Home Work - Assignment 2

Modeling of Force Development

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Modeling of Tension Development: Implementation

1. Analyze a computational model of tension development in cardiac cells
    1. Get equations from Rice 1999 - model 1 or 2
    2. Assume isometric conditions
    3. Implement the equations in conjunction with the Euler method
    4. Reconstruct the effect of sarcomere length on force (Fig. 7B).
    5. Plot the relationship between maximal normalized force and time steps used in the Euler method.
    6. Plot maximal upstroke velocity of normalized force versus time steps.
    7. Choose appropriate time steps and explain your strategy.

Modeling of Tension Development: Comparison

2. Comparison of Numerical Methods

1. Implement the 4th order Runge-Kutta method to solve the upper equations
2. Plot the maximal normalized force versus time steps
3. Plot the maximal upstroke velocity versus time steps
4. Compare the numerical demands of the Runge-Kutta method with the Euler method

Literature

1. Comparison of putative cooperative mechanisms in cardiac muscle: Length dependence and dynamic responses, J. J. Rice and R. L. Winslow and W. C. Hunter, Am. J. Physiol., vol 276, pp H1734-H1754, 1999
2. Computational Cardiology, F. B. Sachse, LNCS 2966, 2003 (background)
3. Your favorite book for numerical solution of ordinary differential equations
   or
4. Computational Cardiology, F. B. Sachse, LNCS 2966, pp 23-26, 2003

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