Discrete maximum principle and the Keller-Segel equations

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In this talk, we will introduce a discrete maximum technique applied to various chemotaxis models [1, 2, 3], which describe the migration of organisms or cells in response to a chemical signal, where both quantities must satisfy certain physical constraints (positivity, discrete principles, and nonnegativity). This approach is based on a finite element method that incorporates a stabilizing term. As a result, the standard finite element method is manipulated algebraically, without involving differential operators in the modification, and produces discrete solutions that are nodally bounded. Specifically, the stabilization term introduces numerical diffusion via a shock detector, which helps regulate the amount of numerical diffusion, thereby minimizing its impact. Additionally, the stabilizing term is proven to be of first order [4].

Références

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[4] R. C. Cabrales, J. V. Gutiérrez-Santacreu *On a convergence proof for an algebraic manipulation finite element method applied to convection-diffusion phenomena*, Preprint.

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