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Topic: Complex Networks Preference: Oral

Traveling and pinned fronts in bistable reaction-diffusion systems on networks

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Traveling and pinned fronts in bistable reaction-diffusion systems have been broadly studied for classical continuous media and regular lattices. In this talk we focus on the network analogs of such non-equilibrium patterns. We consider traveling and stationary patterns in bistable one-component systems on random Erdös-Rényi and hierarchical tree networks. Numerical simulations reveal that traveling fronts exist in such network-organized systems. They represent waves of transition from the one stable state into the other, spreading over the entire network. The fronts can furthermore be pinned, thus forming stationary structures. While pinning of fronts has previously been already considered for chains of diffusively coupled bistable elements, the network architecture brings about significant differences. Particularly, an important role is played by the number of links (i.e. the degree) of a node. For regular trees with a fixed branching factor, the pinning conditions can be analytically determined. It can also be shown that the transition from traveling to standing fronts corresponds to a saddle-node bifurcation. For large Erdös-Rényi networks, stationary patterns are approximately described by a mean-field theory.

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