A parameter estimation problem for a tumour growth model .

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Abstract

In this paper we present a method for estimating unknown parameters that appear on an avascular, spheric tumour growth model. The model for the tumour is based on nutrient driven growth of a continuum of live cells, whose birth and death generate volume changes described by a velocity field. The drug is applied externally, and is assumed to be a diffusible substance capable of killing cells.

The model consists on a coupled system of partial differential equations which is solved numerically. As the domain on which the equations are defined is the tumour, that changes in size over time, the problem can be formulated as a moving boundary one.

After solving the forward problem properly, we are concerned in using the model for the estimation of parameters, by fitting the numerical solution with real data. We define a functional to compare both of them and we use the pattern search method for minimizing it, obtaining good accuracy for the recovery of a few parameters.

Keywords: avascular tumour, constrained optimization, inverse problem, mathematical modeling.

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