
Slow-fast factorization of the Evans function via the Riccati transformation

Björn De Rijk^{*1}, Arjen Doelman¹, and Jens Rademacher²

¹Mathematical Institute, Leiden University – Niels Bohrweg 1 2333 CA Leiden Fax: +31-71-527-7101
Phone: +31-71-527-7111, Netherlands

²Department of Mathematics, University of Bremen – Germany

Abstract

In the spectral stability analysis of pattern solutions, the presence of a small parameter can reduce the complexity of the linear stability problem. The spectrum of the linearization about certain type of patterns is given by the zero set of an analytic function, the so-called Evans function. Our reduction method yields a factorization of the Evans function in accordance with the scale separation induced by the small parameter. For some specific equations this product structure has yet been established by geometric arguments. Our analytic method formalizes and generalizes the factorization procedure. The main tool for the reduction is the Riccati transformation. We employ our techniques to study the spectral stability of stationary, spatially periodic pulse patterns to singularly perturbed reaction-diffusion systems. The asymptotic structure of the factors of the Evans function can be determined explicitly in this setting.

^{*}Speaker