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Measuring and Modeling the Trajectory of Visual Spatial Attention

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In a novel choice-attention gating paradigm, observers monitor a stream of 3x3 letter arrays until a tonal cue directs them to report one row. Analyses of the particular arrays from which reported letters are chosen and of the joint probabilities of reporting pairs of letters are used to derive a theory of attention dynamics. Basically, an attention window opens 0.1 see following a cue to attend to a location, remains open (minimally) 0.3 sec, and admits information simultaneously from all the newly attended locations. The window dynamics are independent of the distance moved. A general computational theory incorporating perceptual acuity, attention dynamics, visual short-term memory, and decision processes, is used to derive the time constants of the true attention window and of iconic memory, and the cue interpretation time and its variability. Partial and whole report paradigms, with and without post-stimulus masks, and measurements of perceptual acuity were performed to test the theory with attention shifts made in other contexts by the same observers with similar stimuli. The theory accounts for about 90% of the variance from the over 400 data points obtained from each of the observers; extensions to the other principle paradigms used to measure the dynamics of visual attention are illustrated.