

Recent stimulus history affects tuning of MT neurons

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The direction of moving objects in the natural environment continually changes. Successful interaction with such objects requires not only a good and up-to-date estimate of the current motion direction, but also of the direction changes. Area MT is considered the main motion area in the primate brain and one may therefore expect that it plays a role in the detection of direction change.

Neuronal direction tuning, however, is usually assessed with visual motion stimuli that move into a single direction for several hundreds of milliseconds. Such stimuli cannot be used to determine the influence of direction changes on the neural responses. In this study, we recorded from 121 neurons of 3 macaque monkeys during visual stimulation with a circular pathway stimulus. This stimulus gradually changed its direction of motion over time; hence each direction was present for a brief moment. The direction changed either in the clockwise or counter clockwise direction. Hence, each stimulus direction was present in either condition, but the stimulus history, i.e. the preceding motion direction, differed.

We found that while the preferred direction (PD) of the neurons remained unchanged, the shape of the direction tuning curve of 69% (84/121) differed significantly between the two conditions. This shows that MT cells do not solely represent snapshots of the current motion direction. Rather, recent stimulus history affects their responses. Hence, MT neurons carry information not only on direction, but also on direction change.