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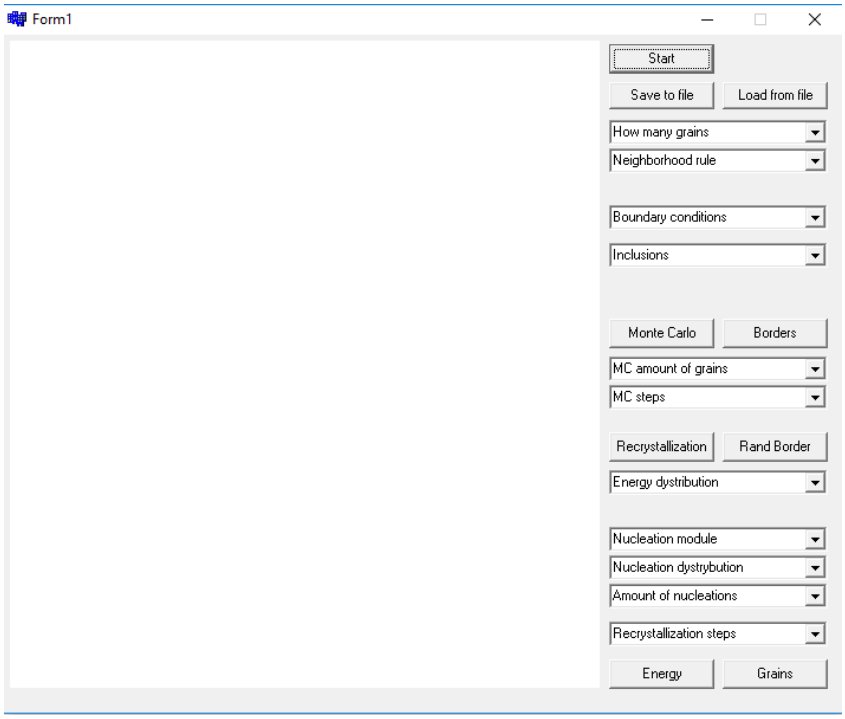
Multiscale Modeling
Report 2

1. Technology

Project is a continuation of my first project to grain growth applications. I'm still using a C++ programing language and build use a builder c++.

2. User Interface

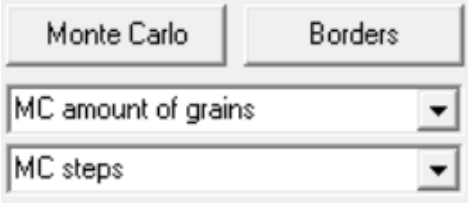


Picture 1 (GUI Application)

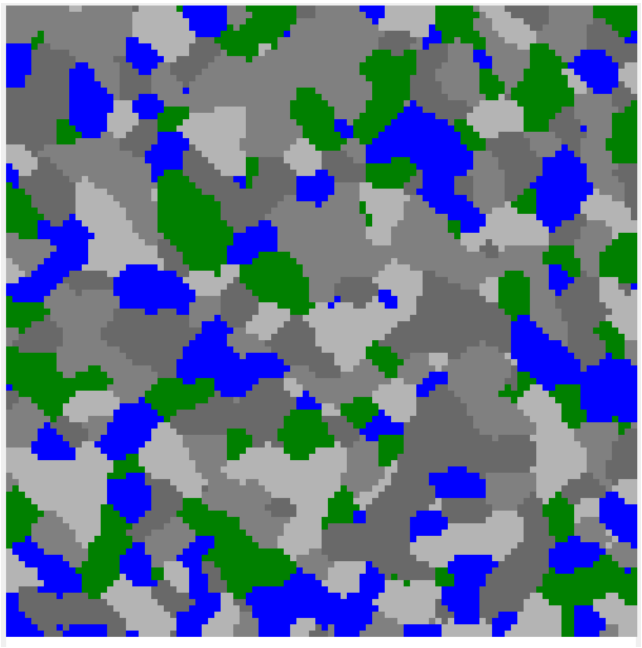
On the Picture number 1 we can see a GUI Application of my program.

3. Application

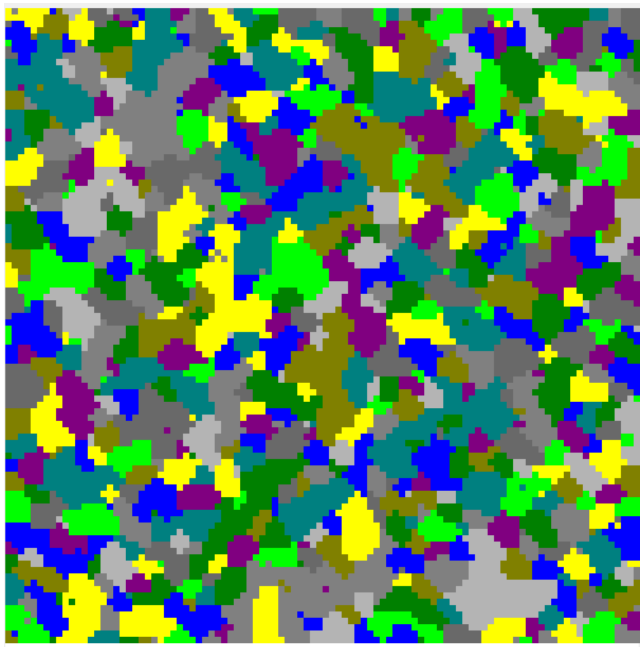
The application give us a possibility to generate and simulation grain structure, using a Monte Carlo Method (Picture 2) We can choose a number of grain and amount iteration.



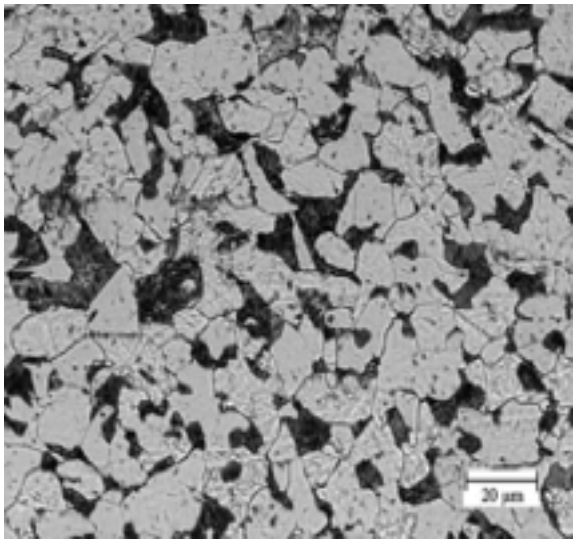
Picture 2 (Monte Carlo options)



Picture 3 (Monte Carlo 5 amount of grains grains and 1100 iterations)



Picture 4 (Monte Carlo 10 amount of 700 iterations)



Picture 5 (real a carbon microstructure)

Compare simulating microstructure (Picture 3) and the real carbon microstructure (Picture 5). I think that Monte Carlo giving a real realistic result. The structures are a similar.

4. Recrystallization

My program can simulate the recrystallization. We can choose two different options of additional energy distribution

- homogeneous add same value of energy to all cells. Who we can see on the Picture 9.
- heterogeneous (example: Picture 7) can adds two different value of the energy.

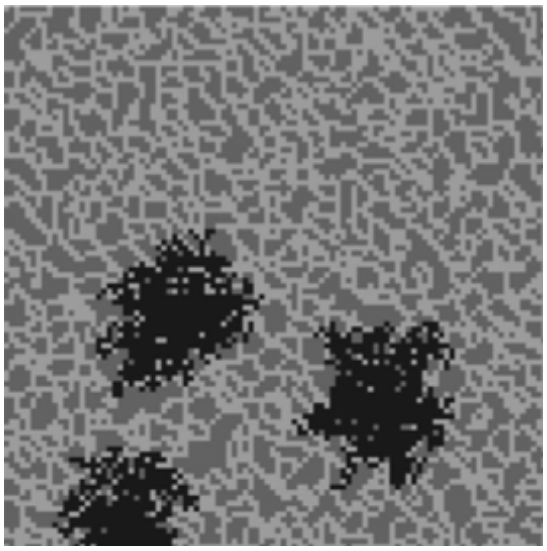
Nucleation have a four options to use:

- Constant (Picture 8)
- Increasing (Picture 6)
- Decreasing
- Only the beginning

The all options might be use on boundaries or anywhere.

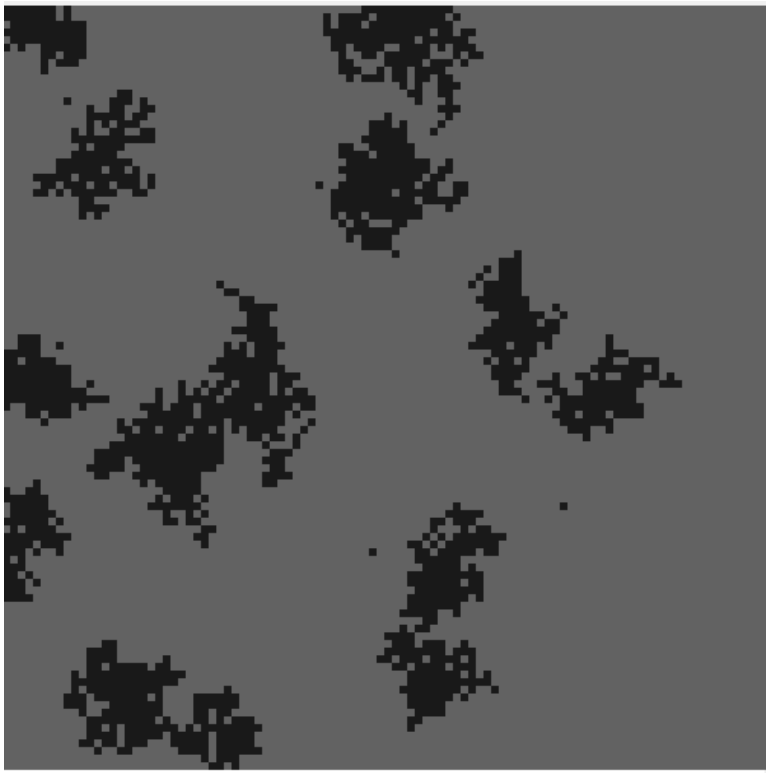
Examples:

Picture 6
(homogenous, 5 energy, increasing, anywhere, 8 nucleations 10 000 steps)



Picture 7
(Simulation energy heterogenous recrystallization)

Picture 8 (heterogenous, 4 bound energy, 5 grains energy, constant, on boundaries, 13 amount nucleations, 13 000 steps)



Picture 9 (example of simulation homogenous recrystallization)

5. Summary

In this project we can use a Monte Carlo method to simulate grain growth. Is a more advanced from Cellular Automata but its slower. The most important think in MC is a amount of iterations. Simulations is a real good option from constructions because is a cheeper and we can use a expending options to check various situations.