Theoretical and numerical results for a chemo-repulsion model with quadratic production[1]

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Abstract

In this talk we consider a chemo-repulsion model with quadratic production in bounded domains, which is a nonlinear parabolic system for two variables: the cell density and the chemical concentration. We analyze mass-conservation and unconditional energy-stability for first order time schemes and fully (in time and space) discrete schemes. Properties as positivity, uniqueness, solvability, weak, strong and more regular a priori estimates of the schemes, and convergence towards weak solutions and error estimates of these schemes are analyzed (when possible). Moreover, the large-time behaviour of the model is analyzed from both theoretical and numerical points of view. The convergence of both variables of the system to constant states is proved.

All these results are part of the contents of the PhD Thesis of Diego A. Rueda-Gómez.

Keywords: Chemorepulsion-production model, first order time schemes, fully discrete scheme, finite element method, energy-stability, convergence, error estimates, large-time behavior.

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References

[1] F. Guillén-González, M. A. Rodríguez-Bellido, D. A. Rueda-Gómez *Study of a chemo-repulsion model with quadratic production. Part I: Analysis of the continuous problem and time-discrete numerical schemes* Submitted. https://arxiv.org/abs/1803.02386

[2] F. Guillén-González, M. A. Rodríguez-Bellido, D. A. Rueda-Gómez *Study of a chemo-repulsion model with quadratic production. Part II: Analysis of an unconditional energy-stable fully discrete scheme* Submitted. https://arxiv.org/pdf/1803.02391

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