Probabilistic cellular automata

The task is to explore the computational power of probabilistic cellular automata. It is known that even the simple *majority problem* can be solved by ordinary cellular automata only with some limitations. The aim of the thesis is to investigate whether the probabilistic extension is more powerful in this respect and whether these limitations can be reduced in some way. In order to support the theoretical considerations, a *tool* should be programmed and used to demonstrate the effects of probability and to give some evidence of what we can gain when using the probabilistic extension.

The tool should be able to cover the following features:

- given the size of one-dimensional (or possibly also 2D) grid of automata, the probabilistic transition rules and the initial configuration, simulations of runs of desired length can be visualized;

- computing an approximation of the probability to reach a configuration satisfying a given property within a given number of steps;

- generating random initial configurations and the respective desired configurations to be reached (according to e.g. the majority problem) and computing an approximation of the expected probability of correct computations using the procedure in the second point.