CAST celebrates sixth year

As CAST celebrates its sixth birthday, its members have many achievements to be proud of. Since CAST’s creation in 2005, its membership has increased from eight to 17 investigators from UNMC, UNL, and UNO.

Research and development in the area of surgical technology requires multidisciplinary expertise. We are proud to have faculty from a variety of fields including specific interests in computer science, engineering, bariatric and minimally invasive surgery, surgical training and outcomes, simulation and programming, ergonomics, orthopedic implant simulation and testing, pathological gait analysis, vascular device design, motor development, and critical care physiology.

CAST continues to grow through successful collaborative efforts in these and other areas.

These accomplishments are seen in our peer-reviewed publications, national and international conference presentations, and continued expansion into additional areas of surgical research.

Farritor hosts innovation series

After teaching a course on innovation in the spring semester, Dr. Shane Farritor, Associate Professor of Engineering at UNL, decided to host a seminar series on the topic this fall.

“I have this great information that I want to get out,” Farritor said. “I feel engineering education doesn’t adequately emphasize the creative and ‘right brain’ aspects of being a good engineer. I also believe that you can do a few small things and really become much more creative.”

Through a series of six talks, Farritor discussed the importance of recognizing and nurturing inherent gifts, taking the steps to move forward from ideas to action, and how to navigate the little obstacles that can slow progress.

Farritor referenced several resources that together provide a clear, cohesive look at the process of innovation.

“I talked about the techniques and perspectives that work for me,” Farritor said. The main goal of the entire series was to spark some interest and a desire to become more creative.”

Farritor is a co-founder of Virtual Incision Corporation and Mrail.
The conventional systems for joint replacements involve the use of jigs or mechanical cutting blocks to determine which cuts to make. The process involves a multitude of metal plates and screws, is highly complex, and each set of jigs costs from $50,000 to $75,000.

Haider’s team has found navigated freehand cutting to be 300 to 500 percent more accurate than current methods. It is also 15 to 35 percent faster, and with a lower complexity and fewer instruments, the procedure is much easier for surgeons to complete.

Easier, cheaper, faster, better—these four attributes are the foundation of the Biomechanics, Orthopaedics and Advanced Surgical Technologies lab led by Dr. Hani Haider.

As people live longer, many will need a joint replacement operation. And as more people need this treatment, the more relevant “easier, cheaper, faster and better” becomes.

“We cannot go more expensive in this economic climate with medicine and surgery today, Haider said. “Unless there is an overwhelmingly solid reason, surgeons will not truly take up any technology on a large scale if it makes their work slower and more expensive, especially when they need to operate on many patients with it.”

The attribute of speed is especially relevant in surgery. The longer patients are under anesthesia, the higher the risk.

Orthopedic joint replacement surgeries are difficult and only a limited number of surgeons are proficient. If you make the procedures more difficult, even fewer surgeons will perform these operations.

The final attribute of ‘better,’ could never be sacrificed in favor of the other three: cheaper, faster, easier.

In other areas of your life, you could have choices about quality, Haider said. “But in America, there is no second-rate medicine.”

Andres Barrera, a Research Associate at Haider’s lab, was instrumental in developing the new technology.

“We created the technology to allow surgeons to perform total knee replacements without using jigs,” Barrera said. They call this technology “navigated freehand cutting for surgery.”

“The idea is to get rid of all that instrumentation,” Barrera said. “And at the same time, we want the surgeons to be faster, the procedure to be cheaper, the outcome to be better and the whole thing to be easier.”

The team created software that allows surgeons to plan surgery by opening DICOM medical images and creating a 3-D model of the bone.

“On the same screen, we have the real imaging and 3-D virtual imaging for the model,” Barrera said.

“The computer knows about the bone, knows about the implant and knows where you want to put it. Now it can tell you how to cut,” Barrera said.

Markers placed on the bone, and on the saw used for cutting, talk to the computer with the help of two cameras, letting it know where the bone and tools are in real time and space.

Guides on the computer screen, as well as a miniature guide placed on the tools themselves through a small onboard-the-tool computer, allow the surgeons to line up cuts with great degrees of accuracy.

Surgeons can also set allowable envelopes of error for the tools; the saw would stop cutting if they deviated from the plan.

The project has taken the team almost 10 years of research and development.

“You can either buy the best, or you can make the best,” Haider said. “There is freedom in science—nobody says you can’t be excellent, but you have to groom it slowly.”
Avishai Meyer

“I appreciate CAST’s multidisciplinary approach to advancing minimally invasive as well as robotic surgery.

If you’re looking at an institution or a field, you want to be in the forefront of that field. This place gives you a good opportunity to really see everything out there and attempt to attack it head on with an excellent staff.

Dr. Oleynikov acts as a mentor to many of the residents and fellows regarding their various clinical or research aspirations.”

Pradeep Pallati

“At CAST, we perform outcomes research in addition to the development of miniature robots. These outcomes provide a guide for the current practitioners in the field of medicine.

My experience at CAST, collaborating with engineering students in the development of miniature robots has been completely new.

The research on miniature robots has been a fruitful project due to the collaborative nature of the work.”

Abhijit Shaligram

“CAST encompasses diverse areas of research, which make significant contributions to society. This ranges from developing cutting edge technology, to creating the future generation of robots for surgical use, to using surgical outcomes research to answer pertinent clinical questions which affect day-to-day medical decision making.

I’ve realized the immense opportunities available to medical researchers, especially for outcomes research, through the information available in various healthcare administrative databases.”

Anton Simorov

“About a decade ago, laparoscopic surgery was facing the same obstacles in the view of modern society as surgical robotics do today. The da Vinci Surgical System is being used in limited fields of surgery nowadays, but CAST investigators are collaboratively working on robots that may some day be a competitor for the well-respected da Vinci.

CAST carries out cutting edge robotic research experiments and I am sure, in the future, robotic surgery will be a standard of care for many procedures—our work here brings this future closer.”
As we look back on the six years that the Center for Advanced Surgical Technology has been in existence, we see a significant change in our organization. Much like a toddler becomes a young child, we are no longer taking our first steps, but are now running forward in our mission to investigate and advance science.

Dr. Nicholas Stergiou, a CAST investigator and Director of the Nebraska Biomechanics Core Facility at the University of Nebraska Omaha, procured funding to expand his research and build the Biomechanics Research Facility on the UNO campus. A paper on improving medication management by redesigning the hospital code cart, coauthored by Dr. Susan Hallbeck of the Innovative Design and Ergonomic Analysis lab at UNL, was a runner-up to the 2011 “Human Factors Prize: Recognizing Excellence in Human Factors/Ergonomic Design” and published in the December issue of their journal.

We encourage you to explore the CAST website and social media sites to learn more about the hard work and recent accomplishments of the CAST investigators.

With all of our recent accomplishments, I’m very proud of the number of staff that contributes on a regular basis to the Center’s activities. We could not do any of this without their dedication and hard work. And much like a young child, we look forward to our teenage years. We hope to further grow, increase our reach, and continue to advance surgical science.

Sincerely,

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