

Numerical simulation of cardiac pacing devices: modeling and validation issues

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Abstract: Pacemakers are cardiac stimulation devices that provide minimal energy to the heart by applying a pacing current between two electrodes. We are interested in building a computational model of this pacing phenomena, that would output reliable estimates of the minimal energy to trigger an action potential. The ultimate goal is to carry out in-silico pre-clinical trials. I will summarize the path we choose to reach this objective and what is our current status.

I will present a 3D model that couples the bidomain equations to a pacemaker, and a 0D surrogate model, results from the analysis of the 3D model, numerical results obtained with 0D simulations, and preliminary 3D ones. In addition, I will show how to establish the model's credibility by going through a verification and validation process. In particular, I'll explain how we calibrate the model against experimental results designed specifically to this aim, and plan to validate it.

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