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THE POSSIBLE ARCHITECTURAL USE OF CELLULAR AUTOMATA VIA ITS CONSTRUCTION OVER APERIODIC TILLING

Keywords: *cellular automaton, wireworld, the game of life, aperiodic tilling, halfhexagon scheme*.

In this paper the possible use of cellular automata in architectural design is presented. First of all the sketchy outline of cellular automaton concerning its constitutional elements and operational rules is introduced. Basic issues such as: lattice, neighbourhood, boundary conditions, cellular states, transition rules, initial conditions and simulation process are discussed. Some examples of original and widespread known cellular tillings are cited.

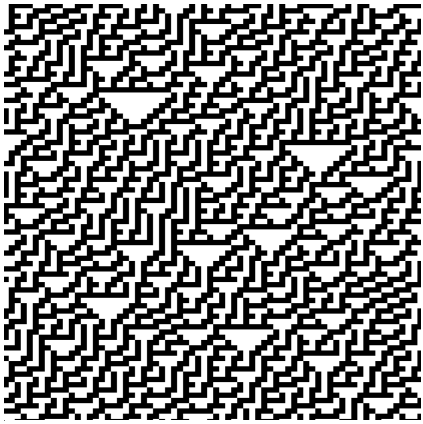

Fig. 1. The pattern created with the use of cellular automata - rule number 30.

Fig. 2 The pattern on a snail shell Conus textile.

In the second part the authors' own consideration on several types of aperiodic tillings are discussed. The differences between periodic, non-periodic and aperiodic tillings are clearly outlined. The particular emphasis was placed on extending the periodic lattice systems with

structures based on aperiodic tilling. From all tesselations only those constructed recursively with the use of repettitive geometric shape are chosen. The possible sollutions to boundary values problem, how to determine the neighbourhood of tilling cells (edge and apex) and possible techniques used for the creation of cellular automata regarding mentioned tillings are presented. The methodology of the study and classification of automata created according to the set of rules was outlined. In this part of the study also the halfhexagon and sphinx/chair systems are described.

In the last but not least part the practical applications of cellular automata were outlined. The realisation of cellular automata rules to traffic and cargo transport as well as physical simulations of wind distribution are described. The possibilities of using cellular automata in broadly understood design, particularly to generate patterns of floors and facades, form-finding and the systems of dynamic elevations are presented. Also the idea of authors' own experiment concerning the shaping of spatial forms using a script created in Grasshopper and Rhinoceros software is introduced.

Fig. 3 The pattern created with the use of cellular automata over aperiodic tilling.

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