BMC Neuroscience

Poster presentation

Open Access

Dynamic topography and receptive fields in a model of auditory cortical plasticity

Eduardo Mercado III* and Webster Tilton

Address: Department of Psychology, University at Buffalo, The State University of New York, Buffalo, NY 14260, USA

Email: Eduardo Mercado* - emiii@buffalo.edu

* Corresponding author

from Sixteenth Annual Computational Neuroscience Meeting: CNS*2007
Toronto, Canada. 7–12 July 2007

Published: 6 July 2007

BMC Neuroscience 2007, **8**(Suppl 2):P189 doi:10.1186/1471-2202-8-S2-P189

Self-organizing maps provide a useful framework for exploring the mechanisms of experience-dependent changes in auditory representations, including those induced by learning. Such models do a good job of explaining many of the changes in tonotopic structure and neural sensitivities produced by classical and operant conditioning involving pure tones [1], but are not able to account for several effects seen after cortical microstimulation, or after basal forebrain stimulation is repeatedly paired with presentations of sounds containing multiple frequencies. In particular, electrical stimulation of rat auditory cortex produces more changes in the responses properties of adjacent sites than they do at the site of stimulation [2], and these receptive field changes are not consistent with a process that makes the neighboring neurons more similar to the most strongly activated neurons. We developed a simple mapping network with a "center-surround" neighborhood function, and a cumulating training function, to assess whether such non-Hebbian learning could account for the kinds changes in cortical response properties seen after neurostimulation. The model exhibits many of the properties of self-organizing maps, but with more dynamic interactions between adjacent nodes that may better account for the variability in auditory cortical plasticity observed experimentally. Ongoing simulations with this model are providing new insights into how complex perceptual experiences restructure existing cortical representations.

References

1. Mercado E, Myers CE, Gluck MA: **A computational model of mechanisms controlling experience-dependent reorganization of representational maps in auditory cortex.** *Cogn Affect Behav Neurosci* 2001, **1:**37-55.
2. Talwar SK, Gerstein GL: **Reorganization in awake rat auditory cortex by local microstimulation and its effect on frequency-discrimination behavior.** *J Neurophysiol* 2001, **86:**1555-1572.