1155-68-585 **Joshua D. Priest*** (jdp8jb@virginia.edu), **Madhav V. Marathe** (mmarathe66@gmail.com), **S. S. Ravi** (ssravi0@gmail.com), **Daniel J. Rosenkrantz** (drosenkrantz@gmail.com) and **Richard E. Stearns** (thestearns2@gmail.com). *Using Boolean Satisfiability to Solve Decision Problems for Synchronous Dynamical Systems.*

A discrete dynamical system over $\{0,1\}$ consists of an undirected graph in which each node has a time varying state value from $\{0,1\}$. Each node $v$ is associated with a local transition function $f_v$ whose inputs are the current state of $v$ and those of its neighbours, and whose output is in $\{0,1\}$. A **Synchronous Dynamical System** (SyDS) has an update mechanism that computes and updates every node's state value *simultaneously*. The **configuration** of a system at a time $t$ is the vector of state values of the nodes at that time. SyDS **trajectories** are sequences of successive configurations over time. Such trajectories can model contagion processes in social networks as well as cascading failures in a networked infrastructure system (such as an electrical power system).

Many decision problems for SyDSs have been studied in the literature. We show that that such decision problems can be reduced to instances of the Boolean Satisfiability Problem (SAT) and solved in practice with open source SAT solvers. These solvers can produce one, several or all solutions to a given decision problem, and under certain circumstances, can do so extremely quickly even when the given SyDS is large. (Received January 21, 2020)