Review ODE Solvers and Extended HH mechanisms

Eric Schwartz

April 11, 2016

Problem 1: Review ODE methods With reference to the stub supplied on the homework page (ode_homework_stub.m): implement the forward, backward and trapezoidal Euler solvers. As in class, you can estimate y_{n+1} that is needed for the backward (and trapezoidal) Euler solver by using the tangent at y_n (as done in class). Compare the solution to that obtained from ode45 in matlab (that is supplied in the stub, for reference.) (The trapezoidal method is simply and average of the forward and backward Euler iterations).

Problem 2: I_L Extensions of HH currents The paper by Pospischil(2008) supplied on the homework page discusses extensions of Hodgkin Huxley for more exotic forms of currents. Write short matlab functions for the sodium and potassium functions that Pospischil gives for the mammalian channels, similar to the ones we used previously for the squid.

Plot both squid and mammalian functions for a range of voltages between -100 and $+20$ mVolts. Note that he includes a variable V_T in these functions which is not specified. Try some reasonable values for this and briefly discuss what you think the effect is of this parameter on spike threshold.