# On Homogeneous Spiking Neural P System Variants

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**Abstract.** (ABSTRACT)

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## 1 Introduction

## 2 Spiking Neural P System and Some Variants

## 3 Homogenization of Spiking Neural P Systems

A *state transition diagram* will be used to represent the activities of a neuron. A *state* is a set of spike counts. For example, the set $\{4, 5\}$ represents spike counts 4 and 5, the set $\{0, 2, 4, 8, ...\}$ represents even spike counts, and the set $\{15, 20, 25, 30, 35, ...\}$ represents spike counts that are multiples of 5 starting from 15.

If a neuron has $n$ spikes, the neuron is said to be *in state* $S$ if $n \in S$. For example, let $n = 10$ be the number spikes in the neuron and $S_1 = \{1\}$, $S_2 = \{2, 4, 9, 10, ...\}$, $S_3 = \{5, 10, 15, 20, ...\}$ be states, the neuron is not in state $S_1$ since $n \notin S_1$ but it is in state $S_2$ and $S_3$ since $n \in S_2$ and $n \in S_3$. States can intersect since they are sets which means a neuron can be in multiple states at the same time.

Most states that are associated with a given neuron represent the regular expressions of the rules in the neuron. For example, in Figure 1 neuron 1 have the rules $r_1 : a/a \to \lambda$ and $r_2 : a(a^2)^+/a^2 \to a$, the state $S_1 = \{1\}$ represents the regular expression $a$ of rule $r_1$ while the state $S_2 = \{3, 5, 7, 9, 11, ...\}$ represents the regular expression $a(a^2)^+$ of rule $r_2$. Neuron 1

Figure 1

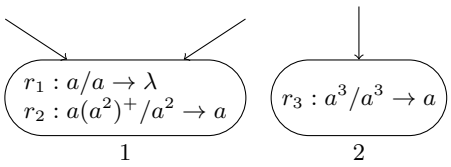


**Fig. 1.** Example Neurons