Spectral Stability of Travelling Fronts. Part 2: Point Spectrum and the Evans Function

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Abstract. In this talk I will focus on the spectral stability analysis of two specific examples of PDEs in 1+1 variables that exhibit travelling fronts. The first is the Fisher-KPP equation, and the second is a Keller-Segel model of bacterial chemotaxis. Travelling fronts arise naturally in each, and linearising the travelling wave PDE around the front leads to an ODE eigenvalue problem, from which the ‘spectrum of the wave’ can be computed. The spectrum naturally breaks up into two sets, the essential spectrum and the point spectrum.

In the first talk, I will set up the spectral problem, and compute the continuous spectrum for each of these waves, as well as a related set, the absolute spectrum, for travelling fronts in these equations. I also plan to discuss some of the dynamical implications of the location of each of these sets.

In the second talk, I will discuss how to compute the point spectrum. This talk will focus on computing the Evans function - a Wronskian-like object whose zeros coincide with the spectrum of the travelling wave. I will focus on a geometrically inspired technique for numerically computing zeros of the Evans functions, as well as some of the implications that this technique has on the full stability analysis.