NUMERICAL CONTINUATION OF SOLUTIONS OF NEURAL FIELD EQUATIONS WITH OSCILLATORY COUPLING FUNCTIONS

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Neural field models, formalized by integro-differential equations, describe the large-scale spatio-temporal dynamics of neuronal populations [1]. They have been used in the past as a framework for modeling a wide range of brain functions, including multi-item working memory [2]. Neural field equations support spatially localized regions of high activity (or bumps) that are initially triggered by brief sensory inputs and subsequently become self-sustained by recurrent interactions within the neural population. We apply a special class of oscillatory coupling functions and analyze how the shape and spatial extension of multi-bump solutions change as the spatial ranges of excitation and inhibition within the field are varied [3]. More precisely, we use numerical continuation to find and follow solutions of neural field equations as the parameter controlling the distance between consecutive zeros of the coupling function is varied [4]. Important for a working memory application, we investigate how changes in this parameter affect the shape of bump solutions and therefore the maximum number of bumps that may exist in a given finite interval.

References

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