J Bioengineer & Biomedical Sci 2017, 7:4 (Suppl)
DOI: 10.4172/2155-9538-C1-018

Utilizing the game of life cellular automaton as a precursor to brain dynamics modeling

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The dynamics of the brain (i.e. neuron activity, information transfer, etc) is a vast research field, where a number of questions still remain unanswered. In recent years, computational modeling has been playing an active role in the field of brain dynamics, helping scientists in the study of such an immense variety of problems. In this work we examine the suitability and application of the Game of Life (GoL) cellular automaton in the study of brain dynamics. This particular cellular automaton has some important features which are also related with brain processes (for instance, pseudo-criticality, 1/f noise, universal computing), hence making it a suitable candidate for brain dynamics modeling. Moreover, due to its computational nature (rectangular grid with information within one time step only allowed to be exchanged between adjacent cells) it has enough flexibility for interpretation, with time step and spatial dimensions being dimensionless. In the present study, GoL is initially utilized to simulate the behavior of a statistically significant set of neurons (of the order of one million) and their interactions with their environment through signal/information transfer in a number of scenario. The process of signal/information propagation across the grid is described and conclusions are drawn on the suitability of GoL to relate to brain dynamics. Further work and extensions of the model are also discussed.

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