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Title:

An improved pairwise-approximation technique for studying the dynamics of a probabilistic, two-state lattice model of intracellular cardiac calcium.

Abstract:

We have previously shown that the ensemble dynamics of a discrete-time, probabilistic two-state lattice model with nearest-neighbor interactions can be approximated by a system of five coupled recurrence equations using a simplified form of pairwise approximation in which second-order effects are ignored. Here we improve on the approximation by including the second-order effects and present an efficient method for computing them. We also investigate the ability of the recurrence equations to predict the degree of spatial clustering present in the lattice model. The model is based on the intracellular calcium release system of cardiac cells, and predicts the emergence of quasi-periodic behavior that corresponds to pathophysiological conditions and sudden cardiac death.