

PERCEPTION

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Abstracts

fixed line. The test results reported here cover a four octave range of spatial frequencies at different directions at 45 deg. intervals around a circle. Results: the observers in experiment 1 report that the task is simple and perform close to 100% correct. Experiment 2 showed that the results remain similar under informal and non-calibrated viewing conditions. Conclusions: the test would provide a simple screening test invaluable to many researchers and clinicians where cortical visual problems have been implicated, eg dyslexia, Alzheimer's disease, dementia, autism; or for screening purposes where visual information plays a very important role, eg drivers, pilots, or air traffic controllers.

◆ **Eye-movement planning during flight maneuvers**

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How are eye-movements planned to access relevant visual information during flight control? From the cockpit perspective, there are two classes of visual information that are relevant for flight control. First, the changing visuals of the external world provide direct perceptual feedback on how the pilot's command of the control stick is affecting the aircraft's current position, orientation and velocity. Second, flight instruments provide abstracted and specific values—on factors such as the aircraft's compass bearing and vertical speed—that have to be continuously monitored, in order for the global objective of certain maneuvers (eg, turns) to be achieved. Trained pilots have to coordinate their eye-movements across this structured visual workspace (ie, outside view and instruments) to access timely and task-relevant information. The current work focuses on providing descriptions of these planned eye-movements. Eye-movements were recorded of pilots in a high-fidelity flight simulator (100° field-of-view) whilst they performed specific flight maneuvers. Fixation durations and transitions between the individual instruments and aspects of the external environment are represented as network graphs. This allowed us to formally describe the sources of information that were relied on across the different tasks and to compare actual performance to expert predictions.

◆ **Blavigator: a navigation aid for blind persons**

97 J Jose, M Moreno, J Pinilla-Dutoit, J Rodrigues, J Du Buf (Vision Laboratory, LARSyS, University of the Algarve, Portugal; e-mail: dubuf@ualg.pt)

Blavigator (blind navigator) is a vision aid for blind and visually impaired persons. It supports local navigation by detecting walkable paths in the immediate vicinity of the user. It guides the user for centering on the path. It also detects obstacles, both static and moving, in front of the user and just beyond the reach of the white cane, such that the user can be alerted. The user can choose between modulated sounds and synthesised speech for path centering and obstacle alerts. Local navigation works both indoor (corridors) and outdoor (sidewalks etc). Global navigation, for wayfinding in neighbourhoods and in buildings, is also possible, provided that a detailed geographic information system is available. Different technologies are used for localising the user: outdoor GPS reception, indoor triangulation of WiFi access points, and visual recognition of landmarks. Already working in realtime on a netbook computer with a simple webcam, the system is cheap, simple to install and maintain, and reliable with a user-friendly interface. The system is being tested in collaboration with ACAPO, the Portuguese association of blind and amblyopes. The ultimate goal is to use the system on a mobile phone with a built-in camera. [Projects: PEst-OE/EEI/LA0009/2011, NeFP7-ICT-2009-6 PN: 270247, RIPD/ADA/109690/2009; PhD grant SFRH/BD/82310/2011.]

◆ **CORF: A computational model of a simple cell with application to contour detection**

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We introduce a computational model of a simple cell, which combines the responses of model LGN cells with center-surround receptive fields (RF). We call it Combination of RFs (CORF) model. We use simulated reverse correlation to demonstrate that the RF map of the CORF model can be divided into elongated inhibitory and excitatory regions, typical of simple cells. Besides orientation selectivity, the CORF model exhibits contrast invariant orientation tuning, cross orientation suppression and response saturation, which are observed in simple cells. These three properties are, however, not possessed by the Gabor function (GF) model, which has gained particular popularity as a computational model of a simple cell. We use two public data sets of images of natural scenes with associated ground truth to compare the CORF and the GF models in a contour detection task, which is assumed to be the primary biological role of simple cells. In this task, the CORF model outperforms the GF model (RuG dataset: $t_{39} = 4.39$, $p < 10^{-4}$, Berkeley dataset: $t(299) = 3.88$, $p < 10^{-4}$). The proposed CORF model is more realistic than the GF model as it shares more properties with simple cells and it is more effective in contour detection.