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BOUBAKER POLYNOMIALS EXPRESSION TO THE MAGNETIC PHASE-SHIFT INDUCED IN LEON–VIGMOND 3D-MODEL OF THE HUMAN HEART

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The heart is simulated as an electrically controlled fluid pump which operates by mechanical contraction. Human heart modeling is undoubtedly a computationally daunting task which must incorporate magnetic, plastic, mechanic and electric patterns. In this paper, a polynomial mathematical formulation for the magnetic field phase shift in a particular heart 3D-model is proposed. The developed model can give an insight into the local and global complex dynamics of the heart magnetic field under controlled excitation as guides to monitoring i.e., the transition from normal to abnormal myocardial activity or collateral dysfunctions. The used protocol allowed handling the boundary conditions in a smooth way.

Keywords: Heart model; magnetic flow equations; Boubaker polynomials expansion scheme (BPES); boundary conditions; Leon−Vigmond model; cable model.

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1. Introduction

Several methods and models have been used in order to investigate flow dynamics inside the human heart. Govindarajan *et al.*[1] solved the two-dimensional Navier−Stokes equations using an Eulerian Levelset-based sharp interface Cartesian grid method, and succeeded to compare the flow-through within both recessed and open pivot hinge heart models. In the same context, Marcelli *et al.*[2] and Schiereck *et al.*[3] experimented peak endocardial acceleration (PEA), during isovolumic