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ANALYSIS AND VALIDATION OF A VARIATIONAL DATA ASSIMILATION PROCEDURE FOR THE ESTIMATION OF CARDIAC CONDUCTIVITIES

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The customization of mathematical models by an accurate patient-specific parameter estimation is a critical step when using computational tools in clinical practice. In cardiac electrophysiology, crucial parameters are the conductivity tensors and their quantification is quite troublesome in living organisms, as witnessed by different discordant data in the literature.

We consider a variational data assimilation approach for the estimation of the cardiac conductivity parameters able to combine available patient-specific measures with mathematical models [1]. In particular, it relies on the least-square minimization of the misfit between experiments and simulations, constrained by the underlying mathematical model. Operating on the conductivity tensors as control variables of the minimization, we obtain a parameter estimation procedure. We significantly improve the numerical approaches present in literature demostrating the reliability of the methodology in presence of noise. Several numerical results will be presented to assess practical critical issues such as the size and the location of the measurement sites for in silico test cases reproducing experimental and realistic settings [2]. Moreover, we will discuss the interplay between the estimation of Monodomain and Bidomain conductivities. This will be finalized with an experimental validation with ex-vivo animal tissues.

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