Efficiency in computing electrocardiology models

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abstract

It is well known that numerical simulations of the electrocardiology models require fine mesh resolution and small time-step size, which increases the computational resources required. This presentation has two goals : One is to illustrate the performance of operator-splitting alternating direction implicit (ADI) schemes for solving the nonlinear cardiac monodomain model. We show how to construct second-order ADI schemes in both space and time while evaluating the ionic model only once per time-step. The derivation of the proposed ADI schemes is based on the semi-implicit backward differentiation formula (SBDF). Large-scale simulations are presented showing that the proposed algorithms reduce the computational time and memory consumed for solving electrocardiology models, compared to standard numerical methods.

Second is to demonstrate the efficiency of a parallel finite element anisotropic mesh adaptation method for solving the bidomain model. To demonstrate the effectiveness of the proposed methodology, numerical simulations on parallel adapted meshes with those on parallel uniform meshes are presented. The computational efficiency is assessed by computing spiral and scroll waves in cardiac tissue.

References

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