Diffusion-driven codimension-2 Turing-Hopf bifurcation in general Brusselator model

Lei Kong[1] and Changrong Zhu[2]

[1]Guizhou University of Finance and Economics
[2]Chongqing University

May 11, 2020

Abstract

The spatiotemporal dynamics for general reaction-diffusion systems of Brusselator type under the homogeneous Neumann boundary condition is considered. It is shown that the reaction-diffusion system has a unique steady state solution. For some suitable ranges of the parameters, we prove that the steady state solution can be a codimension-2 Turing-Hopf point. To understand the spatiotemporal dynamics in the vicinity of the Turing-Hopf bifurcation point, we calculate and analyze the normal form on the center manifold by analytical methods. A wealth of complex spatiotemporal dynamics near the degenerate point are obtained. It is proved that the system undergoes a codimension-2 Turing-Hopf bifurcation. Moreover, several numerical simulations are carried out to illustrate the validity of our theoretical results.

Hosted file

lunwen4-20181203.pdf available at https://authorea.com/users/320245/articles/449839-diffusion-driven-codimension-2-turing-hopf-bifurcation-in-general-brusselator-model

figures/parameter-cure5/parameter-cure5-eps-converted-to.pdf

figures/E0-1/E0-1-eps-converted-to.pdf

figures/E02/E02-eps-converted-to.pdf

4

figures/E012-1/E012-1-eps-converted-to.pdf

5

figures/E0123/E0123-eps-converted-to.pdf

figures/E012-2/E012-2-eps-converted-to.pdf

figures/E01/E01-eps-converted-to.pdf