

POSTER PRESENTATION

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Neural model of biological motion recognition based on shading cues

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From 24th Annual Computational Neuroscience Meeting: CNS*2015
Prague, Czech Republic. 18-23 July 2015

Point-light or stick-figure biological motion stimuli, due to the absence of depth cues, can induce bistable perception, where the walker is perceived as heading in two alternating directions [1,2]. Psychophysical studies suggested an importance of depth cues for biological motion perception [3]. However, neural models of biological motion perception so far have focused on the processing of features that characterize the 2D structure and motion of the human body [4,5]. We extend such models for the processing of shading cues in order to analyze the three-dimensional structure of walkers from monocular stimuli.

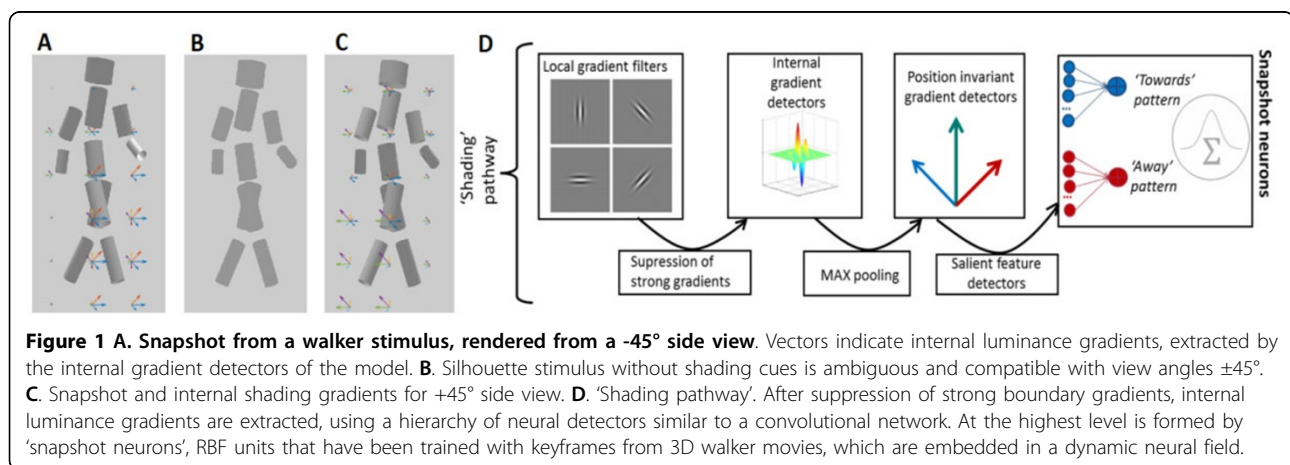
Model

As extension of a learning-based neural model [4], we add a 'shading pathway' that computes the internal contrast gradients that vary with the 3D view of the walker, even if the

silhouette information remains identical (Figure 1A-C). The model exploits physiologically plausible operations. After suppression of strong external luminance gradients caused by the boundaries of the silhouette, internal luminance gradient features are extracted by a hierarchy of neural detectors. These gradient features, combined with the shape features extracted by the form pathway of the model in [4], are used as input for 'snapshot neurons', RBF units that detect 3D body shapes (Figure 1D). These model neurons are embedded within a two-dimensional recurrent neural field [6] that jointly represents the sequential temporal structure of the stimulus and the view of the walker.

Results

The neural field dynamics reproduces perceptual multi-stability and spontaneous perceptual switching between



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stimulus views, observed for silhouette stimuli in psychophysical experiments [1,2]. It also reproduces the disambiguation by addition of shading information and a new perceptual illusion, which illustrates a lighting-from-above prior in the processing of biological motion stimuli.

Acknowledgements

Supported by EC FP7 ABC PITN-GA-011-290011, HBP FP7-604102, Koroibot FP7-611909, COGIMON H2020-644727, DFG GI 305/4-1, DFG GZ: KA 1258/15-1, and BMBF, FKZ: 01GQ1002A.

Published: 18 December 2015

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doi:10.1186/1471-2202-16-S1-P81

Cite this article as: Fedorov and Giese: **Neural model of biological motion recognition based on shading cues.** *BMC Neuroscience* 2015 **16**(Suppl 1):P81.

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