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Impact of visual landmarks on the activity of grid cells and other spatially selective neurons of the medial entorhinal cortex

The medial entorhinal cortex is populated by several types of spatially selective neurons. Their main function is to provide spatial representations that assist navigation. Among these different cell types, grid cells have been studied more intensively. It has been proposed that the activity of grid cells is controlled mainly by motion cues generated internally during movement and by geometrical information related to the shape of an environment. In this talk, I will present data showing how the activity of grid cells is influenced by visual landmarks. We found that, in mice, grid periodicity rapidly disappears when visual input are eliminated. Moreover, the speed code of MEC neurons changed in darkness and the activity of border cells became less confined to environmental boundaries. Half of the MEC neurons changed their firing rate in when visual landmarks are manipulated. I will also present a preliminary experiment investigating whether visual landmarks also influence the location of the firing fields of grid cells. Together, our findings highlight the strong influence of visual landmarks on the rate code of MEC neurons.