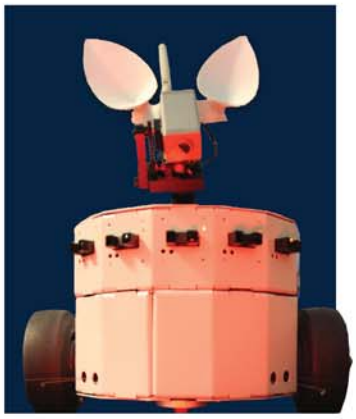
UC researchers to use robots to study brain processes involved in decision making

Findings could lead to advancements in understanding human behavior and further developments in neurorobotics



How we recognize and adapt to change will be the focus of a $1.6 million joint study between researchers at UC Irvine and UC San Diego. Findings will provide insight down to the neuron level about the specific areas of the brain responsible for decision making and attention, which could lead to a better understanding of human behavior as well as improvements in the design of robotic systems that can adapt to changes in the environment.

"Little is known about the areas of the brain involved in making decisions when faced with uncertainty," says Jeffrey Krichmar, a cognitive scientist in UCI's School of Social Sciences and one of the study's lead researchers.

He specializes in neurorobotics, using real-life biological and neural data to program robots to simulate a thinking, moving being. His work with CARL, a life-like robot created with the help of former Hollywood animatronics engineer Brian Cox, has led to several advances in the field, the most recent of which are featured in the September 2009 issue of IEEE Robotics and Automation Magazine.

Working with Krichmar will be UCSD researchers Andrea Chiba, Douglas Nitz and Angela Yu who will provide the biological and neurological data for the study by testing the decision making abilities of rodents in a task where the locations of stimuli that predict food rewards can change abruptly, requiring the rodents to adapt to the new altered environment in order to receive the food reward. Brain recordings taken directly from the rodents during the decision making task will be digitally analyzed and programmed into CARL's software-controlled "brain", enabling the robot to simulate the same behavior.

"We know the areas of the brain that are supposedly involved in tasks associated with predicting and adapting to uncertainty in the world, but getting a complete picture of what is going on in a real brain is not yet technically feasible," says Krichmar.

"Simulating the attentional and decision making capabilities of a rat in a robot will give us the opportunity to examine the entire artificial brain. As the robot navigates the same challenging situations the rat faces, we'll be able to see the areas of the brain being utilized to make decisions and any physical changes taking place."

In addition to potential health applications, their findings will advance the field of robotics through development of the brain-based algorithm that will allow the robot to behave effectively in a complex and uncertain environment.

The three-year study, funded by the National Science Foundation, began in September with $800,000 awarded to UC Irvine and $800,000 awarded to UCSD.