

1098-37-142

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07032. *A Scheme for Modeling and Analyzing the Dynamics of Logical Circuits.*

It is shown how logical circuits can be modeled by discrete dynamical systems that preserve the qualitative behavior observed in physical realizations. While continuous dynamical systems provide quite accurate mechanistic models, they can become extremely computationally expensive to simulate. In contrast, simulating a discrete dynamical system is relatively inexpensive. A model for the RS flip-flop circuit, made with chaotic NOR gates, is found in an ad-hoc manner. This is shown to replicate the qualitative features of the physical realization. Next, a systematic - algorithmic - first principles based approach is developed in order for such dynamical models to more accurately reflect observed behavior and facilitate further investigation. Also, it is demonstrated how this fundamental algorithmic approach can, with similar ease, be used to obtain discrete dynamical models of other more complicated logical circuits. (Received January 21, 2014)