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Title:

Propagation Failure of Traveling Fronts in Discrete Inhomogeneous Media

Abstract:

A crude model for electrical conduction in the nervous system is the spatially discrete Nagumo equation. Employing a piecewise linear approximation of the nonlinearity, one can derive exact solutions of this system such that a portion of the medium for conduction is deteriorated, characteristic of diseases that affect the nervous system. Using Jacobi operator theory, wave-like solutions are constructed for a problem with essentially arbitrary inhomogeneous discrete diffusion, and these solutions directly correspond to monotone traveling wave solutions in the case of homogeneous diffusion. A thorough study of the steady state solutions provides necessary and sufficient conditions for traveling waves to fail to propagate due to inhomogeneities in the medium.