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Seção
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Emergence of criticality in different topologies of networks of map-based neurons

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Resumo

KTz model is a three-dimensional map representing the action potential, a recovery and a slow variable, and exhibits the usual excitable cells behaviors (fast and regular spiking, bursting, etc). When we connect KTz's units in different topologies with a probabilistic two-dimensional Chemical Synapse Map (CSM) we obtain spike avalanches, which is a number of connected neurons spiking one after another. The critical systems show a power law distribution of avalanches, and this is also a signature of Self-Organized Criticality (SOC). In vitro systems have shown neuronal avalanches. Comparisons between LFP recordings in monkeys performing a short term memory task and three subsampled SOC models are available in the literature, as well as in vivo data from rats and a cellular automaton model. These results are promising, and show close connection between critical models and neuronal activity. We simulate KTz neurons connected through CSM on different types of networks (square, scale-free, small world) and our preliminary results show criticality in the square lattice. Random topologies are under check, and they may be of close interest of the medical community, since they can be related to the development of some neural diseases.