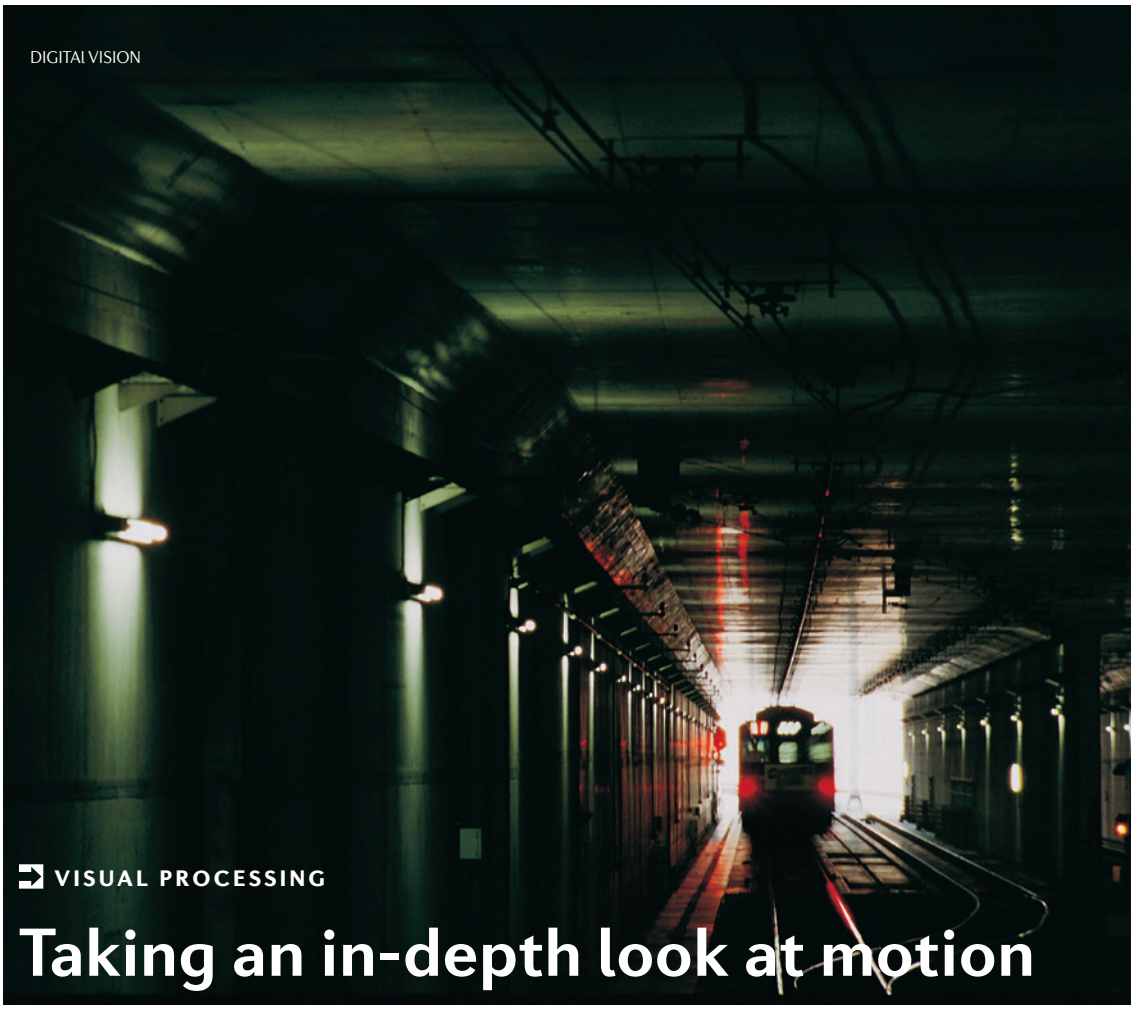


VISUAL PROCESSING

# Taking an in-depth look at motion

> Together, these studies show that neurons in area MT represent motion in depth

How the visual system represents motion in depth — movement of a visual stimulus towards or away from a viewer — is poorly understood. Now, two studies in non-human primates show that neurons in cortical area MT have a crucial role in this process.

Area MT has long been implicated in visual motion processing, but whether it has a role in representing motion in depth has been unclear. To examine this issue, Czuba *et al.* conducted extracellular recordings in area MT in two anaesthetized macaques during the presentation of visual motion stimuli — binocular drifting gratings — that were consistent with various frontoparallel and three-dimensional (3D) directions of motion.

The authors found that of the 236 MT neurons they recorded from ~20% exhibited a strong selectivity to visual stimuli that conveyed movement directly towards or away from the viewer. Further analysis revealed that ~50% of the MT neurons showed a notable bias in their responsiveness to movement away from the viewer, over movement towards the viewer, or vice versa. Thus, 70% of MT neurons represented information about 3D motion.

In another study, Sanada and DeAngelis recorded from 89 MT neurons in two awake macaques during the presentation of binocular visual stimuli comprising circular arrays of random dots, the movement of which could be altered to induce 3D or frontoparallel motion. In line with the findings of Czuba *et al.*, the authors found that a notable proportion (just over 50%) of the MT neurons showed selectively for either approaching or receding motion in depth.

The stimuli used in this study incorporated two binocular cues that convey motion in depth: a change in the disparity (CD) of an object over time and an interocular velocity difference (IOVD) between the images projected onto the two retinas. The authors adjusted the random dot stimuli to disrupt one or the other of these cues. Interestingly, disrupting the CD cue had little effect on the number of MT neurons displaying motion-in-depth selectivity, whereas disrupting the IOVD cue left only a small subpopulation of MT neurons with this capability.

Together, these studies show that neurons in area MT represent motion in depth, and that IOVD cues might have a major role in generating this selectivity.

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**ORIGINAL RESEARCH PAPERS** Czuba, T. B. *et al.* Area MT encodes three-dimensional motion. *J. Neurosci.* **34**, 15522–15533 (2014) | Sanada, T. M. & DeAngelis, G. C. Neural representation of motion-in-depth in area MT. *J. Neurosci.* **34**, 15508–15521 (2014)