Pavarino, L. F.; Scacchi, S.; Verdi, C.; Zampieri, E.; Zampini, S.

Scalable BDDC algorithms for cardiac electromechanical coupling. (English) Zbl 1368.92005

Lee, Chang-Ock (ed.) et al., Domain decomposition methods in science and engineering XXIII. Proceedings of the 23rd international conference, Jeju Island, Korea, July 6–10, 2015. Cham: Springer (ISBN 978-3-319-52388-0/hbk; 978-3-319-52389-7/ebook). Lecture Notes in Computational Science and Engineering 116, 261-268 (2017).

Summary: The spread of electrical excitation in the cardiac muscle and the subsequent contraction-relaxation process is quantitatively described by the cardiac electromechanical coupling model. The electrical model consists of the Bidomain system, which is a degenerate parabolic system of two nonlinear partial differential equations (PDEs) of reaction-diffusion type, describing the evolution in space and time of the intra- and extracellular electric potentials. The PDEs are coupled through the reaction term with a stiff system of ordinary differential equations (ODEs), the *membrane model*, which describes the flow of the ionic currents through the cellular membrane and the dynamics of the associated gating variables. The mechanical model consists of the quasi-static finite elasticity system, modeling the cardiac tissue as a nearly-incompressible transversely isotropic hyperelastic material, and coupled with a system of ODEs accounting for the development of biochemically generated active force.

For the entire collection see [Zbl 1371.65003].

MSC:

92-08	Computational methods for problems pertaining to biology	Cited in **1** Document
92C30	Physiology (general)	
92C10	Biomechanics	
65N55	Multigrid methods; domain decomposition for boundary value problems involving PDEs	

Keywords:

cardiac electromechanical coupling model; extracellular electric potentials; gating variables

Software:

BoomerAMG; PCBDDC; PETSc

Full Text: DOI

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