
COMBINED EFFECT OF DIFFUSION AND REACTION ON THE TRAVELLING WAVE PROFILES OF CERTAIN REACTION-DIFFUSION EQUATIONS

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In this lecture we discuss the existence of monotone travelling wave solutions to the reaction-diffusion equation with rather general density dependent diffusion term. For example, it comprises the porous medium differential operator or the p -Laplacian. The novelty of our approach consists in two facts. First, we focus on the diffusion coefficient which degenerates or has singularities of arbitrary order. In particular, we show that using an appropriate definition of solution the travelling wave profiles exist even in the situations which have not been covered so far. Second, we allow the diffusion coefficient to be discontinuous at a finite number of points with the discontinuities being of the first kind (i.e., finite jumps). As the reaction term concerns, we deal with both bistable and monostable case. In a special case of power-type behavior of diffusion and reaction terms near equilibria we provide detailed asymptotic analysis of monotone travelling wave profiles and classify their shapes. The mutual behavior of both terms, diffusion and reaction, and its influence on the shape of travelling wave is explicitly illustrated and visualized.

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