BMC Neuroscience

Poster presentation

Open Access

A computational model of latency based stimulus selection

Lawrence C York* and Mark CW van Rossum

Address: School of Informatics, University of Edinburgh, Edinburgh, NN3 2RB, UK

Email: Lawrence C York* - s0570135@sms.ed.ac.uk

* Corresponding author

from Eighteenth Annual Computational Neuroscience Meeting: CNS*2009
Berlin, Germany. 18–23 July 2009

Published: 13 July 2009

BMC Neuroscience 2009, **10**(Suppl 1):P307 doi:10.1186/1471-2202-10-S1-P307

This abstract is available from: http://www.biomedcentral.com/1471-2202/10/S1/P307

Introduction

In higher areas of the visual system, such as V4 or STS, the neural response to combined stimuli are often very different from the combined responses to its separate parts. This is not only true for the average firing rates, but also the temporal dynamics of neuronal responses, which can show strong interactions when multiple stimuli are presented. For instance, a recent study found that when two stimuli are presented simultaneously, the neural response follows the stimulus that has the shortest latency, whilst the response to the other stimulus is suppressed [1].

We present a model of a recurrent cortical circuit which utilizes short-term synaptic depression to model this phenomenon. The early response depletes much of the synaptic resource, suppressing the response to the later stimuli. This allows the circuit to preferentially respond to the first stimulus and suppress the response to the second stimulus, reproducing the experimentally observed dynamics. At the same time, the model is consistent with earlier descriptions of interactions in the visual system that only considered total spike counts, ignoring temporal aspects of the response. Moreover, the model explains the long response latencies in higher visual areas to low contrast stimuli.

We then show how such circuits can reduce overlap in the neuronal responses to temporally dense sequences of stimuli. Finally, we demonstrate how this type of circuit allows the visual system to process temporally separate signals, an important property given the wide range of response latencies in higher visual areas. The study underlines the role of synaptic dynamics in explaining cortical responses.

Acknowledgements

LCY and MvR were supported by the Neuroinformatics DTC (EPSRC funded).

References

1. Gawne TJ: **Stimulus selection via differential response latencies in visual cortical area V4.** *Neuroscience Letters* 2008, **435:**198-203.