

Description of MATLAB codes for the XB model presented in “Dynamics of cross-bridge cycling, ATP hydrolysis, force generation, and deformation in cardiac muscle”

There are three MATLAB files “Run_Model.m”, “Model_XB.m” and “passiveForces.m”. The first file generates force-velocity simulations to the experimental data from Palmer et al. 2013 (shown in Figure 4). Second script is the MATLAB function of the muscle model shown in Figure 1B. The third script contains the passive force formulation of Rice et al. 2008.

“Run_Model.m” calls Model_XB.m calls and plots figure 4 of the manuscript. It also plots sarcomere length and total force at each of the afterloads.

“Model_XB.m” contains MATLAB implementation of all the model equations. It also contains the identified XB cycling and force generation parameters presented in Table 1. It also calls the “passiveForces.m” to compute passive force at a given sarcomere length.

“passiveForces.m” returns the value of passive force to “Model_XB.m” at a given sarcomere length. It doesn’t call any function.

References:

- [1] Palmer BM, Schmitt JP, Seidman CE, Seidman JG, Wang Y, Bell SP, et al. Elevated rates of force development and MgATP binding in F764L and S532P myosin mutations causing dilated cardiomyopathy. *Journal of molecular and cellular cardiology*. 2013;57:23-31.
- [2] Rice JJ, Wang F, Bers DM, de Tombe PP. Approximate model of cooperative activation and crossbridge cycling in cardiac muscle using ordinary differential equations. *Biophysical journal*. 2008;95:2368-90.