Application of Formal Framework to Spiking Neural P System Variants: A Proposal

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1 Introduction

Membrane computing is a field of computer science that studies models of computation known as *P systems*. *P systems* refer to a family of models of computation that are inspired by different biological processes. P systems use biological concepts like cells, cell membranes, neurons, tissues, etc. Rules (computation operations) in P systems are inspired by biological processes like chemical reactions in cells, ion transport between regions divided by membranes, membrane creation, division and dissolution, spiking of neurons, neurogenesis, and synaptogenesis.

There is no single formal definition for the term 'P system' but there are certain characteristics that apply to most P systems. Most P systems use multiset of symbols as computing elements. One can think of these symbols as molecules or ions. The multiset of symbols are compartmentalized into regions and these regions are defined by membranes that enclose them. i.e. Region 1 is the space enclosed by membrane 1. This is the reason why the field is known as 'membrane' computing. Regions can be connected to each other. For example, in cell-like P system, membranes in the cell can be nested. If there are two membranes in a cell, membrane 0 and membrane 1, and membrane 1 is inside membrane 0 then the region enclosed by membrane 0 that is outside mebrane 1 is 'connected' to the region enclosed by membrane 1. In tissue-like P system, membranes represent cells and a cell enclosed one region. Cells (and hence regions) are connected to each other via channels. Tissue P systems form networks of cells. In general, the *configuration* of a P system refers to the network of cells/membranes with each cell/membrane

containing a multiset of objects (the multiset can be empty). In some P systems, a cell/membrane has an internal state/status that is different from its content (multiset of symbols). For example, in some cell-like P system, a membrane has a state known as *polarity* or *charge* which can either be negative, positive, or neutral.

[2] [1] [3] [4]

hello world

2 Proposal

References

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