Fokas method approach for a tumor invasion problem with discontinous diffusion in 1+1 dimensions

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Gliomas are among the most aggressive forms of primary brain tumors. Over the past years mathematical models in the form based on Partial Differential Equations (PDE's) have been well developed to study gliomas growth. In this work, we consider a well established mathematical model which focuses on two parameters: proliferation and diffusion. Due to the heterogeneity of the brain tissue (white and grey matter) the diffusion coefficient is considered to be discontinuous.

The Fokas transform method is an analytical method which derives the solution, for a certain class, of PDE's in an integral form. The analytical solution can be evaluated at any point of the space-time domain without requiring any knowledge of the solution at any other point in this domain.

We adapt the Fokas's transform method to the multi-domain environment induced by the interface discontinuities of our problem's domain.

A fast and efficient numerical technique which is capable of producing high-order approximations of the analytical solution, is derived and successfully applied to the gliomas diffusion model. Numerical results of the technique will be presented.