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Forming Domino Patterns by Uniform Cellular Automata

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Here a domino is considered as a pair of black cells, surrounded by white cells. The task is to form a maximum number of dominoes (horizontal or vertically oriented) in a square field of cells. This task can by solved by cellular automata agents [1] which are moving around and acting according to an embedded finite state machine that was evolved by genetic algorithm. Applications are for example: finding a filter for domino particles with high throughput, or packing a maximum number of domino packets in a container.

Now it is the question how this task can be solved without intelligent agents, just with an uniform cellular automata rule. In a methodical way, the aimed global pattern is scanned for valid local neighborhood patterns, so-called templates. Then the rule is designed in a probabilistic way that the new cell state converges to the templates and through them to the aimed global pattern. Starting from any random initial configuration, the effectiveness and efficiency of the designed rules are studied through simulations using synchronous and asynchronous updating schemes. The used method is also illustrated by the simpler task to form a checkerboard pattern [2,3].

[1] Hoffmann R., Désérable D. (2017) Generating Maximal Domino Patterns by Cellular Automata Agents. In: Malyshkin V. (eds) Parallel Computing Technologies 2017. LNCS 10421, pp 18-31

[2] Fatès N., Marcovici I., Taati S. (2016) Two-Dimensional Traffic Rules and the Density Classification Problem. In: Cook M., Neary T. (eds) Cellular Automata and Discrete Complex Systems. AUTOMATA 2016. LNCS, vol 9664. pp 135-148

[3] Hoffmann R. (2018) Checkerboard Pattern Formed by Cellular Automata Agents. In: Adamatzky A. (eds) Shortest Path Solvers. From Software to Wetware. Emergence, Complexity and Computation, vol 32. pp 239-264