

A Mathematical Model of Working Memory with Dynamic Synapses

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Abstract

Working memory is the structures and processes used for temporarily storing, manipulating, and keeping information active in mind. It is widely believed that this kind of memory is emerged from reverberation in the recurrent neural populations as a form of persistent neural activity during delay period. However, recently there is a research proposing a new model for working memory, which states that working memory is maintained in synaptic efficacy of the neurons through synaptic facilitation, and it can perform population coding well. Moreover, this model also brings the possibility of single cell coding other than population coding in traditional models.

In this research, we investigate the new model's capability of single cell coding, and how size and topology of network have an effect on it. We found that this working memory model can really perform single cell coding even if it is quite small amount of information. Also, sizes and topologies of networks can affect the coding efficiency.