Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

The Joint Effect of Network Topology and Update Functions on the Stability of Boolean Networks SHANE SQUIRES, ANDREW POMERANCE, EDWARD OTT, MICHELLE GIRVAN, University of Maryland–College Park — Boolean networks are dynamical systems commonly used to model biological systems such as gene regulatory networks and neural networks. In a Boolean network, the state of each node can take one of two values, which is updated at discrete time steps using an update function that depends only on the states of its inputs on the previous time step. We study the stability of attractors in a Boolean network with respect to small perturbations. While recent past work has addressed the separate effects on stability of nontrivial network topology and update functions, only very crude information exists on how these effects interact. We present a general solution for finding the stability of Boolean networks, considering the joint effects of network topology and update functions. In particular, we show that the predictions of our approach agree with simulations of Boolean networks with threshold update functions.

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Date submitted: 07 Nov 2012 Electronic form version 1.4