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Contribution of spatial and temporal integration in heading perception

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Statement of the Problem: The optic flow pattern occurring during the observer's motion through the environment is a powerful cue for the direction of self-motion (heading). Most of the existing theories on visual heading determination considered only the contribution of the instantaneous flow field. The aim of the present study is to evaluate the relative contribution of spatial and temporal information integration in heading estimation.

Methodology & Theoretical Orientation: Four different conditions simulated the observer's motion towards a wall with stationary eyes and head. In the static condition a single snapshot of an instantaneous flow field was presented and the heading direction was specified by the orientation of paired dot elements. In the flicker condition, a random sequence of snapshots with paired dots was presented. In the motion condition the heading direction was specified by the trajectory of the moving dots, while in the combined condition it was specified both by the trajectory of motion and the orientation of paired dots. In all conditions except the static one the lifetimes of the dots was limited to 100 ms and on every frame one-third of the dots were randomly re-positioned. In all conditions, 30% of the dots had random direction and/or orientation. The observers had to determine whether the heading direction was shifted away from straight ahead.

Findings: The heading direction was estimated with highest sensitivity in the combined condition. The improvement in this condition could not be predicted by an optimal combination of the information in the static and motion displays, but is well described by the combination of the information in the flicker and motion displays.

Conclusion & Significance: The results imply that temporal information integration plays a significant role in heading perception and that the determination of self-motion direction is not based solely on the instantaneous optic flow.

Biography

Nadejda Bocheva is an Associate Professor at Institute of Neurobiology, Bulgarian Academy of Sciences. Her research interests include "Human visual information processing, spatial vision, motion perception, visual recovery of 3D shape and ageing". She has more than 40 publications in scientific journals. She has received a Fogarty International Collaborative Award in 2002. She is member of American Psychological Association and of the Sofia section of the Bulgarian Physiological Society.

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