



Bio-Robotics – Science and Systems State of the Art and Future Directions Frontiers Session, ASME DSCC 2008

Tuesday October 21st 2008
16:30-18:30 Kalamazoo
Frontier session TuCT3

Organized by
ASME DSCD Robotics Technical Committee

Venkat Krovi
Marcia O'Malley



Venkat N. Krovi

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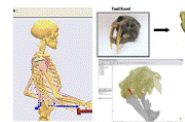
<http://mechatronics.eng.buffalo.edu>

Research Interests

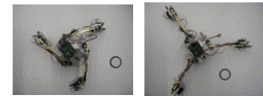
- Lifecycle treatment (design, analysis, implementation and verification) of **smart, mechanical and mechatronic systems.**
- **Research Thrusts**
 - (a) Multi-robot Cooperative Payload Transport
 - (b) Haptic Device Design
 - (c) Mediated Teleoperation;
 - (d) Haptic Rehabilitation
 - (e) Distributed real-time simulation/control of systems.

Research Highlights

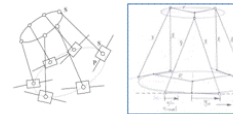
Theme: Modulation of power by articulated electromechanical systems



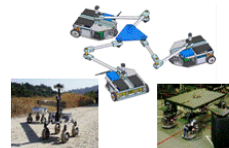
Bio-mechanical Analyses
 (MARS Petfood)



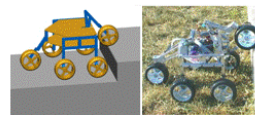
Reconfigurable Omnidirectional Articulated Mobile Robot (ROAMeR)
 (NSF CAREER IIS-0347653)



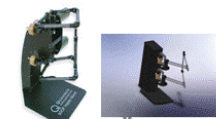
New Parallel Platforms
 (MARS Petfood)



Army of Ants
 NSF CAREER IIS-0347653



Uneven Terrain Locomotion



RT-Haptic Interactive Virtual Env.
 (NSF CRI IIS-0751132)

Design, modeling, analysis, simulation & prototyping of
"Mechatronic & Robotic Systems"

<http://mechatronics.eng.buffalo.edu>

Honors

- NSF CAREER 2004
- 2000 Petro-Canada Young Innovator, McGill University

Professional Activities

- ASME DSCD Robotics TC (Past Chair)
- TE, IEEE/ASME Transactions on Mechatronics
- AE, ASME Journal of Dynamic Systems and Control, AE
- Chair, M&R Conference 2010, IDETC 2010
- Finance Chair, CASE 2010
- Publications Chair, ICRA 2010



Marcie O'Malley

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Mechanical Engineering and Materials Science
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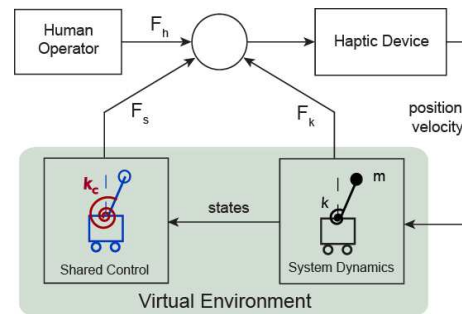
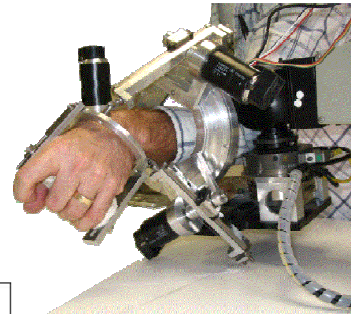
<http://mahilab.rice.edu>

Research Interests

- Haptics
 - Hardware design
 - Control
 - Psychophysics
- Robotic-assisted rehabilitation
- Vision-based control
- Computational motor control
- Nanorobotic manipulation
- Physical HRI

Research Highlights

Exoskeleton devices facilitate motor recovery post-stroke



Haptic guidance via shared control uses all states of system to be controlled



Master Manipulator (Phantom Haptic Interface)

Position Commands to Slave



Force Feedback to Master



Nanomanipulator (ZyveX)

Nanomanipulation with vision-based force sensing and feedback

Honors

- NSF CAREER 2005
- ONR YIP 2004
- George R. Brown Award for Superior Teaching (Rice University) 2008

Professional Activities

- ASME DSCD Robotics TC Co-Chair (and next Chair)
- IEEE Haptics TC Co-Chair
- IEEE Transactions on Haptics Associate Editor
- ASME/IEEE Transactions on Mechatronics Associate Editor (2009+)

BioRobotics: Science and Systems

An interdisciplinary field at the intersection of biology and robotics with research activities from:

- Creating/operating robots based on biological counterparts (human- and animal-biomimetic paradigms)
- Evaluating biological algorithms for potential engineering applications (reflex behaviors; saccading)
- Deconstructing the functioning of living organisms from the macro (neuromusculoskeletal systems) to the micro levels (cell as a machine)
- Constructing the next generation of biorobots from the bottom-up (systems biology).

BioRobotics: Science and Systems

■ Underlying themes

- Investigate the working principles (design and control) of biological systems from a bio-mechatronic viewpoint
- Exploit this knowledge in order to develop methodologies and innovative technologies for the design, fabrication and control of bio-inspired machines and systems

■ Challenges

- Multi-scale irregularities, inhomogeneities and nonlinearities inherent to biological systems
- Relationships between the distinct research vocabularies and approaches of biological and robotics researchers persist in creating road-blocks.

■ Needs

- Foster innovative research and technology
- Promote training of researchers
- Engagement of a community well-versed from multiple scientific and technological fronts.

Bio-Robotics – Science and Systems

This session brings together a panel to:

- Outline the current-state-of-the-art
- Present various possibilities for future vision
- Initiate discussion of the potential
- Develop a community-vision for future of the science and technologies

Bio-Robotics – Science and Systems

“Those who cannot remember the past are condemned to repeat it.”

George Santayana

	Time	Speakers	Topic
Welcome/Introduction	16:30-16:35	Venkat Krovi, Marcia O'Malley	
Current State-of-the-Art	16:35-16:40	Venkat Krovi	Biomimetic
	16:40-16:45	Sunil Agrawal	Exoskeletons
	16:45-16:50	Michael Goldfarb	Prosthetic Devices
	16:50-16:55	Wayne Book	Haptics
	16:55-17:00	Ranjan Mukherjee	Legged Systems
	17:00-17:05	Herbert Tanner	Swarms and Flocks

Disclaimers from Panel: A five minute overview of such diverse fields would be highly incomplete

Bio-Robotics – Science and Systems

Future Trends	17:10- 17:15	Sunil Agrawal
	17:15-17:20	Harry Asada
	17:20-17:25	Eric Barth
	17:25-17:30	Nikhil Chopra
	17:30-17:35	Jonathan Clark
	17:35-17:40	Kevin Fite
	17:45-17:50	Brent Gillespie
	17:45-17:50	Michael Goldfarb
	17:50-17:55	Venkat Krovi
	17:55-18:00	Ranjan Mukherjee
	18:05-18":10	Marcia O'Malley
	18:10-18:15	James Schmiedeler
	18:15-18:20	Herbert Tanner
Discussion	18:20-18:25	Panel Discussion
Concluding Remarks	18:25-18:30	Marcia O'Malley