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Detection of Perturbation in Chromatic and Luminance-Defined Lines and Square-Waves

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Abstract. The composition of a stimulus may affect how cues are combined. A thin luminance ring surrounding a uniform chromatic test facilitates contrast detection as much as a uniform luminance pedestal (Cole, Stromeyer & Kronauer, 1990, JOSA A, 7(1), 128-140). This could suggest that there is a specific facilitatory relationship between luminance lines and chromatic edges that is not present in other combinations. Therefore, combining luminance lines and chromatic edges could also improve performance in edge detection tasks. Here we use a novel task, perturbation detection, target gratings were sinusoidally perturbed in space and subjects were asked to detect which of two stimuli was not straight. Perturbation thresholds, were measured for chromatic and luminance defined line and square-wave gratings alone and in combination. The introduction of a line mask produced increased thresholds in all conditions. However, the introduction of a chromatic square-wave mask improved perception of perturbation in luminance lines, whereas the introduction of a luminance defined square-wave mask has little effect on the perturbation thresholds for chromatic lines. This could suggest that when a luminance line is presented with a chromatic edge, such as the chromatic boundaries in a square-wave grating, the chromatic information becomes 'tied' to the luminance information. The perceived location of the chromatic edge may be determined by the location of the luminance line.