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Game Time

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Video game fanatics may think University of Dayton researcher Tarek Taha has the best job in the world. His work involves a room full of 1,716 PlayStation® 3s at the U.S. Air Force Research Laboratory.

The University of Dayton associate professor of electrical and computer engineering is having fun. He's working with these gaming systems to find ways to make computers smarter by mimicking human brains.

"We can do things better than computers. Our vision system can recognize people and items in pictures that would be impossible or highly challenging for current generation computers," Taha said. "Brains have a fundamentally different way of working than computers. Because they have a different way of working, we want to see if computers can possibly mimic the process."

Taha said the human brain has about 100 billion neurons, with each neuron connecting to 10,000 other neurons to create nearly 100 trillion connections. That complexity means it's currently not possible for any existing supercomputer to simulate a human brain.

"Each PS3™ we are using is running Linux and is quite a powerful system," Taha said, so that's why the Air Force turned to a large set of Playstation 3s to simulate the brain.
While it's quite a few years away, Taha said the goal is to replicate some of the actual capabilities of the human brain on a large network of computers.

"Computers can do a lot of useful things now, but we are working to take a giant leap in the capabilities of these systems in the future," Taha said. "If we are successful, we could see things like self-driving vehicles and smart robots in hospitals."

Another challenge is finding a more energy efficient way to operate a computer that thinks like a human.

"A human brain consumes about 20 watts of power, while the PS3™ cluster consumes megawatts," he said. "The brain is very efficient at what it does."

Taha also is working to develop new hardware based on recent technological breakthroughs (memristors) that would mimic the brain much more efficiently than the PS3™ cluster. This could lead to portable applications, such as smart consumer products and radically new intelligent devices.

So far, Taha's group has been able to model about half a billion neurons, which is about the size of a mouse brain, with only 300 PS3™s. It is working on modeling larger systems on the entire PS3™ cluster. Taha said a mouse brain is smarter than a smart phone or computer, because "a mouse can learn things like which way to go in a house, find food or take care of its children."

A National Science Foundation CAREER award that supports junior faculty who exemplify the role of teacher-scholar through outstanding research is funding Taha's work.

Taha is scheduled to make three presentations related to this work at the International Joint Conference on Neural Networks in San Jose, Calif., in August.

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