

A Cellular Automata Model of a Chemical Reaction

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Abstract

The Greenburg-Hastings Model (GHM) is a cellular automaton that can be used to model a class of chemical reactions called Belousov-Zhabotinsky (BZ) reactions. This reaction is interesting chemically because the reaction oscillates between excited and ground states for a long time before reaching equilibrium. The GHM is useful for these reactions because molecules in the excited state in a BZ reaction excite nearby molecules in the ground state at the next time step, which is the same mechanism implemented to excite cells in a cellular automaton.

This research provides a mathematical framework for the GHM model relevant to the BZ reaction. Parameters considered include the threshold of excited cells (or molecules) needed to excite a new cell, the radius of the local rule, and size of the alphabet. The dynamics in the physically relevant case are fully understood; time permitting, other parameter combinations will be discussed.