* Electronic Address: yasumasa@pp.iij4u.or.jp
[1] Tohoku University, WPI-AIMR

On the interplay between intrinsic and extrinsic instabilities of spatially localized patterns

Yasumasa Nishiura[1*]

Spatially localized dissipative structures are observed in various fields, such as neural signaling, chemical reactions, discharge patterns, granular materials, vegetated landscapes and binary convection. These patterns are much simpler than single living cells, however they seem to inherit several characteristic living state feature, such as self-replication, self-healing and robustness as a system. Adaptive switching of dynamics can also be observed when these patterns collide with each other, or when they encounter heterogeneities or environmental changes in the media. These behaviors stem from an interplay between the intrinsic instability of each localized pattern and the strength of external signals. To understand such an interplay, we explore the global geometric interrelation amongst all relevant solution branches of a corresponding system with approximate unfolding parameters. For instance, it has been uncovered that large deformations at strong collisions are mapped into the network of unstable patterns called scattors, and that an organizing center for 1D pulse generators is a double homoclinic orbit of butterfly type. We will illustrate the impact of this approach by presenting its application in relation to the decision making process of amoeboid locomotion and hierarchical structures of ordered patterns arising in reaction diffusion systems and binary fluids.