

Making computer work like a brain

Rutgers part of military project

Artificial intelligence, long the stuff of science fiction tales such as "2001: A Space Odyssey," has frustrated computer scientists for decades. The Pentagon is funding a closer look at how the human brain works its magic, in hopes of teaching computers to think, it turns out, is even harder than teaching people to do it. So the experts are programming machines to do it.

This project aims to tap advances in neuroscience and cognitive psychology — from imaging technologies that identify brain activity to emerging theories about the role of emotions.

The goal is to figure out how the mind makes decisions — and then design systems to help soldiers fight on battlefields of the future.

"We want to create systems that truly know what they're doing," said David Gunning of the Defense Advanced Research Projects Agency, the Pentagon

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BREAKDOWN OF THE RESEARCH
BY KEVIN COUGHLIN

The University of Colorado: Will develop a cognitive architecture of three major brain regions: 1) frontal cortex, 2) posterior cortex, and 3) the hippocampal system. Key capabilities include learning and memory, visual processing, action selection and rule-based behaviors.

Algotek Inc.: Will focus on the thalamus, cortex, basal ganglia, hippocampus and amygdala. The thrust of its approach is to capture the mechanisms by which perceptual experiences are coded into memories.

George Mason University: Will seek to develop a self-aware cognitive architecture with human-like learning and memory capabilities. Brain components to be modeled include the basal ganglia and hippocampus.

Harvard: Will focus on the visual cortex and other "higher" cortical areas, to understand how the brain selects and identifies objects in the visual environment.

University of Maryland: Will study multiple regions of the cortex including the prefrontal, motor and visual areas, and how they are involved in learning to recognize spoken words and to verbally identify perceived objects. The team will also focus on the role of visual cortical areas, prefrontal cortex and the hippocampus in working memory.

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SOURCE: The Defense Advanced Research Project

Pentagon studies brain function for better computers

Rutgers University in Newark is among 15 institutions and companies taking a closer look at how the brain works to determine how the mind makes decisions. They hope to apply the information gathered to design smarter machines in the military. Following are some of the groups involved, the areas of the brain that are their focus and what they hope to learn:

BRAIN

clues about what each region of the brain actually does. University traversed 132 miles of Mojave desert in less than seven hours this month, and is affected by Alzheimer's disease and aging. Gluck used the hippocampus as his model for software to manage Navy helicopters. He said his system detected unfamiliar vibrations in gearboxes before they caused crashes. Harvard University, the Massachusetts Institute of Technology and Carnegie Mellon University also are taking part in the DARPA project, which is drawing together psychologists, neuroscientists and computer scientists.

At their kickoff meeting next week in San Diego, they will ponder using playing computer games to test their systems based on the project's findings. Ultimately, the Pentagon seeks machines to fight wars with fewer soldiers. Computers should interpret data from satellites, sensors and drones, freeing commanders to focus on key decisions, Gunning said. The military also wants computers to guide vehicles through combat zones. A driverless Volkswagen from Stanford

But that's because computers can test millions of moves quickly. They don't fare so well processing visual cues, making "gut decisions," or learning from mistakes. Humans, on the other hand, draw from experience to make hunches and educated guesses. "You can interpret a visual image, processing all the things your eye is seeing as you walk down the street. No computer can do that and even interpret the path you should walk. You're making sense of what (that) to the computer would be individual colored pixels on a screen," Gunning said.

"We've gotten to the point where, if a tank is nicely painted in the middle of a desert, a computer can recognize it. But if the tank is half under a tree, in shadows, the computer doesn't have a chance of recognizing it as a tank."

Civilian spinoffs could include smarter robots to clean your house or drive your

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Military wants computers that think

car, or truly helpful programs to sift your communications.

But the project troubles some people. Smart-yet-unfeeling war machines could make the battlefield "an even nastier place," says bioethicist Arthur Caplan of the University of Pennsylvania.

Computer scientist John Laird of the University of Michigan wants to explore building emotional computers. Anger may enhance decision-making, Laird said, by jolting the mind to cope with bad situations.

Laird was inspired by the movie "Memento," in which brain damage thwarts the main character from making new memories. "Every A.I. system I've ever built is just as crippled as that guy," he said. "I decided to try to build in capabilities that humans have."

Could this lead to murderous machines like HAL in "2001"?

"We're so far away from making computers intelligent that we don't have to worry about that," Gunning said.

Kevin Coughlin covers technology. He may be reached at kcoughlin@star-ledger.com or (973) 392-1763.

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