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Title: Nonlinear Diffusion Model arising from the Glioblastoma growth

Abstract:

We present a differential system modeling Glioblastoma growth. This problem couples two density variables (tumor and necrotic cells) with the oxygen concentration (vasculature). We assume that necrosis and vasculature satisfy some nonlinear ODE equations. The tumor is modeled by a diffusion-reaction PDE where its diffusion velocity depends, in a nonlinear and increasing way, on the vasculature. Therefore, we will study a mixed model formed by one PDE and two ODEs.

We are going to analyse this model in a theoretical and numerical way. First, we prove a priori estimates about the possible solutions of our model and later, we get the existence of global in time weak solutions using fixed point and compactness arguments. Second, we design a first-order time scheme conserving all estimates of the continuous problem. Finally, some numerical simulations using Finite Elements in space will be shown related to medical research in the oncology study.