AGH University of Science and Technology

Multiscale Modelling

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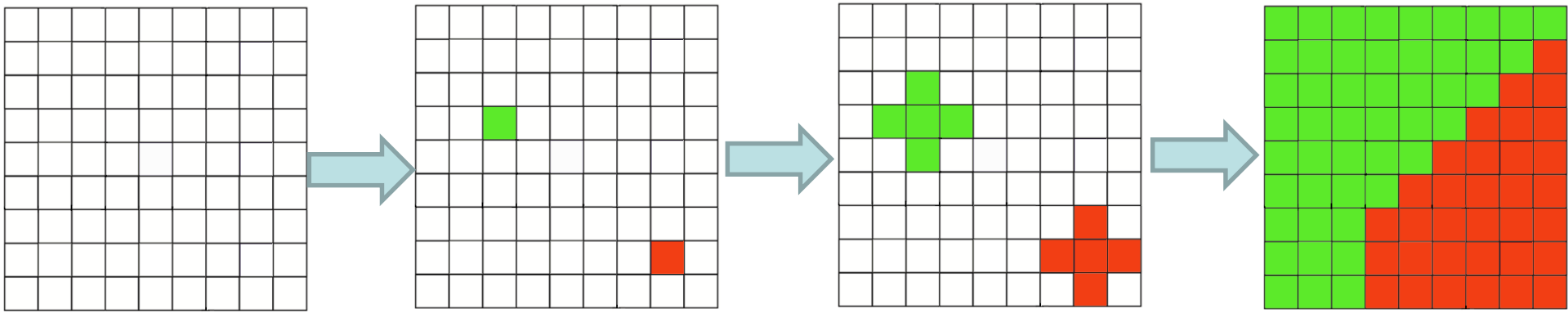
Classes calendar

	Issues
1	Organizational class - simple grain growth CA + visualization
2	Microstructures export/import to/from txt files, pictures.
3	Modification of cellular automata grain growth algorithm- inclusions (at the beginning/end of the simulation)
4	**Modification of CA grain growth algorithm - influence of grain curvature**
5	Modification of CA grain growth algorithm - substructures CA
6	Modification of CA grain growth algorithm - boundaries coloring
7	**Reports 1st part**
8	Monte Carlo grain growth algorithm
9	Modification of MC grain growth algorithm - substructures CA, MC
10	MC static recrystallization algorithm - energy distribution
11	MC static recrystallization algorithm - nucleation
12	MC static recrystallization algorithm - growth
13	**Reports 2nd part**
14	Final degree

Simple Grain Growth CA algorithm

2 grains
Von Neumann neighborhood



Initial space

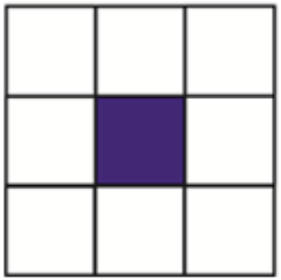
1st step

2nd step

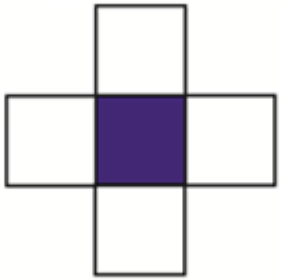
last step

Grain boundary shape control

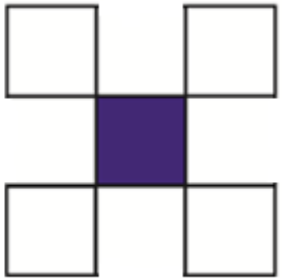
Moore

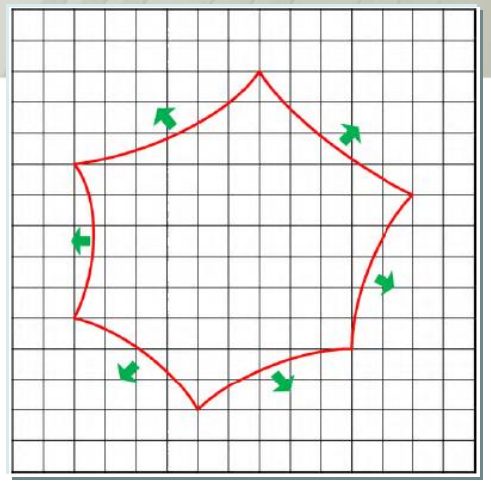


Nearest Moore

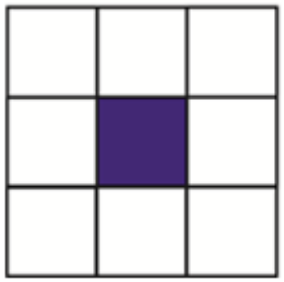


Further Moore

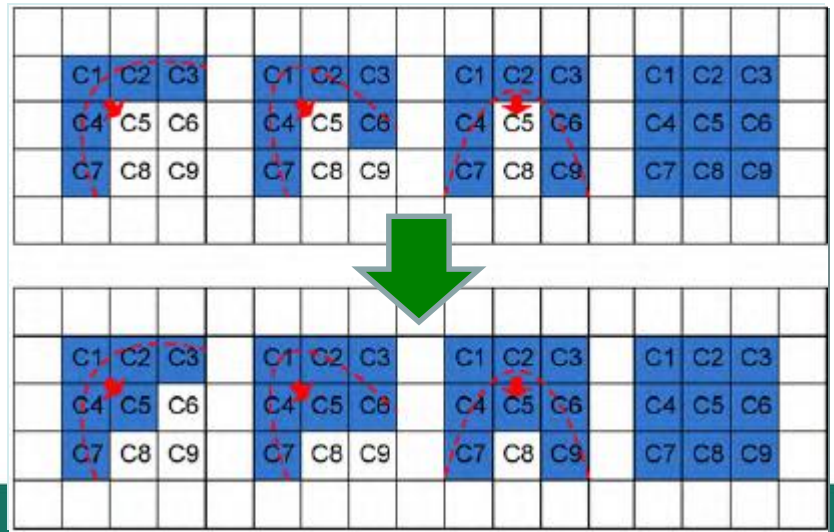




Rule 1:



The id of particular cell depends on its all neighbors. If five to eight of the cells neighbors id's is equal to S, then cell transforms to the state S



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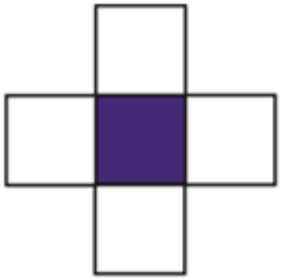
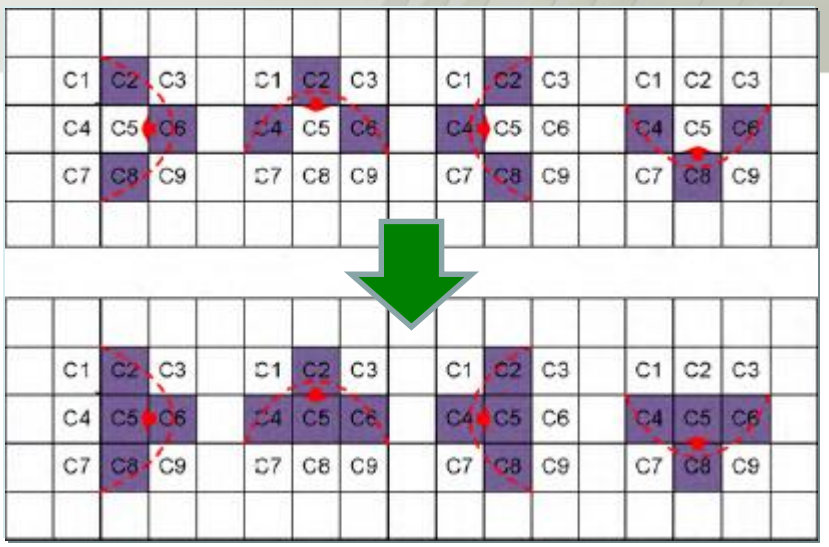
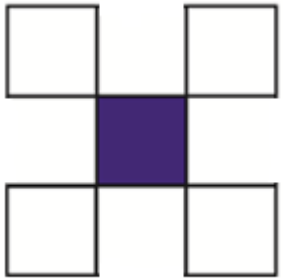
Rule 2:



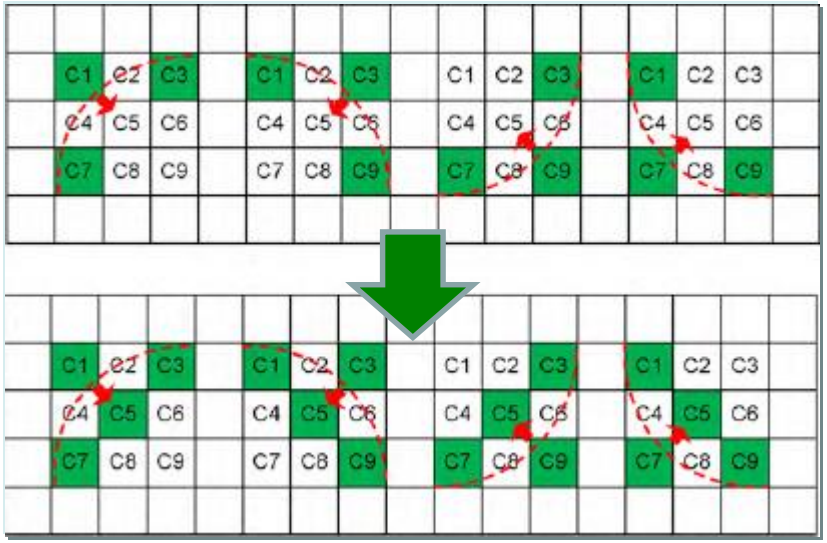
The id of particular cell depends on its nearest neighbors. If three of the cells neighbors id's is equal to S, then cell transforms to the state S



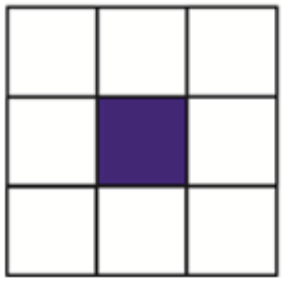
Rule 3:



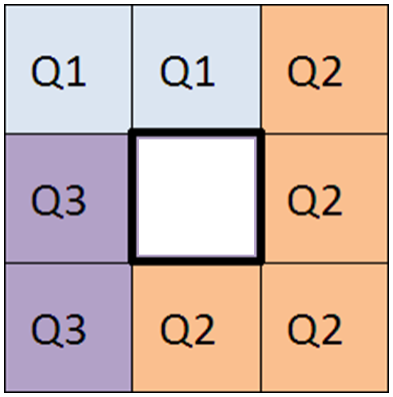
The id of particular cell depends on its further neighbors. If three of the cells neighbors id's is equal to S, then cell transforms to the state S



Rule 4:



The id of particular cell depends on its all neighbors, and has X % probability chance to change.



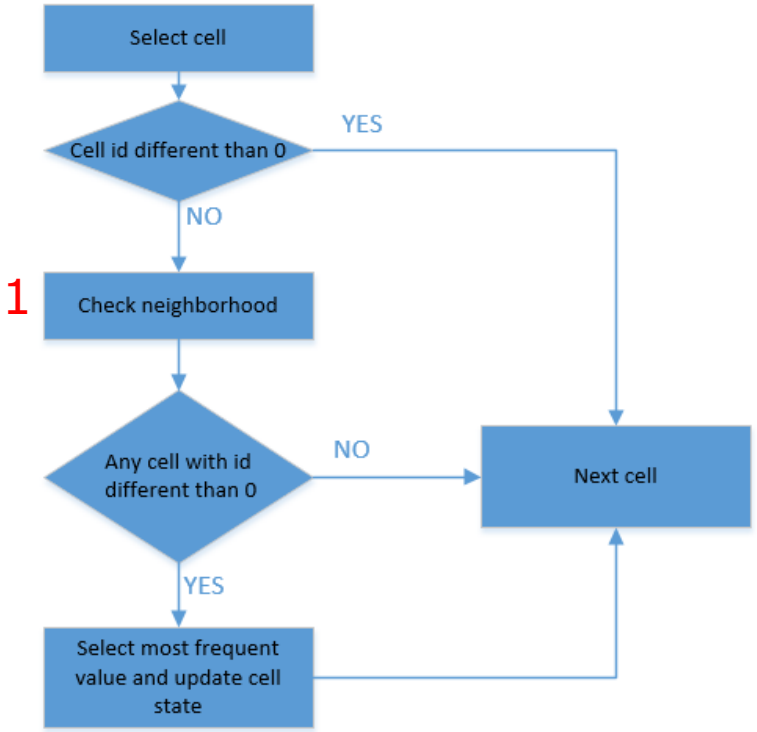
If random

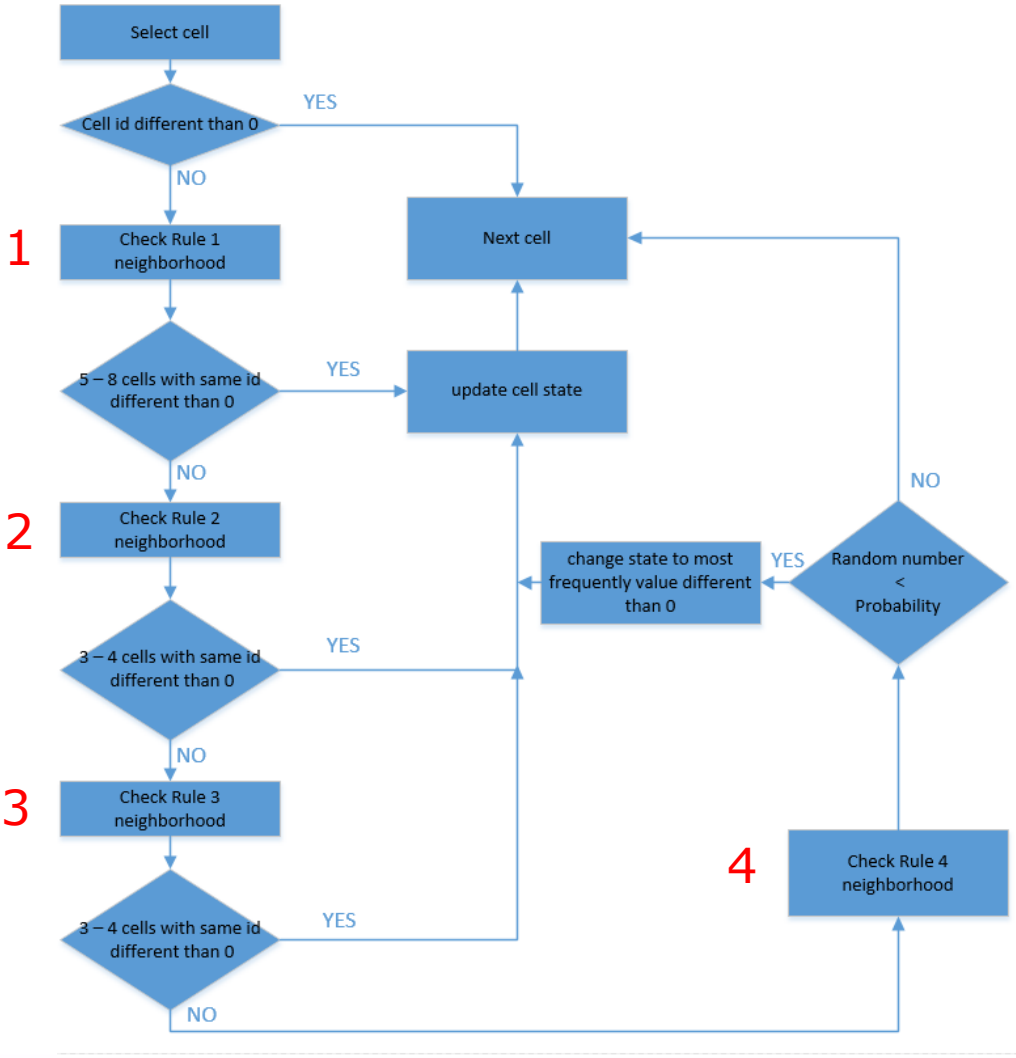
$n <= X$

$n \in (1-100)$

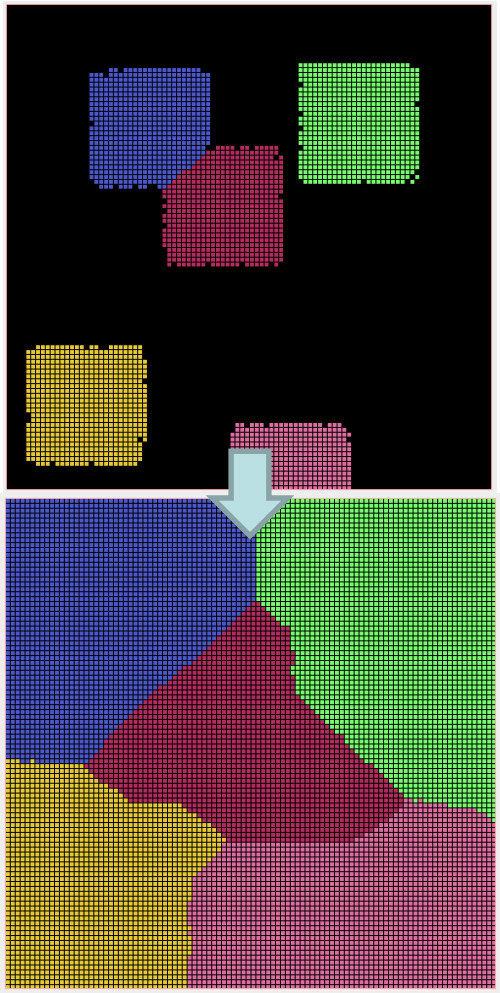
Grain boundary shape control

Simple Grain Growth CA algorithm





Example of grain growth with 90% probability for rule 4:



Example of grain growth with 10% probability for rule 4: