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The Existence of Dendritic Fronts

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Abstract. In this paper, we study a fourth order semilinear parabolic equation on the infinite real line. We show that in a certain parameter range, this equation has propagating front solutions (solutions tending to 0 at $+\infty$ and advancing to the right with a speed c) which leave behind them a *periodic* pattern in the laboratory frame. This is thus an example of spontaneous pattern formation.

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1. Introduction

In this paper, we discuss the *existence problem* for a certain type of parabolic equation motivated by the physical problem of dendrite formation. It has been pointed out (for several years, by now) that some of the parabolic (integro-) differential equations which are considered in connection with solidification and dendrite formation show, at least in numerical, and also in some physical experiments a very intriguing behaviour. One observes, in general, a *one-parameter* family of propagating fronts, and it seems that "most" initial data converge to a particular front, thereby leading to a *selection* of the propagation speed. It is furthermore conjectured that this selected speed coincides with that speed for which