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Maurice Margenstern* (`margens@sciences.univ-metz.fr`), Université de Metz, LITA, EA 3097, UFR MIM, Ile du Saulcy, METZ, France. *Decreasing Complexity of a Universal Cellular Automaton in the Hyperbolic 3D Space.*

The cellular automaton which is presented here relies on the construction of a universal cellular automaton in the hyperbolic plane of [1] which implements a railway circuit simulating a two register machine. This railway is based on the construction of I. Stewart, [2], using the same three kinds of switch points as in [2]. The constructed cellular automaton has 22 states.

Here, the 3D structure allows to decrease the number of states down to 5. First, crossings are replaced by bridges. Second, as here tiles are copies of the Poincaré' dodecahedron, they have 12 neighbours versus 5 in the planar CA [1]. Moreover, rules are not only rotation invariant, they only differ by the patterns of their lexicographically ordered representation. The technique of [3] is essential.

[1] F. Herrmann, M. Margenstern, A universal cellular automaton in the hyperbolic plane, TCS, 296, (2003), 327-364.

[2] I. Stewart, A Subway Named Turing, Mathematical Recreations in Scientific American, (1994), 90-92.

[3] M. Margenstern, G. Skorder, Tools for devising cellular automata in the hyperbolic 3D space, FI, (2003), 369-398. (Received February 03, 2005)