UNIVERSIDADE DE LISBOA
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Mês de: Julho 2007

SEMINÁRIOS DE ANÁLISE

Dia 12 de Julho (quinta-feira), às **15h30**, na Sala B3-01

Oscillating travelling fronts in a scalar delayed reaction-diffusion equation

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Abstract:

We study positive and generally non-monotone traveling waves of monostable reaction-diffusion equations with delay

$u_t(t, x) = \Delta u\,(t, x) - u\,(t, x) + g\,(u(t-h, x)),\ u\,(t, x) \geq 0,\ x \in \mathrm{IR}^m,$ (1)

assuming that it has exactly two non-negative equilibria u_1 ¿ 0 and u_2 ¿ k > 0.

The nonlinearity g is called *the birth function*, therefore it must be non-negative. We assume additionally that $g\,(x)$ is hump-shaped, with the unique maximum at some $x_M > 0$. For example, such requirements are satisfied by the diffusive Nicholson's blowflies equation. Since the biological interpretation of u is the size of an adult population, we consider *only* non-negative wave solutions $u\,(x, t) =$ $(x + ct)$ for (1). Now, we say that the classical solution $u\,(x, t) =$ $(x + ct)$ of (1) is a traveling front, if the profile function satisfies $(-\infty) = 0$ and $(+\infty) = k$.

If $h = 0$ in (1), we get a *monostable* reaction-diffusion equation without delay. The problem of existence of traveling fronts for this equation is quite well under-stood. In particular, for every such equation we can indicate $c_* > 0$ (*the minimal speed of propagation*) such that, for every $c \geq c_*$, it has *exactly one* traveling front $u\,(c, t) =$ $(x + ct)$. Furthermore, the profile is necessarily strictly increasing. Finally, Eq. (1) does not have any travelling front propagating at the velocity $c < c_*$.

However, the situation will change drastically if we consider $h > 0$. In fact, at the present moment, it seems to be unrealistic to expect that we can develop a similar theory concerning the existence, uniqueness and geometric properties of wavefronts for delayed equation (1). In this talk, we present some our recent advances related to the above topics.

Parcialmente suportado pela FCT ao abrigo do Programa POCTI

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