“Mind-reading” experiment highlights how brain records memories

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Courtesy Wellcome Trust Centre
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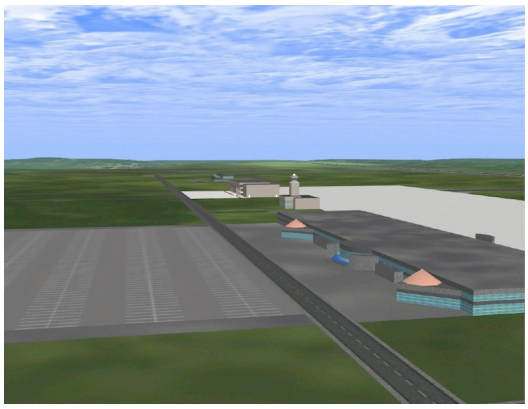
New research adds to mounting evidence that it’s possible to “read” memories just by looking at brain activity. Experimenters found that our notion of where we are is recorded in regular patterns, contrary to current scientific thinking.

Demis Hassabis and Eleanor Maguire at the Wellcome Trust Centre for Neuroimaging at University College London previously studied the role of a small area of the brain known as the hippocampus believed to be crucial for navigation, memory recall and imagining future events. Now, the researchers studied how the hippocampus records memory.



Researchers used a scanner that measures changes in blood flow within the brain, to examine brain activity as a volunteer navigated a virtual reality environment. The data were then analysed by a computer program.

When we move around, brain cells, or neurons, in the hippocampus known as “place cells” activate to tell us where we are.

Hassabis, Maguire and colleagues used a scanner that measures changes in blood flow within the brain, to examine these cells’ activity as a volunteer navigated a virtual reality environment. The data were then analysed by a computer program developed by Hassabis.

“Surprisingly, just by looking at the brain data we could predict exactly where they were in the virtual reality environment,” said Maguire. The study appeared March 12 in the research journal *Current Biology*.

Earlier studies in rats indicated the hippocampus records spatial memories, or the concept of where we are. But animal studies, which measured activity at the level of dozens of cells at most, implied there was no structure to how these memories are recorded.

The new work contradicts this idea. The key difference: the new study allowed a bigger-picture view through use of the brain scanning technology fMRI, or functional Magnetic Resonance Imaging, Maguire said. “By looking at activity over tens of thousands of neurons, we can see that there must be a functional structure – a pattern – to how these memories are encoded,” she explained.

“Understanding how we as humans record our memories is critical to helping us learn how information is processed in the hippocampus and how our memories are eroded by diseases such as Alzheimer’s,” added Hassabis. “It’s also a small step towards the idea of mind reading.”

Maguire previously led a study into the brains of cab drivers who spend years mandatorily learning the maze of London streets—information known in the profession as “The Knowledge.”

She found that in these cabbies, an area to the rear of the hippocampus was enlarged, suggesting that this was the area involved in learning location and direction. In the new study, Hassabis, Maguire and colleagues found that the patterns relating to spatial memory lie in this same area, suggesting that the rear of the hippocampus helps represent the layout of spatial environments.