Spiking Neural P Systems

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Propositions belonging to the thesis

Spiking Neural P Systems

by Jun Wang

1. A spiking neural P system solving SAT can be constructed with a constant number of initial neurons instead of the linear number achieved previously. [This thesis, Chapter 4]

2. The ”limited” spiking neural P systems do not represent a “true” asynchronous mode. [This thesis, Chapter 2]

3. The power of neurons with a threshold is caused by a phenomenon inspired by nature, which however does not exactly follow the biological facts. [This thesis, Chapter 6]

4. Computationally complete spiking neural P systems can be obtained where the neuron is simple and homogeneous (using the single rule $a^* / a \rightarrow a$), so each neurons works simply as a transmitter of information. [This thesis, Chapter 7]

5. The integration in an unique model of concepts from artificial neural networks and spiking neural P systems is not an easy task, thus, some of the ingredients used in the model for Hebbian learning are not usual in the SN P systems framework. [M.A. Gutiérrez-Naranjo, M.J. Pérez-Jiménez. Hebbian Learning from Spiking Neural P Systems View. *In Proceedings of 9th Workshop on Membrane Computing*, pages 217-230, 2008]

6. There is a close analogy between tokens in a Petri net and spikes in SN P systems. In future the combination of their features should be investigated. [V.P. Metta, K. Krithivasan, and D. Garg. Modeling Spiking Neural P Systems using Timed Petri Nets. *Nature and Biologically Inspired Computing*, 25-30, 2009]

7. SN P systems have been efficiently simulated on graphics processing units such as GPUs. The crucial step in this is that the nature of SN P systems allow their representation as matrices. [F.G. Cabarle, H. Adorna, M.A. Martínez-del-Amor: Simulating Spiking Neural P Systems Without Delays Using GPUs. *International Journal of Natural Computing Research*, 2(2): 19-31, 2011]

8. A framework of SN P systems can have several features that behave nondeterministically (spiking rules, thresholds, timing). In order to better understand the framework, their separate contributions in computing power should be compared.

9. It is good way to get flash ideas when you are riding a bicycle.