Slow diffusive dynamics in a chaotic balanced neural network

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Summary:
Nimrod Shaham (with co-author Yoram Burak) studied the effects of chaotic dynamics on storage of continuous parameters in working memory. The work introduces a model of a balanced network which possesses a continuum of steady states - a commonly proposed mechanism for maintenance of continuous parameter working memory in the brain. Neurons in the network exhibit chaotic Poisson-like firing, in similarity to cortical neurons in the brain. The chaotic noise drives random diffusion along the continuous attractor manifold, which has two important consequences: first, the random diffusion gradually degrades the maintenance of memory in the neural network. Second, spikes of different neurons are correlated over long times. These spike correlations differ substantially from those described in previous models of the balanced state. Shaham and Burak propose to look for such slowly decaying spike correlations in brain areas involved in the maintenance of continuous-parameter working memory, such as the prefrontal cortex.
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