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The Role of Attention in Perceiving Motion

2.2 The role of attention in vision is definitely becoming a hot topic as anyone who was at ARVO97 will know! But of course it is not new (is anything?) Westheimer in 1912 showed that a set of three stimuli (a plus sign and then a times sign and then another plus sign) could be interpreted as a wheel or windmill rotating in one direction by an attentional effort. The idea of an important role for attention in motion detection has been rejuvenated recently by Pat Cavanagh and George Sperling amongst others.

2.3 The experiments that Frans described to us involved not crosses made of lines but patterns of dots arranged at the ends of imaginary spokes separated by a variable step between 10 and 45 degs. This stimulus has ambiguous motion energy, both directions are equally likely, and therefore it needs something to "get it going". Eye movements can do it for example: tracking one of the discs in a certain direction results in an apparent motion of the configuration in the tracked direction. The 'tracking' can instead be done by the mind's eye while the eyes actually remained stationary. The stimuli were presented at a range of update rates to delineate the fastest and slowest rates at which subjects perceived motion. Subjects were instructed either to track using eye movements or to track with attention.

2.4.1 When subjects did not track with their eyes (just their attention), the minimum speed was pretty constant at about 0.5 rev/sec for the range of gaps between the stimuli (approx. 10-45 degs). The maximum speed (rev/sec) increased with larger gaps although this turned into a DECREASE if you looked at the number of steps/sec.

2.4.2 When subjects did track with their eyes, the maximum speed for smaller gaps increased over the no-tracking condition, although not for bigger gaps (the functions converged at a step size of around 45 degs). At its peak, targets flashing at up to 38 steps/sec were perceived as rotating when eye movements were allowed.

2.5 These findings could be modelled by postulating the monitoring of the movement of a "zone of attention" (falling off gradually from the attended point). The motion detectors would then be modeled by instead of adding two retinal locations through a delay line (Reichardt-type), adding a retinal location and an (attentional) efferent copy signal describing the position of this zone as described in Cavanagh, P. (1992) "Attention-based motion perception". Science, 257, 1563-1565.

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