binocular vision

Perceptual consequences of binocular matching by correlation: Effects of disparity waveform and waveform orientation

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A binocular correlation model predicts several aspects of human spatial stereoresolution (Banks et al, 2004 Journal of Neuroscience 24 2077-2089). Performance of the model is limited by two properties: the smallest available correlation window, and the assumption that disparity is constant across small image patches (consistent with the physiology; Nienborg et al, 2004 Journal of Neuroscience 24 2065-2076). The model predicts that the form of disparity modulation should affect stereopsis. We presented square- and sawtooth-wave corrugations in random-dot stereograms and measured coherence thresholds (signal dots/total dots) for vertical and horizontal corrugations. We observed two effects: 1) coherence thresholds were lower for square than sawtooth waves, and 2) thresholds were lower for horizontal than vertical orientations. The first effect is predicted by the correlation model because square waves have regions of constant disparity. The second effect is consistent with the slant anisotropy of binocular vision (Bradshaw & Rogers, 1999 Vision Research 39 3049-3056); it implies that the correlation windows used by the visual system are not isotropic (Tyler & Kontsevich, 2001 Vision Research 41 2235-2243).