1. Discussion

In a field of dots undergoing random Brownian movement, a single dot that changes its position in a consistent direction is more easily detected than can be explained by local motion detectors situated along the object's trajectory and treated as independent samples [Verghese et al., 1999]. The enhancement in detectability seems to occur only after 100 ms of movement, possibly due to a process that responds to an initial cue from local motion detectors by reducing the number of detectors monitored to those in the vicinity of the initial motion signal, in particular those in the object's predicted path [Verghese and McKee, 2002]. An interaction between local motion and position sensors thus appears necessary to account for performance at motion discrimination.

MS: I expected to see a broader conclusion statement about synergy, cooperativity, or interaction... without returning the focus to the specific case involved. If you want to limit, as in some cooperive interaction ... at play... even in simple detection

Discuss crowding as a source of uncertainty about (relative) position

Discuss anatomical implications of eccentricity rule. Many brain areas are foveated. v4 receptive field, v1lateral connection size, other numerology

why is it so hard to find global motion in the brain? We seem to locate it among a class of phenomena which integrate local visual features into higher level percepts. What about the ventral stream?

Having two classes of stimuli that are well distinguished behaviorally, we would hope to be able to find neurophysiological correlates of both types of motion perception. The underpinnings of local motion are Vaina and Cowey [1996] provides one positive finding, a patient with a unilateral cortical lesion slightly posterior to the hMT+ complex, resulting in a deficit in detection of global but not local motion in the contralateral field. Because receptive fields in MT are large, reflecting the integration of many V1 receptive fields spanning a range of spatial positions, it is natural to suppose that a global motion process could be supported by MT. However, attempts to observe MT neurons in the act of responding to global, as opposed to local, motion, have met with little success. For example, when random dot local motion stimuli are presented in a window that moves independently of the dots, MT cells respond primarily to to the local motion [Priebe et al., 2001]. Responses in macaque MT and MST to a stimulus opposing local and global motion showed no selectivity of cell responses to global motion direction, even though the stimuli elicited an oculomotor pursuit response in the direction of global motion [Ilg and Churan, 2004]. Livingstone et al. [2001] used sparse noise to map second-order spatiotemporal kernels in MT receptive fields and could not find any spatiotemporal interaction at scales larger than those of V1 receptive fields. Finally, recordings in MT made using stimuli similar to those used in this report find no selectivity in MT cells for global motion [Shadlen et al., 1993, Hedges et al., 2004]. It appears that direction selective responses in MT are, like those of V1, a function of local, and not global, motion.

Verghese and McKee [2002] found that detectability of a single dot with consistent direction among randomly moving backgrounds was enhanced after 100 ms of target motion. In that

report they also show (Figure 1 of that paper) that there is some enhancement is preserved even if the target motion is discontinuous; a target that suddenly jumped sideways or backwards in the middle of its motion trajectory still had enhanced detectability relative to the baseline. However, if the size of the jump was too large, the enhancement vanished vanished. In the light of the present study, we suggest that the critical maximum jump size may be the same as the critical spacing of crowding. The enhancement observed in that paper has been interpreted as a process that responds to an initial cue from local motion detectors by reducing the number of detectors monitored to just those in the vicinity of the initial motion signal. It may be that the mechanism that winnows the pool of motion detectors is the same as the integration field of Pelli et al. [2004].

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