UW team part of IBM 'cognitive' computing chip project

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(PhysOrg.com) -- University of Wisconsin-Madison researchers are part of the IBM-led team that has unveiled a new generation of experimental computer chips - the first step in a project to create a computer that borrows principles from a mammal brain.

The chips combine neuroscience and nanotechnology to operate more like brain cells by thinking and learning from experiences. They also run on much less power than current technology.

UW-Madison neuroscientist Giulio Tononi leads the UW team, which is designing the software to teach the chips to learn and think.

"We are using the new IBM neurosynaptic chip to develop cognitive computing architectures that are good at integrating information - a key adaptive feature that the brain excels at, and which has proven difficult to achieve using conventional computers," says Tononi, professor of psychiatry at the UW School of Medicine and Public Health and an internationally known expert on consciousness.

The UW-Madison team includes professor Mikko Lipasti of computer sciences and scientists from both the computer sciences and the neurosciences. Along with Columbia University and IBM, they are the "software" team for the cognitive computer project.

Meanwhile, nanotechnology and supercomputing experts from Cornell and the University of California-Merced are collaborating with the IBM

team to design the "hardware." Dharmendra Modha of IBM is the principal investigator of the project, which began in late 2008 and is called the Systems of Neuromorphic Adaptive Plastic Scalable Electronics (SyNAPSE) project.

Along with announcing the creation of the first two "cognitive" computer chips today, IBM also announced that the project has been awarded about $21 million in new funding from the Defense Advanced Research Projects Agency (DARPA) for the second phase of the project.

The project's ultimate goal is to create a small, low power-usage computer that analyzes complex information from multiple senses at once, but also dynamically rewires itself as it interacts with its environment.

The new prototype chips are a significant next step toward this goal. These chips each contain 256 digital "neurons" and won't be programmed the way traditional computers are today. Rather, cognitive computers are expected to learn through experiences, find correlations, create hypotheses, and remember - and learn from - the outcomes, mimicking the work of the brain.

The project leader, IBM's Modha, envisions small computers that can make decisions based on complex data. For example, a cognitive computing system in the ocean could use sensors that constantly record and report metrics such as temperature, pressure, wave height, acoustics and ocean tide, and issue tsunami warnings based on its decision making.

"We've managed to break through a number of intellectual and conceptual barriers by bringing together some of the best experts across neuroscience, nanoscience and supercomputing," says Modha. "This is an exciting time."

Provided by University of Wisconsin-Madison