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Abstracts

encodings of space (Wills et al, 2010 *Science* **328** 1573–1576) is an important question for further study.

◆ A disparity energy model improved by line, edge and keypoint correspondences

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Disparity energy models (DEMs) estimate local depth information on the basis of V1 complex cells. Our recent DEM (Martins et al, 2011 *ISSPIT* 261–266) employs a population code. Once the population's cells have been trained with random-dot stereograms, it is applied at all retinotopic positions in the visual field. Despite producing good results in textured regions, the model needs to be made more precise, especially at depth transitions. We therefore combine the DEM with two complementary disparity models: (1) Responses of V1 end-stopped cells are used to detect keypoints like edge junctions, line endings and points with large curvature. Responses of simple cells are used to detect orientations of the keypoints underlying line and edge structures. The annotated keypoints are then used in the left-right matching process, with a hierarchical, multi-scale tree structure. (2) Responses of simple and complex cells are used to detect line and edge events. In the left-right matching process, disparity evidence is accumulated by combining corresponding event types, polarities and their numbers. This is done by grouping cells in the multi-scale line-edge space. By combining the three models, disparity can be improved at depth transitions and in regions where the DEM is less accurate. [Projects: PEst-OE/EEI/LA0009/2011, NeFP7-ICT-2009–6 PN: 270247, RIPD/ADA/109690/2009; PhD grants SFRH-BD-44941–2008, SFRH/BD/79812/2011.]

◆ Subthreshold contrast smoothness as a depth cue

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It is well known that the luminance contrast change of a visual stimulus is one of cues to depth. However, it is unclear how the smoothness of contrast change correlates with depth perception. Here, we investigate the relationship between the contrast smoothness and depth perception. Two same-sized bars were vertically presented on the display. Both bars contained the luminance contrast difference from one side to the other (LtoR or RtoL). The contrast difference and smoothness of contrast change from one to the other were varied from trial to trial. One participant group was asked to report which bar was more tilted (Depth task), another group reported which bar was darker (Luminance task). Both tasks were conducted with monocular viewing. In general, the performance of the luminance task would be the same or better than that of the depth task because of cognitive hierarchy. However, we find that the performance of the depth task was better than that of the luminance task when the contrast smoothness was subthreshold. The present results demonstrate two suggestions. First, contrast smoothness would be useful as one of depth cues. Second, the contrast smoothness becomes a relatively effective depth cue especially when it is subthreshold.

◆ Contour shape and perception of holes on 3D surfaces

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Convexity and concavity are powerful determinants of figure-ground segmentation; concave sides look more like a hole (background) while convex ones as a figure (Bertamini, 2006 *Perception* **35** 883–894). In most studies of figure-ground segmentation, however, 'flat' or 2D figures are used; no variance of depth within each figure. The objective of this work is to study whether the roles of convexity and concavity are still maintained with 'curved' or 3D surfaces as figures. 3D surfaces are rendered using computer graphics software. Two images of the same 3D surface (one with a convex hole projected on it, the other with a concave hole) are presented side-by-side to an observer, who is required to choose the one looking more like a hole; 85 observers participate in this experiment. No statistically significant difference is found between convex and concave holes. In the second experiment, we augment the scene with cast shadows; the shadow due to the hole is rendered to fall on the ground, which is visible through the hole. Unlike the first experiment, much more observers choose concave holes over convex ones for looking more like a hole in a statistically significant way.

◆ Star Trek illusion de...

24 J Qian, Y Petrov (No...

Size constancy is a well-kn... distance on the retinal ima... we demonstrated a simila... accounts for effects of vie... that we called "general ob... this hypothesis. Pairs of di... as a small black disk floa... by binocular disparity. Ob... the optic flow. The illusor... separation for each pair v... stronger than the accompa... much faster than size wit... object constancy.

◆ Stereo-fusion efficie...

25 locks
M Wagner[1], N Schw... Jerusalem, Israel; e-m...

We studied the efficiency... disparity fusion locks. T... images embedded in RDS... direction gaps (crossed or... frames "fusion-locks"... deg vertical, 2 deg horizon... and 20.5 horizontal). We... 4 keys corresponding to L... tasks. Binocular eye-mov... peripheral lock significant... stereo-fusion efficiency. W... showed vergence drifts an... performance and prolong... reflecting conflicting acco... zero-disparity images as t...

◆ The lack of transfe...

26 S Preuß[1], H Hecht... Gutenberg-Universi... Gutenberg-Universi...

Nowadays many routine s... of a camera and two lapar... surgery". The camera pr... 2D image on a monitor... that requires only one i... high. In single-port surg... perceptual motor action... methods. In a cross-over... then switched to the oth... more complex spatial ma... Also, the 2D picture migh... Subjects improved with p... investigate if mental prac...