

Readings in Neuroinformatics

Slaven Cvijetic, 13.12.18

RECEPTIVE FIELDS AND FUNCTIONAL ARCHITECTURE OF MONKEY STRIATE CORTEX, By D. H. HUBEL AND T. N. WIESEL, From the Department of Physiology, Harvard Medical School, Boston, Mass., U.S.A., J. Physiol. (1968), 195, pp. 215-243.

Abstract

In the past years, research has focused on the cat visual system. The visual area 1, V1 or striate cortex, is a crucial structure involved in many different visual perceptions functions. Its underlying cellular structure and cell types have yet to be illuminated by animal models closer to humans. For this purpose, we have analysed the monkey striate cortex, since monkeys come close the human performance and usage of the visual system. We used six spider monkeys and sixteen macaques, which were anaesthized with succinylcholine and gallamine triethiodide to prevent all eye movements. Microelectrodes were used to stimulate the striate cortex and obtain electrophysiological measurements. We found 3 different cell types that differ in their receptive fields. They are simple, complex and hypercomplex cells. Simple cells have clearly distinct ON and OFF centers and surrounds and are approximately circular. Complex cells receive inputs from simple cells amongst others and their ON and OFF centers and surrounds overlap. Complex cells make up most of the striate cortex. They are especially sensitive to edges and specific orientations of bars. Colour perception does not seem to play a major role in the striate cortex. Most of the cells were mainly unselective for wavelength. Furthermore, retinotopy is preserved in V1 and ordered orientation columns have been identified. Those are columns that respond optimally to a given angle of a bar stimulus, but do not or barely respond to other orientations. A second type of columns are ocular dominance columns that prefer the input from one eye only. Thus, we contributed to a major analysis and characterization of the monkey striate cortex. Due to the close evolutionary kinship with us, the results are highly relevant for humans as well.