Abstract

Poster Instructions

A Neurodynamical Model Of Brightness Induction In V1 Following Static And Dynamic Contextual InfUences Presentation Code: p063.04 - Abstract Number: 2231 - Poster Board Number: D4	
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Brightness induction is the modulation of the perceived intensity of an area by the luminance of surrounding areas. Although striate cortex is traditionally regarded as an area mostly responsive to sensory (i.e. retinal) information, neurophysiological evidence suggests that perceived brightness information might be explicitly represented in V1. Such evidence has been observed both in anesthetised cats where neuronal response modulations have been found to follow luminance changes outside the receptive felds and in human fMRI measurements.
In this work, possible neural mechanisms that ofer a plausible explanation for such phenomenon are investigated. To this end, we consider the model proposed by Z.Li (Li, Network:Comput. Neural Syst., 10 (1999)) which is based on neurophysiological evidence and focuses on the part of V1 responsible for contextual infuences, i.e. layer 2-3 pyramidal cells, interneurons, and horizontal intracortical connections. This model has reproduced other phenomena such as contour detection and preattentive segmentation, which share with brightness induction the relevant efect of contextual infuences. We have extended the original model such that the input to the network is obtained from a complete multiscale and multiorientation wavelet decomposition, thereby allowing the recovery of an image refecting the perceived intensity. The proposed model successfully accounts for well known psychophysical efects for static contexts (among them: the White's and modifed White's efects, the Todorovic, Chevreul, achromatic ring patterns, and grating induction efects) and also for brigthness induction in dynamic contexts defned by modulating the luminance of surrounding areas (e.g. the brightness of a static central area is perceived to vary in antiphase to the sinusoidal luminance changes of its surroundings). This work thus suggests that intra-cortical interactions in V1 could partially explain perceptual brightness induction efects and reveals how a common general architecture may account for several different fundamental processes emerging early in the visual processing pathway.