

Mitchell J.H. Lum

CONTACT INFORMATION 4801 24th Ave. NE #505 *Mobile:* (206) 356-6813
Seattle, WA 98105 USA *E-mail:* mitchlum@u.washington.edu

EMPLOYMENT OBJECTIVE I seek full time employment working in robotics or human interface related areas.

RESEARCH INTERESTS Surgical Robotics, Mobile Robotic Telesurgery, Haptic Interaction and Kinematic Optimization

The collaboration between fundamental science, engineering and medicine provides physicians with improved tools and techniques for delivering patients effective health care. Minimally invasive surgery (MIS) techniques have revolutionized the way a number of surgical procedures are performed. Mobile robotic telesurgery (MRT) stands to take telemedicine to the next level. My work in the BioRobotics Lab has focused on the development of the RAVEN surgical robot, a telesurgery system that teleoperates utilizing a single bi-directional UDP socket via a remote master device. As a preliminary experiment, the system was deployed into a remote environment (desert) and was powered by gas generators. An Unmanned Aerial Vehicle (UAV) acted as an aerial digital data link to provide connectivity between the surgeon control station and the surgical manipulators. The RAVEN was also tested in NASA's NEEMO 12 mission, a training analog to space flight that takes place in the Aquarius undersea habitat, 3.5 miles off the Florida Keys. Surgeons in Seattle, WA teleoperated on an inanimate model, communicating through commercial Internet between Seattle, WA and Key Largo, FL and across a microwave link between the base station in Key Largo and Aquarius. The creation and testing of a deployable surgical robot system will facilitate growth in the area of MRT and lead to future systems saving human lives on the battlefield and in other remote environments.

EDUCATION **University of Washington**, Seattle, WA USA

Ph.D. Electrical Engineering, Candidate

- Expected graduation: Spring, 2008

M.S. Electrical Engineering, December 2004

- Thesis: "Kinematic Optimization of a 2-DOF Spherical Mechanism for a Minimally Invasive Surgical Robot"
- Advisors: Blake Hannaford and Jacob Rosen

B.S., Electrical Engineering, March 2002

- Focus: Controls and Robotics
- Minor: Mathematics

EXPERIENCE **BioRobotics Lab**, University of Washington, Seattle, WA USA

Graduate Research Assistant, March 2002 - current

- Lead graduate student on the development of RAVEN Surgical Robot System
- <http://brl.ee.washington.edu/RAVEN/>

Undergraduate Research Assistant October, 1999 - March 2002

Intel Research Seattle, Seattle, WA USA

Graduate Intern, June 2007 - March 2008

Personal Robotics, Haptic Interaction

NASA Jet Propulsion Lab, Pasadena, CA USA

Summer Undergraduate Research Assistant, June 2001 - August 2001

Haptic and Stereoscopic Immersive Virtual Environments

SKILLS

Programming/Software: C/C++/C#, QT, Matlab, Mathematica, HTML, Solidworks

Hardware: DC motors and servo controllers (Maxon), PHANToM Haptic Devices

Fabrication: Lathe, Vertical milling machine

Leadership: Lead graduate student for RAVEN system development, Project leader for BioRobotics Lab group in HAPs/MRT (High Altitude Platforms for Mobile Robotic Telesurgery), Project leader for BioRobotics Lab group on NASA NEEMO 12 participation

**PATENTS AND
INVENTION
DISCLOSURES****Patents**

Spherical Motion Mechanism, (Pending), USPTO #11/113,824

Invention Disclosures

Networked Surgical Robot Control System

Surgical Robot Gross Positioning System

Sationary Actuation Pack for Surgical Manipulator

Automated Tool Rack System (TRS) for Robotic Surgery

Programable Logic Controller Safety System for Surgical Robot

**HONORS AND
AWARDS**

Dept. of Electrical Engineering, Outstanding Graduate Research Award 2007

Dept. of Electrical Engineering, Graduate Spirit of Community Award 2007

15th Annual Medicine Meets Virtual Reality Conference, Poster Award - Feb 2007

Dept. of Electrical Engineering, Chair's Award 2006

Dept. of Electrical Engineering, Undergraduate Spirit of Community Award 2002

Mary Gates Research Training Grant, Oct 2001 - March 2002

NASA Undergraduate Student Research Program, Jet Propulsion Lab, Pasadena, CA USA, June 2001 - Sept 2001

Mary Gates Research Training Grant, Oct 2000 - June 2001

**SELECTED
PUBLICATIONS**

M.J.H. Lum, J. Rosen, M. N. Sinanan, B. Hannaford, 'Kinematic Optimization of Serial and Parallel Spherical Mechanism for a Minimally Invasive Surgical Robot,' IEEE Transactions on Biomedical Engineering, vol.53, no.7, July 2006.

M.J.H. Lum, D.C.W. Friedman, G. Sankaranarayanan, H. King, A. Wright, M.N. Sinanan, T. Lendvay, J. Rosen, B. Hannaford, 'Objective Assessment of Telesurgical Robotic Systems: Telerobotic FLS,' Medicine Meets Virtual Reality 16, vol. 132, pp.263-265, Long Beach, CA.

M.J.H. Lum, D.C.W. Friedman, H. King, T.J Broderick, M.N. Sinanan, J. Rosen, B. Hannaford, 'Teleoperation of a Surgical Robot via Airborne Wireless Radio and Transatlantic InternetLinks,' Field and Service Robotics Conference, 2007.

M.J.H. Lum, J. Rosen, H. King, D.C.W. Friedman, G. Donlin, G. Sankaranarayanan, B. Harnett, L. Huffman, C. Doarn, T. Broderick, B. Hannaford, 'Telesurgery Via Unmanned Aerial Vehicle (UAV) with a Field Deployable Surgical Robot,' Medicine Meets Virtual Reality 15, vol. 125, pp. 313-315, Long Beach, CA.

M.J.H. Lum, D. Trimble, J. Rosen, K. Fodero, H. King, G. Sankaranarayanan, J. Doshier, R. Leushke, B Martin-Anderson, M.N. Sinanan, B. Hannaford, 'Multidisciplinary approach for developing a new minimally invasive surgical robot system,' Proceedings of the 2006 BioRob Conference, Pisa, Italy, February, 2006.

M.J.H. Lum, D. Warden, J. Rosen, M.N. Sinanan, B. Hannaford, 'Hybrid analysis of a spherical mechanism for a minimally invasive surgical (MIS) robot - design concepts for multiple optimizations,' Proceedings of Medicine Meets Virtual Reality, vol. 119, pp. 349-354, Long Beach, CA, January 2006.

M.J.H. Lum, 'Kinematic Optimization of a 2-DOF Spherical Mechanism for a Minimally Invasive Surgical Robot,' MSEE Thesis, University of Washington, Department of Electrical Engineering, December 2004.

M.J.H. Lum, J. Rosen, M. Sinanan, B. Hannaford, 'Kinematic optimization of a spherical mechanism for a minimally invasive surgical robot.,' Proc. IEEE International Conference on Robotics and Automation, New Orleans, LA, May 2004.

C. Basdogan, **M.J.H. Lum**, J. Salcedo, E. Chow, 'Autostereoscopic and haptic visualization for space exploration and mission design,' HAPTICS 2002, Proceedings. 10th Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, 24-25 March 2002 Page(s):271 - 276.

OTHER INTERESTS Swimming, Triathlons, SCUBA, Snowboarding, Photography, Competitive Shooting