eeK 08

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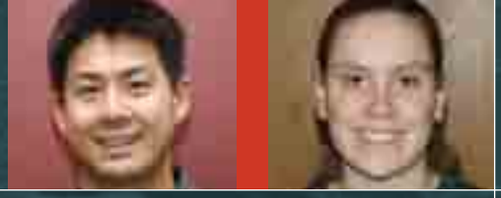

RAVEN Undersea Adventures:
NASA NEEMO XII

MITCHELL LUM & DIANA FRIEDMAN — Graduate Students (EE)

This spring the team from the BioRobotics Lab was on the road again, taking the RAVEN Surgical Robot (see EEK 2007 and EEK 2006) to Key Largo to participate in the twelfth NASA Extreme Environments Missions Operation (NEEMO). NEEMO is NASA's training analog to space flight. It takes place in the Aquarius Undersea Habitat 3.5 miles off the Florida Keys at a depth of about 60ft. The RAVEN was deployed in the habitat for three days of testing and experiments with surgeons operating remotely from Seattle. The RAVEN was also set up and run by NASA's Aquanaut team, with the BioRobotics Lab team providing mission support from on-shore in Key Largo.

Mitchell Lum and Diana Friedman were sent to Key Largo to provide on-site support while Hawkeye King, Gina Donlin and Ganesh Sankaranarayanan provided support in Seattle for surgeons Thomas Lenday (Seattle Children's Hospital), Andrew Wright (UWMC) and Mika Sinanan (UWMC). During the experiment from Seattle to Aquarius, the surgeons' motion commands were sent through commercial Internet to the on-shore base in Key Largo, then across a microwave communication link, ten miles out to the Life Support Buoy floating atop Aquarius, then into the habitat to control the RAVEN. Video feedback was then relayed back to the surgeons. The total round trip delay from the surgeon making a motion to the surgeon seeing that motion on the video display was about one second. The task performed by the surgeons was based on the Fundamentals of Laparoscopic Surgery block transfer, a standardized task used in surgical training.

Along with the main experiment, the RAVEN was used for other NASA objectives. Astrogeologist Dr. Mary Sue Bell remotely analyzed simulated lunar samples. In an educational outreach event, a group of high school students from Cincinnati also got a turn controlling the RAVEN, manipulating foam rocks. Once the RAVEN was back on shore, it was teleoperated from the American Telemedicine Association meeting in Nashville.

Participation in NEEMO XII allowed the BioRobotics Lab team to further develop, test and debug the RAVEN. It allowed NASA Aquanauts to learn how to set up and run a complex system themselves with remote support from the engineers who developed it. NASA was able to evaluate the use of a surgical robot for future space missions.

Developing robotic systems is a hands-on process, and the deployment in Aquarius provided an incredibly unique experience. Who knows where the BioRobotics team will be headed in 2008? eeK08

Aquanaut Dominic Landucci peers in through a port hole to observe Lendvay's progress with the RAVEN.

At the Universtiy of Washington, Pediatric Urologist Thomas Lendvay MD, performs a surgical training task from over 3000 miles away.

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