Nonlinear Sciences > Cellular Automata and Lattice Gases

Construction of an isotropic cellular automaton for a reaction-diffusion equation by means of a random walk

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We propose a new method to construct an isotropic cellular automaton corresponding to a reaction-diffusion equation. The method consists of replacing the diffusion term and the reaction term of the reaction-diffusion equation with a random walk of microscopic particles and a discrete vector field which defines the time evolution of the particles. The cellular automaton thus obtained can retain isotropy and therefore reproduces the patterns found in the numerical solutions of the reaction-diffusion equation. As a specific example, we apply the method to the Belousov-Zhabotinsky reaction in excitable media.

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