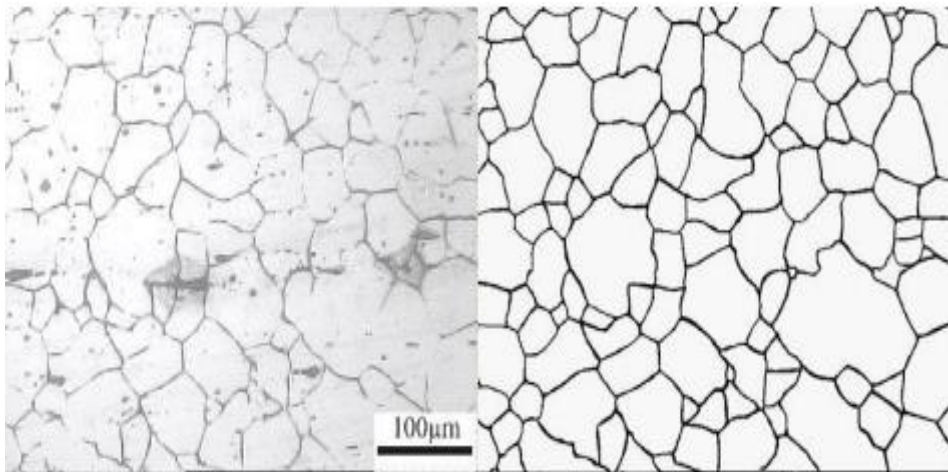3. Comparison with real microstructures

Real microstructure
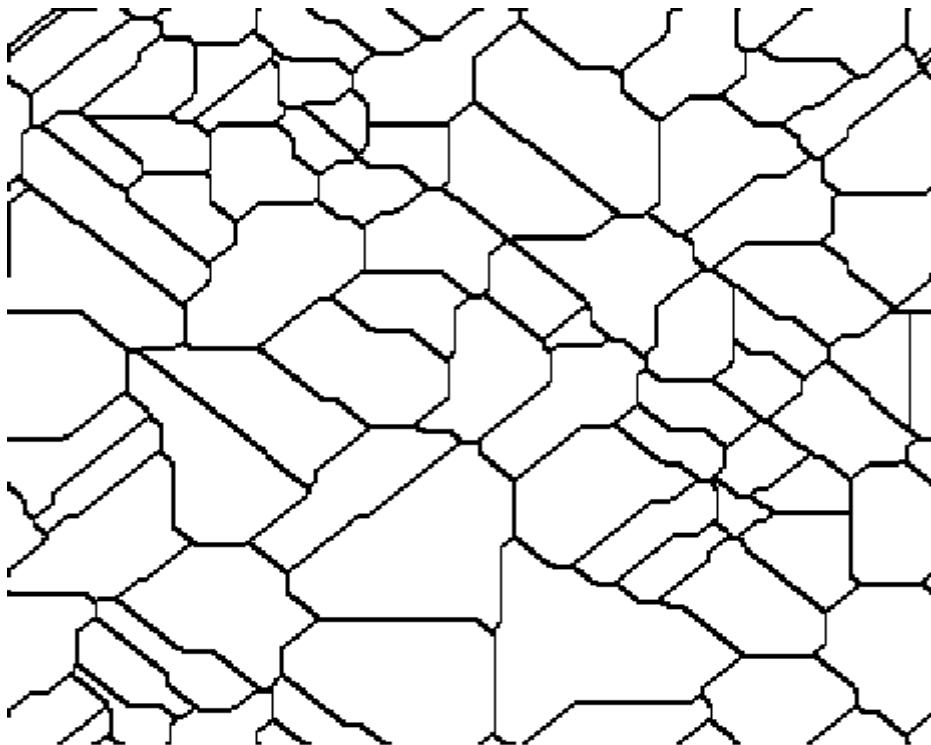

Fig. 7. Real microstructure

Microstructure from app

Fig. 8. Generated microstructure

4. Summary

Implemented program displays grains growth microstructure with Moore neighbourhood. Application can displays different microstructures related with grains number. After final microstructure generation, program can export these results to bitmap or txt file. This simple system also allows to generate boundaries on the grains growth map and clear interiors of the spaces between boundaries. Application allows to add inclusions inside the simulation and set the type of such inclusion as well.