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Measuring the Spatial Resolution of Visual Attention.

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Purpose. To derive the spatial modulation transfer function and thereby the effective receptive field for visual spatial attention. Procedure. Lu and Sperling1 recently identified a class of motion stimuli which is ambiguous to first- and second-order motion systems. However, a third-order motion system, which relies on visual attention to select certain features and bind them together across frames, yields a clear perception of motion. We extended their paradigm to stimuli consisting of temporal sequences of five windowed horizontal sine wave gratings. Each grating was exposed for 100 msec then displaced 90 deg consistently to the right or left relative to its predecessor (left/right direction was randomized between trials). Approximately isoluminant gratings (alternating bands of red and green) alternated with second-order gratings (alternating bands of high and low contrast texture). No motion is perceived in such stimuli unless attention is allocated appropriately. Subjects made direction-of-motion judgments under "attend to red" or "attend to green" instructions. A response was considered correct if it was consistent with the direction computed by binding the attended color and the high-contrast texture feature across frames. Feedback was given after each trial. Direction accuracy was measured over a range of viewing distances that yielded retinal stimuli varying from 0.5 to 6 c/deg, and *d'* was computed for each observer and condition. **Results.** Three observers, after initial training, produced similar *d'* data with cutoff frequencies of approximately 4 c/deg, from which receptive field widths of 12 min were inferred. **Conclusion.** This third-order motion paradigm allows the application of experimental and theoretical tools from psychophysics (linear systems analysis, signal detection theory) to to the cognitive processes of attention.

[1]Z-L Lu & G. Sperling (1995). *Nature,* v377,237-239.

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