Fung, P. K.; **Robinson, P. A.**

Neural field theory of calcium dependent plasticity with applications to transcranial magnetic stimulation. (English) Zbl 1314.92036

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Summary: Calcium dependent plasticity (CaDP), a physiologically realistic plasticity mechanism in the microscopic regime, is incorporated into a neural field theory to explore system-level plasticity. This system-level plasticity model is capable of reproducing the characteristic plasticity window of spike-timing dependent plasticity (STDP) in paired associative stimulation (PAS), where a peripheral electric pulse stimulation is paired to transcranial magnetic stimulation (TMS) in the cortex, and rTMS frequency dependent plasticity, where low and high frequency rTMS trains induce depression and potentiation, respectively. These thus reproduce experimental results for system-level plasticity for the first time. This also bridges the gap between microscopic plasticity theory and system-level plasticity observed experimentally, and addresses long standing problems of stability and adaptability by predicting stable plasticity, a possible seizure state where neurons fire at a high rate, and spike-rate adaptation.

MSC:

92C20 Neural biology

Keywords:

synaptic plasticity; spike-rate adaptation; spike-timing dependent plasticity; paired associative stimulation

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