Mathematical Modeling of Working Memory in the Presence of Random Disturbance using Neural Field Equations

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In this paper, we describe a neural field model which explains how a population of cortical neurons may encode in its firing pattern simultaneously the nature and time of sequential stimulus events. A deterministic model describing this process was presented in [1]. Here, we investigate how noise-induced perturbations may affect the coding process. From a mathematical point of view, this is obtained by means of a two-dimensional neural field equation, where one dimension represents the nature of the event (for example, the color of a light signal) and the other represents the moment when the signal has occurred. Some numerical experiments are carried out using a computational algorithm for two-dimensional stochastic neural field equations. This MATLAB-based numerical algorithm in presented in [2] (one-dimensional case) and [3] (two-dimensional case). The numerical results are discussed and their physical interpretation is explained.

References

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