Nevada Scientists Present Research for National Science Foundation, United States Senate

July 10, 2009

Rapidly advancing technology is changing the way that people, computers, and the world interact. The National Science Foundation's (NSF) vision for the future is one in which smart cars can communicate with their passengers and each other to make auto accidents a thing of the past, smart buildings know and are aware of their occupants, sensor networks monitor and respond to changes in the environment, and intelligent robots help people in their daily tasks. To make this vision a reality, the NSF has called on researchers to develop new technology that will more tightly integrate computers into our daily lives. The NSF calls such technology "Cyber-Physical Systems," and expects that they will fundamentally change the way we live our lives.

On July 8 and 9, Fred Harris, Roger Hoang, Richard Kelley, and Sohei Okamoto from the University of Nevada, Reno and the Desert Research Institute traveled to Washington D.C. to speak with members of the National Science Foundation and the United States Senate, including Senator Reid, about their research on Cyber-Physical Systems.

The research on such systems spans multiple areas of research. Harris spoke on work being done by multiple departments in the College of Engineering to design smarter power delivery systems with the goal of making sure that surprise events in the power grid don't lead to brownouts and blackouts in large regions of the country. Okamoto (Ph.D. student of CSE faculty Sergiu Dascalu) showed off research being done by UNR and DRI throughout the state on Cyber-Physical Systems for the environment. These include a network of sensors to detect and measure earthquakes in the Sierra Nevada mountain range, sensors to track the environmental consequences of activities at the Nevada Test Site, and environmental monitoring systems that deliver information to decision-makers and the public in the blink of an eye, guaranteeing that the best and most relevant information is available as needed.

Along slightly different lines, Hoang (Ph.D. student of Harris) presented research linking neuroscience and computation, describing work done by the College of Engineering and the Medical School to simulate neurons and larger structures in the brain. Ongoing work with the simulator is dedicated not only to basic research and robot control, but to the study of diseases such as alzheimer's, parkinson's, and autism. Hoang also showed how scientists can use advanced computer graphics and virtual reality equipment such as the new six-sided CAVE at DRI to visualize their work and speed up the process of research.

While Hoang talked about brain simulations that could in the future be used to create intelligent machines, Kelley (Ph.D. student of CSE faculty Monica Nicolescu) described his work in the Computer Science and Engineering Department, developing robots that use social information to understand and predict humans' behavior and intentions. While the ultimate goal of such research is robots that have social skills and can fluently interact with humans, Kelley described more immediate uses of such technology, including surveillance, security, and smart homes that are capable of assisting the elderly.

Cyber-Physical Systems hold the potential to bring about a revolutionary change in all aspects of Americans' lives. During their trip to the nation's capitol, Nevada's researchers showed how they are working to bring the University to the forefront of the effort to make Cyber-Physical Systems a reality.