Abstract

In this talk, the principle of local activity will be presented for studying the complex behavior of different reaction-diffusion systems. Nonlinear reaction-diffusion type equations are widely used to describe phenomena in different fields, such as in the biology-Fisher model, Hodgkin-Huxley model and its simplification-FitzHugh-Nagumo nerve conduction model, physics-Sine-Gordon model, in chemistry-Brusselator equation, etc.

For the reaction-diffusion model, one can determine the domain of the cell parameters in order for the cells to be locally active, and thus potentially capable of exhibiting complexity. In the literature, the so-called edge of chaos (EC) means a region in the parameter space of a dynamical system, where complex phenomena and information processing can emerge. We shall present one model where Brusselator equations are in the reaction term. In our model, each cell will be arranged on a two-dimensional square grid and will be connected to adjacent cells through coupling devices that mimic 2-D spatial diffusion and transmit the cell's state to its neighboring cells.