PATH MULTIMODALITY IN A FEEDFORWARD SNN MODULE, USING LIF WITH LATENCY MODEL

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Abstract: In this paper, the network transmission properties of a feedforward Spiking Neural Network (SNN) affected by synchronous stimuli are investigated with respect to the connection probability and the synaptic strengths. By means of an event-driven method, all simulations are conducted using the Leaky Integrate-and-Fire with Latency (LIFL) model. Typical cases are taken into consideration, in which a network section (module) is able to process the input information, introducing a particular behavior, that we have called path multimodality. Simulation results are discussed. Through this phenomenon, the output layer of the network can generate a number of temporally spaced groups of synchronous spikes. The multimodality effect could be applied for various purposes, for instance in coding or else transmission issues.

Key words: *Feedforward SNN, LIF with latency model, synchrony, firing rate, path multimodality*

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1. Introduction

Spiking Neural Networks (SNNs) represent a class of biological inspired neural networks that are widely implemented in many research fields, such as engineering, neurophysiology, neuroscience. These kind of networks seem very useful, in particular, for the elaboration of both sensory and cognitive information [2, 3, 15, 23, 27]. For example, the transmission of the spiking activity through a neural network appears of great interest and many computational models have been proposed to approach this problem, such as feedforward models with convergent-divergent connections [1, 8, 11, 16–18, 20, 22, 28, 34, 35]. These studies involve rate codes or else temporal codes [24, 27], depending on the spiking activity which can be asynchronous, or else synchronous [21]. This difference is due to the necessity of saving the information in subsequent stages of a sensory pathway.

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