QUASI-PERIODIC BOUNDARY INTEGRAL MODEL OF NERVE ELECTRICAL STIMULATION

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ABSTRACT. We present a model for the electrical activity of a nerve under external stimulation. The nerve is composed of many axons, each consisting of alternating myelinated and unmyelinated regions, as well as ions channels that giving rise to nonlinear bioelectrical phenomena.

Due to the complexity of the underlying geometry, a direct discretization of the model is unfeasible. Therefore, it is necessary to introduce some simplifications.

Our approach builds upon [?],[?] where the nerve is reduced to a set of two-dimensional axons, and boundary integral formulations are used to obtain significant results. However, the two-dimensional truncation greatly reduces the applicability of the model.

In our study, we depart from dimensional reduction. Instead, we approximate the entire problem by a family of quasi-periodic problems and demonstrate an effective discretization technique using the boundary integral method.

Keywords: Quasi-Periodic Problem, Boundary Integral Formulation.

Mathematics Subject Classifications (2010): 65M38, 65M12,65R20

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