Nonlinear Sciences > Pattern Formation and Solitons

Drift and Meander of Spiral Waves

Andrew J. Foulkes

(Submitted on 21 Dec 2009)

In this thesis, we are concerned with the dynamics of spiral wave solutions to Reaction-Diffsion systems of equations, and how they behave when subject to symmetry breaking perturbations. We present an asymptotic theory of the study of meandering (quasiperiodic spiral wave solutions) spiral waves which are drifting due to symmetry breaking perturbations. This theory is based on earlier theories: the 1995 Biktashev et al theory of drift of rigidly rotating spirals, and the 1996 Biktashev et al theory of meander of spirals in unperturbed systems. We combine the two theories by first rewriting the 1995 drift theory using the symmetry quotient system method of the 1996 meander theory, and then go on to extend the approach to meandering spirals by considering Floquet theory and using a singular perturbation method. We demonstrate the work of the newly developed theory on simple examples. We also develop a numerical implementation of the quotient system method, demonstrate its numerical convergence and its use in calculations which would be difficult to do by the standard methods, and also link this study to the problem of calculation of response functions of spiral waves.

Comments:	PhD Thesis, University of Liverpool, Finalised March 2009, 282 pages, many figures, pdf file size 5Mb
Subjects:	**Pattern Formation and Solitons (nlin.PS)**
Cite as:	**arXiv:0912.4247v1 [nlin.PS]**

Submission history

From: Andrew Foulkes Dr [view email]

[v1] Mon, 21 Dec 2009 17:42:22 GMT (12258kb)

Which authors of this paper are endorsers?