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Abstracts of Short Communications and Posters

Section:

10. Partial Differential Equations

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**On a reaction–diffusion system modelling chemotaxis.**

Chemotaxis can be modelled by the reaction–diffusion system

$$U_t = \Delta U - \chi \nabla \cdot (U \nabla V), \quad V_t = \alpha \Delta V - \beta V + \delta U.$$

Here $U$ denotes the population density, $V$ the density of the chemotactic agent. The system is considered for positive initial values $U_0, V_0$ under homogeneous Neumann conditions on $R_+ \times \Omega$ where $\Omega \subset R^2$ is a piecewise smooth domain; $\alpha$, $\beta$, $\delta$, $\chi$ are positive constants. The system has the Lyapunov function

$$F(U,V) = \int_\Omega \left\{ \frac{\chi}{2\delta} \left( \alpha |\nabla V|^2 + \beta V^2 \right) + U(\log U - \chi V) \right\} dx$$

i. e. this functional decays along solutions as time increases. If

$$\frac{\delta \chi \|U_0\|_{L_1}}{4 \alpha \Theta} < 1 \,,$$

where $\Theta$ is the smallest interior angle formed by the boundary curves of $\Omega$ then the Lyapunov function remains bounded from below for all times. Under this smallness condition for the initial values there is a (possibly nontrivial) asymptotic state $(U^\star, V^\star)$ .