

Comparison between parallel and serial dynamical behaviour of boolean networks.

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Abstract

In this article we study some aspects about the parallel and serial dynamical behaviour of a boolean network.

We study the relationship between the structure of the associated graph and the attractors of a boolean network. We show that for boolean networks with an arborescent associated graph, the length of the dynamical cycles are a power of two and under certain conditions the attractors are only fixed points.

Furthermore, we study the robustness of the dynamical behaviour of a boolean network with an arborescent associated graph, for serial and parallel updates. We show that, if we choose a good order of update then the dynamical behaviour is the same in both cases, and if the associated graph does not have loops the converse is also true.

On the other hand, we are interested in the robustness of the set of attractors of a boolean network for serial and parallel updates. It is well known that the set of fixed points of a boolean network is the same for both types of update. In this article we prove that a dynamical cycle of a boolean network without loops with parallel update is not a dynamical cycle for the same network with serial update and viceversa.

Keywords: Boolean network, attractor, robustness, parallel update, serial update.