Cross-diffusion-induced instability on networks

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The concept of Turing instability, namely that diffusion can destabilize the uniform steady state, is well known either in the context of partial differential equations (PDEs) or in a network of dynamical systems. Recently, reaction-diffusion equations with cross-diffusion terms have been investigated, showing an analogous effect known as cross-diffusion-induced instability [1]. In [2], we extend this concept to a network of dynamical systems, showing that the spectrum of the graph Laplacian plays the role of the Laplace operator in reaction-diffusion equations and determines the instability appearance. In particular, we consider a network model for competing species, coming from the PDEs context. The influence of the topological structure on the cross-diffusion induced instability is highlighted, considering different topologies, both regular rings or lattices, but also small-world and Erdős-Rényi networks.

References

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