CAST in the community

CAST investigators are helping to create awareness about current technologies and developments in the robotics field by bringing their research into the community.

Dr. Shane Farritor (pictured), engineering professor at the University of Nebraska-Lincoln, presented examples of robotic technology to a group of visitors at the “Sunday with a Scientist” event hosted at Morrill Hall earlier this year.

Dr. Joseph Siu, of the UNMC College of Public Health, and Dr. Carl Nelson, engineering professor at UNL, participated in the Nebraska Robotics Expo at the Strategic Air and Space Museum. Siu organized a booth to exhibit CAST research, while Nelson helped judge one of the student robotics competitions.

Investigators visit Johnson Space Center

Investigators and project staff participated in a tour of mission control and the simulation center at the Johnson Space Center. The visit was spent in joint discussion of the priorities of the Human Research Program Exploration Medical Capability and the integration of a University of Nebraska project for Supporting Surgical Options in Space.

Jeff Hawks will be traveling to the Space Center to discuss his work on a device for automated chest tube insertion in the event of a spontaneous pneumothorax, funded under a Research Mini-Grant with NASA EPSCoR.

“We would like to perform some in vivo experiments soon,” Hawks said, “and use the information to pursue additional funding through NASA and Nebraska Space Grants.”

Carl Nelson and a group of his engineering students were chosen to participate in part of a NASA microgravity project, testing micro flame ionization detectors. These detectors test air quality in space vehicle cabins. Nelson’s group is testing the behavior of the flame that goes into part of that process.

Nelson and the group of students will design an apparatus to mount the various components, as well as cameras to monitor the behavior.

Upon completion of the one-semester projects, the group visits the Johnson Space Center to perform actual flight tests on the NASA Weightless Wonder aircraft.
The Nebraska Biomechanics Core Facility (NBCF), located on the University of Nebraska Omaha campus, was founded by Dr. Nicholas Stergiou using funds from the Nebraska Research Initiative.

The lab performs research with respect to whole-body mechanics, particularly looking at human movement variability.

“How come when we do something again and again, we cannot always do it the same way?” Stergiou said.

For example, when playing darts you cannot always hit the bullseye. No matter how much you practice, there is always some variability that prevents you from performing consistently every time.

“This variability exists within your body,” Stergiou said. “Why it exists underlies everything I research.”

Stergiou and his research team work on gait variability, motor learning, virtual reality, as well as how various auditory or visual stimulations can affect what we do and how we do it.

This variability can be harnessed for learning purposes and utilized to understand and develop techniques for learning. That is how Stergiou and his lab came to be involved in the CAST collaboration.

Dr. Dmitry Oleynikov, CAST director, mentioned to Stergiou that UNMC had the da Vinci Surgical System, developed by Intuitive Surgical, but they didn’t know the best ways to train surgeons on using the technology.

A virtual reality training program has been developed for the da Vinci robot, and several studies have been performed on the impacts of distractions on learning.

Over the years this project has been passed to Dr. Joseph Siu in the UNMC College of Public Health, while Stergiou serves in more of an advisory role.

The NBCF also works with engineers at UNL, such as Dr. Carl Nelson. Together they are building an exoskeleton that will help people to walk faster—it stores energy from the person’s own gait and releases it in a controlled way to improve the push off in walking.

“People give me credit, say that I’m really smart,” Stergiou said, “but I think I’m smart because I surround myself with intelligent people and very hardworking people. I am successful because I’ve been able to recruit people to work with me in my lab, and I’ve been blessed with excellent collaborators, at UNMC, UNO, UNL and around the globe.”

This May, the NBCF will break ground on a new building dedicated to biomechanics research. Thanks to a private donor, the University of Nebraska Omaha Research Building will open by the summer of 2013.
Brazilian delegation visits CAST

A delegation of higher education leaders, funded by the Government of Brazil and the U.S. Embassy in Brazil, visited the CAST lab in February as part of an effort to illuminate educational and professional opportunities in the field of science.

The Science Without Borders (SWB) program was announced in July 2011 by Brazilian President Dilma Rousseff. Over a period of five years, 100,000 students, both undergraduate and graduate, will be funded to study for up to a year in the U.S., Asia and Europe.

Government and business leaders in Brazil hope to generate an innovative and entrepreneurial environment by sending more students to the U.S., transforming society through higher education.

The delegation will visit various universities around the country to evaluate respective strengths through which they can develop partnerships for the Science Without Borders initiative.

SWB sent its first group of students to the U.S. earlier this year, 25 students to UNL and three students to UNO, with the majority of the group focusing on engineering. The graduate portion of the program will begin in the coming year, with a Ph.D. program to follow.

There is also a hope to create opportunities for U.S. faculty and graduate students to study and conduct research in Brazil, furthering international collaboration in scientific and technological innovation.

Oleynikov earns UNMC honor

Dr. Dmitry Oleynikov, CAST Director was awarded the UNMC Distinguished Scientist Award for the 2011 year.

This award, sponsored by the University Chancellor, recognizes those researchers who have been the most productive and best collaborators over the last five years.

In 2011, Oleynikov successfully published 22 manuscripts in peer-reviewed journals and seven book chapters, a few of which are still in press. He authored 25 abstracts which were presented at national conferences over the year, and he was an invited lecturer at nine national surgical conferences.

Oleynikov was also appointed to the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) Board of Governors.

A formal awards ceremony to recognize Oleynikov and the additional award recipients will be held at the Durham Research Center on May 22, 2012.
Blast from the Past: Amy Lehman

Amy Lehman, a Ph.D. candidate in engineering at the University of Nebraska-Lincoln, has been working with Dr. Shane Farritor in CAST research since 2006. After earning a bachelor’s degree in mechanical engineering in 2003, Lehman worked as a production engineer and sales engineer for a manufacturing company. When her brother was diagnosed with Hodgkin’s lymphoma, Lehman decided to utilize her engineering skills in the medical field.

“As we made weekly, and eventually daily, trips to UNMC, I decided to refocus my career goals on benefiting those who are faced with medical challenges,” Lehman said. “I began researching opportunities that would enable me to use my engineering skills in the development of medical technologies.”

It was as she planned to return to graduate school that Lehman learned of Farritor’s research in surgical robotics. He had been one of her undergraduate professors, and Lehman met with him to learn more about the collaboration and join his research group.

Much of Lehman’s work during her time with CAST has focused on the mechanical design of miniature in vivo robots for minimally invasive surgery. Lehman designed and built four robots throughout her graduate studies; the first robots were designed to perform a cholecystectomy using a natural orifice insertion method, while her current projects focus on robots for single-incision colectomy.

“I have really benefited from the CAST collaboration,” Lehman said. “Working with Dr. Farritor and Dr. Oleynikov, I have learned to better determine the needs from a medical perspective and how to implement these needs through engineering. I have also had the opportunity to present our research to broad audiences in medical and engineering communities.”

After earning her Ph.D., Lehman hopes to teach part-time at UNL and spend more time with her family.

Letter from the Director

CAST continues to play a vital role locally, nationally and internationally in its commitment to public service and outreach efforts. From Lincoln, NE to Houston, TX to Brazil, CAST investigators work to form new research collaborations and promote learning in the field of robotics and minimally invasive surgery.

The Nebraska Biomechanics Core Facility (NBCF) is making great strides in the area of human movement variability and developing techniques for learning in surgical environments. Commitment to the field of biomechanics has supported the creation of a new facility, allowing for expansion of current research efforts.

As summer approaches, we congratulate our recent graduates and wish them the best of luck. Our students’ successes directly impact CAST’s progress and academic productivity. Please stop in to see us soon – we’ll give you a tour!

Sincerely,

Dmitry Oleynikov, M.D., F.A.C.S.
Professor of Surgery
Director, Center for Advanced Surgical Technology