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Estimate of the travelling wave speed for an integro-differential equation

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Abstract. Travelling waves for nonlocal reaction-diffusion equations are studied. The minimax representation of the wave speed is obtained. It is used to obtain analytical estimates and asymptotic values of the speed. Two regimes of wave propagation are identified. One of the them is dominated by diffusion and another one by the nonlocal interaction.

Key words: nonlocal reaction-diffusion equation, wave speed, minimax representation, estimates

1 Introduction

We consider the nonlocal reaction-diffusion equation

$$\frac{\partial u}{\partial t} = D \frac{\partial^2 u}{\partial x^2} + \int_{-\infty}^{\infty} \phi(x-y) S(u(y+a, t-\tau)) dy - ku, \quad (1.1)$$

where $\phi(x)$ is a non-negative integrable function with a bounded support, $S(u)$ is a smooth non-negative and non-decreasing function such that the equation

$$S(u) = ku \quad (1.2)$$

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