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Characterisation of the elementary cellular automata with neighbourhood priority based
deterministic updates. (English) [Zbl 07427988]

Summary: Classically, cellular automata and, in fact, automata networks in general, have synchronous
dynamics defined by a local function. But the interest on asynchronous versions of both systems has grown,
since it provides an extra degree of freedom. The standard way to define deterministic asynchronism is
to set an update priority to each node. It has been shown that these networks can solve problems that
were not previously solvable with synchronous systems. However, such a way to define asynchronism
depends totally on the relative position of the node in the network. Here, we propose a new way to
look at asynchronism in such systems, in that the priority now relies on the state transitions of the
system’s underlying local function. This leads to a scalable way to add deterministic asynchronism in
such networks. Taking the elementary cellular automata space as a baseline, we carry out a complete
caracterisation of its dynamics using the proposed asynchronism update scheme.

MSC:
68Qxx Theory of computing
05Axx Enumerative combinatorics
05Cxx Graph theory

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