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Minimal Wave Speed of Competitive Diffusive Systems with Time Delays

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Abstract

This paper is concerned with the minimal wave speed of competitive diffusive systems, of which the corresponding wave system is of infinite dimensional. By constructing upper and lower solutions, the existence of traveling wave solutions is confirmed, which shows the minimal wave speed. Therefore, it completes the known results.

Keywords: generalized upper and lower solutions

AMS Subject Classification (2000): 35K57; 35C07; 37C65.

1 Introduction

Traveling wave solutions of parabolic type systems have been widely studied since Fisher [3] and Kolmogorov et al. [4]. In [13, 14, 16], there are some classical backgrounds and earlier results on the traveling wave solutions. To better describe the problem, we first give the definition of traveling wave solutions of the following classical reaction-diffusion system

$$\frac{\partial w(x,t)}{\partial t} = D\Delta w(x,t) + f(w(x,t)), \tag{1.1}$$

where $w(x,t) \in \mathbb{R}^n, x \in \mathbb{R}, t > 0,\ f : \mathbb{R}^n \to \mathbb{R}^n$. If there exist $\rho \in C^2(\mathbb{R},\mathbb{R}^n)$ and $c \in \mathbb{R}$ such that $w(x,t) = \rho(\xi), \xi = x + ct$, is a special solution of (1.1), then (1.1) has a traveling wave solution. Of course, to formulate different phenomena, $\rho(\xi)$ also satisfies proper asymptotic boundary conditions, we call such a solution is a desired traveling wave solution.

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