

Venkat N. Krovi

Work

Mechanical and Aerospace Engineering
University at Buffalo (SUNY)
318 Jarvis Hall
Buffalo, NY 14260
Office Location: 1011 Furnas Hall
Tel : (716) 645-2593 x2264
Fax: (716) 645-3668

Home

11 Olde Ivy Drive
Williamsville, NY 14221
Res: (716) 636-0656
Cell: (716) 228-0175

E-mail: vkrovi@eng.buffalo.edu
URL: <http://www.eng.buffalo.edu/~vkrovi>

Research Interests

Lifecycle treatment (conception, design, modeling, analysis, control, implementation and verification) of articulated mechanical and mechatronic systems for enhanced manipulation tasks.

Education

1992-1998

University of Pennsylvania, Philadelphia, Pennsylvania

Ph.D., Mechanical Engineering and Applied Mechanics, December 1998
Advisors : Prof. Vijay Kumar and Prof. G. K. Ananthasuresh

M.S.E., Mechanical Engineering and Applied Mechanics, December 1995
Advisor: Prof. Vijay Kumar

1988-1992

Indian Institute of Technology, Madras, India

B.Tech., Department of Mechanical Engineering, June 1992

Employment

University at Buffalo (SUNY), Buffalo, New York

Sep. 2007-present *Associate Professor*, Department of Mechanical and Aerospace Engineering
Jun. 2005-present *Adjunct Appointment*, Department of Electrical Engineering
Apr. 2003-Aug. 2006 *Member*, UB Center for Advanced Technology in Biomedical Devices
Sep. 2002-Aug. 2008 *Director (Robotics & Haptics)*, New York State Center for Engineering Design and Industrial Innovation (NYSCEDII)
Sep. 2001-Aug. 2007 *Assistant Professor*, Department of Mechanical and Aerospace Engineering

McGill University, Montreal, Quebec

Jan. 1999-Sep. 2001 *Assistant Professor*, Department of Mechanical Engineering
Jan. 1999-Sep. 2001 *Faculty Member*, McGill Center for Intelligent Machines (CIM)

University of Pennsylvania, Philadelphia, Pennsylvania

Dec. 1992-Oct. 1998 *Research Assistant*, Mechanical Engineering and Applied Mechanics

Awards and Honors

Best Paper Award (with Agarwal, P., Narayanan, M.S., Lee, L.-F, Mendel, F.C.), “*Simulation-Based Design of Exoskeletons using Musculoskeletal Analysis*,” Computers in Engineering Conference, **2010 ASME International Design Engineering Technical Conferences**, Montréal, Quebec, Canada, August 2010.

Best Poster Award (with Shah, H., and Narayanan, M.S.), “*CAD-Enhanced Workspace Optimization for Parallel Manipulators: A Case Study*,” **2010 IEEE Conference on Automation Science and Engineering**, Toronto, Ontario, Canada.

Best Poster Award (with L-F. Lee), “*Musculoskeletal Simulation-based Parametric Study of Optimal Gait Frequency in Biped Locomotion*,” **IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob 2008)**, Phoenix, AZ, 2008.

National Science Foundation CAREER Award, Robotics and Human Augmentation Program, Division of Information and Intelligent Systems, 2004.

Riefler Award, University at Buffalo, 2002, 2003.

2000 Petro-Canada Young Innovator Award, McGill University, Montreal, Canada, 2000.

Proctor & Gamble Best Student Paper Award, 5th National Applied Mechanisms & Robotics Conference, Cincinnati, Ohio, 1997.

John A. Goff Outstanding Graduate Student Award, Mechanical Engineering and Applied Mechanics, University of Pennsylvania, 1997.

Proctor & Gamble Best Student Paper Award, 4th National Applied Mechanisms & Robotics Conference, Cincinnati, Ohio, 1995.

Finalist, All India Class X Mathematics Olympiad, India, 1986.

National Talent Search Examination Scholarship Recipient, National Council of Educational Research and Training (NCERT), Govt. of India, 1985-1992.

Professional Memberships and Activities

▪ **Memberships**

American Society of Mechanical Engineers (ASME)

Secretary, Mechanisms & Robotics Technical Committee, Design Division, 2010-2011.

Chair, Robotics Technical Committee, Dynamic Systems and Control Division, 2006-2008.

Vice Chair, Robotics Technical Panel, Dynamic Systems and Control Division, 2003-2006.

Elected Voting Member, Mechanisms Technical Committee, Design Division, 2002-2008.

Member, 1996-present.

Institute of Electrical and Electronics Engineers (IEEE)

Finance Chair, Conference Activities Board, Robotics and Automation Society, IEEE.

Member, 1996-present.

▪ **Editorial Duties**

Technical Editor, **IEEE/ASME Transactions on Mechatronics**, April 2008-March 2011.

Associate Editor, **ASME Journal of Dynamic Systems Measurement and Control**, January 2008- December 2010.

Guest Co-Editor, Focused Section on Anthropomorphism in Mechatronic Systems, **IEEE/ASME Transactions on Mechatronics**, Vol. 14, No. 6, December 2009.

Guest Co-Editor, Special Issue of the **International Journal of Robotics Research**, Vol. 27, No. 2, February 2008.

Guest Co-Editor, Focused Section on Biomimetics and Novel Aspects in Robotics, **IEEE/ASME Transactions on Mechatronics**, Vol. 11, No. 2, April 2006.

Guest Co-Editor, Special Issue on Novel Robotics and Control, **ASME Journal of Dynamic Systems Measurement and Control**, Vol. 128, No. 1, March 2006.

▪ **Funding Agencies/ Reviews/ Roadmapping Workshops**

Survey report, “Status of Robotics Research in the United States (2010): Robots for Real” for Michael Reischman, Deputy Assistant Director, ENG Directorate, National Science Foundation, July 2010.

Survey report, “Status of Robotics Research in the United States (2009)” for Michael Reischman, Deputy Assistant Director, ENG Directorate, National Science Foundation, November 2009.

Invited participant, NSF-CMMI Roadmapping Workshop for Neuromechanical Engineering, Arlington, VA, September 14 -15, 2009.

National Science Foundation Panel, Dynamic Systems Program, ENG Directorate, 2009.

National Science Foundation Panel, Control Systems Program, ENG Directorate, 2009.

Site Visitor, NSERC Industrial Research Chair Application, Natural Sciences and Engineering Research Council (NSERC) of Canada, 2009.

Panelist, Indo-US Science and Technology Forum, 2009.

Survey report, “Status of Robotics Research in the United States (2008)” for Michael Reischman, Deputy Assistant Director, ENG Directorate, National Science Foundation, August 2008.

Invited participant, NSF/CCC/CRA Roadmapping Workshop for Medical and Healthcare Robotics, Arlington, VA, June 19-20, 2008.

Panelist, Korean Science and Engineering Foundation, 2008.

Invited participant, Strategic Planning Workshop of the Dynamic Systems and Control Division of the American Society of Mechanical Engineers, 2008.

National Science Foundation Panel, Robust Intelligence Program, CISE Directorate, 2008

National Science Foundation Panel, GOALI Program, ENG Directorate, 2008.

National Science Foundation Panel, Dynamic Systems Program, ENG Directorate, 2008.

National Science Foundation Panel, Robust Intelligence Program, CISE Directorate, 2007.

National Science Foundation Panel, CBET Program, CISE Directorate, 2007.

Army Research Office, 2005.

National Science Foundation Panel, Robotics and Human Augmentation Program, CISE Directorate, 2004.

National Science Foundation Panel, SENSORS Program, ENG Directorate, 2003.

National Academy of Science, COBASE program, 2003.

Natural Sciences and Engineering Research Council of Canada, Individual New Researcher Program, 2001.

Canadian Foundation for Innovation, 2000.

Le Fonds pour la Formation de Chercheurs et l'Aide à la Recherche, Equipe Program, 2000.

▪ **Journal Manuscript Review**

ASME Journal of Mechanical Design (For AEs: G.K. Ananthasuresh, S. Agrawal, G. Chirikjian, C. Gosselin, Q.J. Ge, L. Howell, K. Lewis, P. Laroche, J. M. McCarthy, C. Mavroidis, M. Raghavan, J. Rastegar)

ASME Journal of Mechanisms and Robotics (For AEs: A. Murray, V. Kumar, G.K. Ananthasuresh)

ASME Journal of Mechanical Design (For AEs: G.K. Ananthasuresh, S. Agrawal, G. Chirikjian, C. Gosselin, Q.J. Ge, L. Howell, K. Lewis, P. Laroche, J. M. McCarthy, C. Mavroidis, M. Raghavan, J. Rastegar)

ASME Journal of Computing and Information Science in Engineering (For AEs: J. Michopoulos, J. Oliver)

ASME Journal of Computational and Nonlinear Dynamics (For AEs: S. Sinha)

ASME/IEEE Transactions on Mechatronics (For AEs: S. Agrawal, D. Mavroidis, I-M. Chen)

IEEE Transactions on Robotics (For Associate Eds. J. Angeles, I. Bonev, M. Buehler, C. Gosselin, N. Sarkar, J. Troccaz, J. Wen, F. Lamiroux, F. Thomas)

IEEE Transactions of Automation Science and Engineering (For AEs: S. Akella, P. Fiorini, M. Zhang)

IEEE Transactions on Neural Sciences and Rehabilitation Engineering (For AEs: M. Van der Loos, G. Burdea)

International Journal of Robotics Research (For AEs: M. Buehler, J. Hollerbach)

International Journal of Mechatronics (For AEs: C. Melchiorri)

IEEE Transactions of Control System Technology (For AEs: L. Villiani)

IEEE Control Systems Magazine (For AEs: H. Ashrafiuon)

Mechanisms and Machine Theory (For AEs: K. Kazerounian, G. Chirikjian)

Journal of Field Robotics (For AEs: S. Singh)

Robotics and Autonomous Systems (For Associate Eds. W. Gruver)

▪ **Conference Service**

- **Member**, Conference Activities Board, Robotics and Automation Society, IEEE.
- **Finance Chair**, 2012 International Conference on Robotics and Automation, Minneapolis, MN, May 14-19 2012, <http://mobile.ieee-ras.org/calendar/list>.
- **Finance Chair**, 2010 IEEE Conference on Automation Science and Engineering, Toronto, Canada, August 22-24, <http://www.case2010.org/>.
- **Finance Co-Chair**, 2010 IEEE International Conference on Robotics and Automation, Anchorage, AL, May 3-7 2010, <http://www.icra2010.org/>.
- **Conference Chair**, Mechanisms and Robotics Conference, ASME International Design Engineering Technical Conferences, Montreal, Canada, August 15-18, 2010, <http://www.asmeconferences.org/IDETC2010/>.
- **Organizer**, “[Bio-Robotics – Science and Systems: State of the Art and Future Directions](http://www.eng.buffalo.edu/~vkrovi/DSC2008_BIOROBOTICS/),” Frontier Session at 2008 ASME Dynamic Systems and Control Conference (DSCC 2008), October 2008. http://www.eng.buffalo.edu/~vkrovi/DSC2008_BIOROBOTICS/.
- **Publicity Chair**, ASME Design Engineering Technical Conferences, Philadelphia, PA, September 10 -13, 2006, <http://www.asmeconferences.org/IDETC06/Organizers.cfm>.
- **Chair**, ASME Student Mechanism Design Competition, 27th Biennial Mechanisms and Robotics Conference, Montreal, Canada, Sep. 29 – Oct. 2, 2002, URL: <http://www.eng.buffalo.edu/~vkrovi/MechDesignContest2002>.

▪ **Reviewer**

ASME Design Engineering Technical Conferences – DAC, MECH, CIE (1999-present).
ASME International Mechanical Engineering Congress and Exposition (2001-present).
IEEE International Conference on Robotics and Automation (2004-present).
IEEE/RSJ International Conference on Intelligent Robots and Systems (2005-present).
IEEE Conference on Decision and Control (2004, 2005).

▪ **Conference Editorial Board and Session Chair**

ASME Design Engineering Technical Conferences (2002 - present).
ASME International Mechanical Engineering Congress and Exposition (2003 - 2007).
ASME Dynamic Systems and Control Conference (2008)
IEEE International Conference on Robotics and Automation (2005 - present).
IEEE/RSJ International Conference on Intelligent Robots and Systems (2005 - present).
2002 NSF Workshop on Fundamental Issues and Future Research Directions for Parallel Mechanisms and Manipulators.
2004 IEEE Engineering in Medicine and Biology Conference.

Service

▪ **University at Buffalo**

▪ **University**

Member, IRDF Review Panel, Office of VP (Research), University at Buffalo, June 2006.

Member, IRCAF Review Panel, Office of VP (Research), University at Buffalo, October 2004.

Member, MyUB Improvement Committee, University at Buffalo, Feb. 2004-present.

Judge, Sigma Xi Student Research Competition, 2005-2009.

Judge, Annual Post-Doctoral Research Poster Competition, April 2009.

Faculty Mentor, SUNY Louis Stokes Alliance for Minority Participation (LSAMP), May 2004 – present.

Faculty Mentor, SUNY Collegiate Science and Technology Entry Program (CSTEP) for Minority Students, May 2009.

▪ **School of Engineering and Applied Sciences**

Department Representative, SENS Computing Advisory Committee, School of Engineering and Applied Sciences, Spring 2006-present.

Judge, IEEE Region I Micromouse Maze Competition, June 2005.

Planning Committee Report to the Dean Karwan on deployment of EDS Software in the MAE Dept. and SEAS.

Mentor, Freshman Mentoring Program, 2004-present.

Contributor, Igniting Ideas 6, “Big Picture Engineering: Visualization, Simulation, and Modeling,” 2005.

▪ **Department**

Chairperson, Lab Upgrade Committee, November 2008 - present

Member, Graduate Studies Committee, January 2009 - present

Ph. D. Qualifying Committee, Dynamics and Control Group, 2001-present.

Over 20 Ph. D. and M.S. Committees, 2001-present (more details under Research Supervision: Committee Membership).

Seminar Chair, Mechanical and Aerospace Engineering, University at Buffalo, 09/2004-08/2007.

Lab Tours for Open House 2001, 2002, 2003, 2004, 2005, 2006.

Lab Tours for Preview Day 2002, 2003, 2004, 2005, 2006, 2007.

- **Community Service and Outreach**

ARMLAB/AAUW “Tech Savvy '10 Haptics: The Touchy-Feely Side of Robotics” Workshop for girls in grades 9 - 12 (approx. 36 students) on March 13, 2010. Website: <http://www.eng.buffalo.edu/techsavvy/2010/>

Gifted Math Program March Symposium 2010 - "Mechanisms & Robotics: Geometry in Motion" Workshop with approximately 50 students with outstanding mathematics ability from 7-12 grades on March 10, 2010. Website: <http://giftedmath.buffalo.edu/program.htm>

ARMLAB/CSTEP'09 “5-week Summer Robotics Workshop for Underrepresented Students,” Collegiate Science and Technology Entry Program (CSTEP), June 1-July 9, 2009, Website: <http://sites.google.com/site/cstepsummer09/>.

ARMLAB/AAUW “Tech Savvy '09 Robotics Workshop for girls in grades 6-9 from the Western New York” to approximately 40 students (in 3 sessions), March 07, 2009. Website: <http://www.youtube.com/watch?v=20PsJM-NG9I>

“2006 Summer Workshop on Robotics for High School Students,” 2006 NYSCEDII Cyber Engineering High School Summer Workshop, July 10 - 14, 2006. Website: <http://mechatronics.eng.buffalo.edu/education/summerworkshop2006/>.

“Summer Workshop on Robotics for High School Students,” 2005 NYSCEDII Summer Workshops in Scientific Visualization and Robotics, August 3 - 5, 2005. Website: <http://mechatronics.eng.buffalo.edu/education/summerworkshop2005/>.

Mentor, State University of New York Louis Stokes Alliance for Minority Participation (SUNY LSAMP) Summer Research Internships (2002-2004) and Buffalo Engineering Alliance for Minorities (BEAM) Summer Research Internships (2005) Website: <http://mechatronics.eng.buffalo.edu/education/>.

“2003 Workshop on Robotics for High School Students,” 2003 NYSCEDII Summer Workshops in Scientific Visualization and Robotics, July 7 - 11, 2003. Website: <http://mechatronics.eng.buffalo.edu/education/summerworkshop2003/>.

“Taking Virtual Prototyping to High Schools, ” Workshop on Virtual Prototyping Technologies for Newfane High School, October 26th 2002 and November 2nd 2002. Website: <http://mechatronics.eng.buffalo.edu/NewfaneHighSchool/>.

- **McGill University**

Coordinator, Mechatronics Curriculum Option in Mechanical Engineering, McGill University, 2000-2001.

Chair, Robotic Seminar Series, Center for Intelligent Machines, McGill University, 1999-2001.

Faculty Advisor, Student Chapter of American Society of Mechanical Engineers at McGill University, 1999-2001.

Courses Taught (*Enhancement of Existing Course; *Newly developed Course Content)

▪ **University at Buffalo (SUNY), Buffalo, New York,** **Department of Mechanical and Aerospace Engineering**

MAE 340 ⁺	Systems Analysis Laboratories (10 Lab Sections)	S'03, S'04, S'05, S'06, S'07, S'09, S'10
MAE 412 ⁺	Machines and Mechanisms II	F'01, F'02, F'03, F'04, F'05, F'06, F'07
MAE 512 ⁺	Machines and Mechanisms II (Graduate)	F'05, F'06, F'07 (<i>Also Enginet F'07</i>)
MAE 413/ MAE 513*	Robotic Mobility and Manipulation (Newly Developed Course)	S'09, S'11
MAE 459	Capstone Design Groups	2001, 2002, 2003, 2004, 2007
MAE 476/ MAE 576*	Mechatronics	S'02, S'03, S'10 (<i>Also Enginet S'03</i>)
MAE 493/ MAE 593*	Mathematical Methods in Robotics	F'05 (<i>Also Enginet F'05</i>), F'06, S'07, F'08, F'09, F'10
MAE 505	Special Topics – Robotics	F'03, F'04 (<i>Also Enginet F'04</i>)
MAE 501/ MAE 601	Individual Problems (Graduate)	F'01, S'02, F'02, S'03, F'03, S'04, F'04, S'05, F'05, S'06, F'06, S'07, F'07, S'08, F'08, S'09, F'09, S'10, F'10, S'11

▪ **McGill University, Montreal, Canada,** **Department of Mechanical Engineering**

305-554A*	Microprocessors for Mechanical Systems	F'99, F'00
305-412B ⁺	Dynamics of Systems	S'00, S'01
305-404B	Honors Thesis	F'99

Research Supervision

▪ **University at Buffalo (SUNY), Buffalo, New York,** **Department of Mechanical and Aerospace Engineering**

Ph.D., University at Buffalo

Seung-kook Jun	Topic: Visual Servoing for Cooperative Aerial Payload Manipulation	Dec. 2014 (Expected)
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Suren Kumar	Topic: Machine Learning for Human Activity Recognition	Dec. 2014 (Expected)
Madusudanan Sathia Narayanan	Topic: Multiresolution High-Fidelity Haptic Feedback	Dec. 2012 (Expected)
Xiaobo Zhou	Topic: Cooperative Aerial Payload Manipulation	Dec. 2012 (Expected)
Lengfeng Lee	Analysis And Design Optimization Of In-Parallel Haptic Devices (Currently: Post-doctoral researcher with Prof. Brian Umberger, Kinesiology, UMass Amherst)	Dec. 2010
Chin-Pei Tang	Design and Control Framework for Cooperative Payload Transport by Robot Collectives (Currently: Post-doctoral researcher with Prof. Mark Spong, UT Dallas)	Feb. 2008
Rajan Bhatt	Towards Modular Cooperation Between Multiple Nonholonomic Wheeled Mobile Manipulators (Currently: Research Scientist, Center for Computer Aided Design (CCAD), University of Iowa)	Feb. 2007

M.S. (Thesis), University at Buffalo

Priyanshu Agrawal	Topic: Probabilistic Modeling for Human Activity Recognition	Sep. 2011 (Expected)
Xiaobo Zhou	Topic: Coordination and Control of Quadrotor Systems	Sep. 2011 (Expected)
Hrishi Shah	Kinematic, Dynamic and Workspace Analysis of a Novel 6-DOF Parallel Manipulator (Currently: Caterpillar Inc. Product Engineer)	Sep. 2010
Sumit Tripathi	Role of Symbolic Computation in Linear and Model-based Controller Development (Currently: Caterpillar Inc. Product Engineer)	Sep. 2010
Patrick Miller	Output Synchronization for Teleoperation of Mobile Manipulators (Currently: CALSPAN Corp./Electrical Engineer)	Dec. 2008
Srikanth Kannan	Quantitative Analysis of Masticatory Performance in Vertebrates (Currently: SIMULIA Dassault Systèmes/Interactive Product Engineer)	Sep. 2008
Madusudanan Sathianathan	Analysis Of Parallel Manipulator Architectures for Mastication Studies (Currently: University at Buffalo/Ph.D. Candidate)	Sep. 2008
Qiushi Fu	Kinematics Of Articulated Wheeled Robots: Exploiting Reconfigurability and Redundancy (Currently: Arizona State University/ Ph.D. Candidate)	Sep. 2008
Hao Su	Cooperative Control of Payload Transport by Mobile Manipulator Collectives (Currently: WPI/Ph.D. Candidate)	Sep. 2008

Yao Wang	Kinematics And Dynamics Analysis of a Stewart Platform Parallel Manipulator (Currently: University of Texas at Austin/Ph.D. Candidate)	Sep. 2008
Kun Yu	Virtual Prototyping based Analysis of Cable Robot Manipulators (Currently: Cameron Compressors/Design Engineer)	Feb. 2008
Anand Naik	A Study of Haptic Feedback for Steer-By-Wire Applications (Currently: Delphi APC/Electric Steering Systems Engineer)	May 2007
Glenn White	Simultaneous Motion and Interaction Force Control of a Nonholonomic Mobile Manipulator (Currently: GM Fuel Cell/Test Engineer)	Jun. 2006
Michael Del Signore	A Screw-Theoretic Framework For Musculoskeletal System Analysis (Currently: NAVSEA-EOD/Field Engineer)	Feb. 2006
Lengfeng Lee (Stayed for Ph.D)	Decentralized Motion Planning within an Artificial Potential Framework (APF) for Cooperative Payload Transport by Multi-Robot Collectives (Currently: University at Buffalo/Ph.D. Candidate)	Feb. 2005
Talib Bhabrawala	Shape Modeling using Extended Superquadrics (Currently: GE Aero Energy, Design Engineer)	Feb. 2005
Chetan Jadhav	A Low-Cost Framework for Individualized Interactive Telerehabilitation (Currently: State Street Corp, Market Analyst)	Sep. 2004
Chin-Pei Tang	Control of a Modular Composite System of Mobile Manipulators (Continued for Ph.D.)	Jun. 2004
Seung Kook Jun	Design Considerations for an Articulated Leg-Wheel Locomotion Subsystem (Currently: Samsung Heavy Engineering/Test Engineer)	Jun. 2004
Rajan Bhatt	Physical Cooperation of a Modular Composite System of Several Mobile Manipulators (Continued for Ph.D.)	Feb. 2004
Pravin Nair	Quantitative Performance Evaluation of Upper-Limb Dysfunction (Currently: Capital One Auto Finance, Database Administrator)	Feb. 2004
<u>M.S. (Project), University at Buffalo</u>		
Matthew Szymanski	A Dynamic Study of an Infant Swing Drive Mechanism (Currently: Fisher Price/Product Engineering)	May 2008
Nicholas Gill	Comparison of Crank-Rocker Balancing in Pro-Engineer 2.0 and Analytical Methods (Currently: Fisher Price/Product Engineering)	Feb. 2008
Chihan Yang	Artificial Mechanical System Modeling And Simulation	Feb. 2006
Kiran Konakanchi	Musculoskeletal Modeling Of Smilodon Fatalis For Virtual Functional Performance Testing	Sep. 2005

Tao Gan	Automated CAD Generation to Improve Design Process- A Fourbar Linkage Case Study	Sep. 2005
Ajay D'Souza	Modeling and Kinematic Analysis of a 6 D.O.F. Motion Base using Virtual Prototyping Tools	Jun. 2003
Daniel O. Gott	The Smart Car Project: A Case Study in Computer- Mediated Interfaces	Jun. 2003
Chris Nowak	Wireless Data Acquisition System for In-Flight Acceleration Measurement of a Football	Jun. 2003
Harpreet Virk	Shape Synthesis of a Compliant Mechanism for Path Following	Jan. 2003

M.S. (Course) , University at Buffalo

Prasanna Venkatesan		Jun. 2003
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Undergraduate Research, University at Buffalo

Colin Lea	Machine Learning for Surgical Skill Acquisition (NSF- REU)	Fall 2010 - present
Osaka Shepherd Buay Nhial Christopher Williams Nercy Moreno	Summer Robotics and Virtual Prototyping Workshop Collegiate Science and Technology Entry Program (CSTEP) for minority undergraduate students http://sites.google.com/site/cstepsummer09	Summer 2009
Bryan Jones	Leg-Wheel Locomotion for Robotic Applications (NSF REU)	Fall 2008– Fall 2009
Colin Lea Brian Dolan	Reconfigurable Haptic Systems (NSF-REU)	Fall 2008– Fall 2009
John R. Amend, Jr. Shajan Thomas	Leg-Wheel Locomotion for Robotic Applications (NSF REU)	Fall 2007 Spr. 2008
Sophie Gomez	Optimization of Four-Bar Linkages	Summer 2007
Brendan Yadav	Independent Mechatronics Project: Control of the BoEBot	Spring 2006
Srivatsa Mahesh	Freshman Research Internship: Virtual Prototyping with CAD	Fall 2005
Christopher Guerra	2005 BEAM/SEAS Honors Research Summer Program, 11 th Grade Student from Canisius High School	Summer 2005
Annapurna Vanga	Senior Design Project: Conversion of CAT-scans of Sabertooth Skulls using MIMICS	Sep. 2004
Ben Whiting	6-week Research Internship for High School Students	Summer 2004

Denisse Yopez	SUNY Louis Stokes Alliance for Minority Participation (SUNY LSAMP), Freshman Research Internship: Modeling of SmartCAR in SolidEdge	May-July 2004
Jonathan Westcott	Senior Design Project: Development of Web-Based Self-Paced Tutorials for Studying Planar Mechanisms	Sep. 2003
Philana Owusu	SUNY Louis Stokes Alliance for Minority Participation (SUNY LSAMP) Freshman Research Internship: Virtual Prototyping of a Wheeled Mobile Robot	May-July 2003
Lengfeng Lee	Senior Design Project: Virtual Prototyping Approach to Teaching Planar Mechanism Analysis	Dec. 2002
Neexon Khoo Arturo Machuca Kok-Kuan Leong Swee Lei Pang	Senior Design Project: Virtual Prototyping of the Suspension System of an All-Terrain Vehicle	Dec. 2002
Sara Forde	SUNY Louis Stokes Alliance for Minority Participation, Freshman Internship, Virtual Prototyping with CAD	May-Dec. 2002

Committee Member, University at Buffalo

Anirudh Shivaswamy (M.S.)	Robust Attitude Estimation in the Presence of Magnetic Disturbances	Dec. 2010
Christopher Wirz (M.S.)	Multi-Input Modeling using Sparsity Constraints with Global Local Approximation	Aug. 2008
Subramaniam Iyer (M.S.)	Time Optimal Trajectory Generation for a Differential Drive Robot	Aug. 2008
Lalit Kumar (M.S.)	Development Of An Interface Between Matlab And Pro/Engineer Using J-Link	April. 2007
Sousaku Kawaguchi (M.S.)	Comprehensive Exam - no title	Oct. 2006
Matthew Morse (M.S.)	Comprehensive Exam - no title	Sep. 2006
John Eddy (Ph.D)	Solving Distributed, Non-Cooperative Design Problems Using Multi-Agent Systems	Feb. 2006
Min-Chang Tsai (M.S.)	Pitch-Arm Control and Virtual Realization of T-Type Robot Helicopter	Sep. 2005
Thomas Conord (M.S.)	Linear Matrix Inequality Based Robust Control Synthesis	Sep. 2005
Vamsi Pateel (M.S.)	Bite Force Estimation Of Smilodon Fatalis: Using Forward And Inverse Methodologies	Jun. 2005
Rohit Thali (M.S.)	A Study of Uncertainty and Optimality in Distributed Product Design	Jun. 2005
Sai Gavirneni (M.S.)	Comprehensive Exam - no title	Jun. 2005

Jairam Ramaswamy (M.S.)	Comprehensive Exam - no title	Jun. 2005
Amol Kulkarni (M.S.)	Unigraphics NX Open Application Programming Interface	Jun. 2005
Sameer Patwardhan (M.S.)	Using Anthropometric Modeling for Optimal Ergonomic Considerations in Automobile Interior Design	Feb. 2005
Gaurav Tyagi (M.S.)	A Heuristic Optimization Based Methodology for Fire Evacuation Simulation Incorporating Human Behaviors	Feb. 2005
Rajaey Kased (M.S.)	Rest-to-Rest Motion of an Experimental Flexible Structure Subject to Friction	Sep. 2004
Jonathan Moscato (M.S.)	Virtual Modeling of Centrally Controlled Real Time Systems using Object Oriented Programming	Sep. 2004
Bertrand Douillard (M.S.)	Design & Implementation of a Slam Algorithm on an Amigobot	Sep. 2004
Arun Natarajan (M.S.)	Spacecraft Attitude Maneuvers with Input Saturation using Model Error Control Synthesis	Sep. 2004
Amit Paygude (M.S.)	Development of an Interoperability Tool in Parasolid	Sep. 2004
Saurabh Srivastava (M.S.)	Local discontinuous Galerkin methods : application to elastodynamics and elastoplasticity	Feb. 2004
Ganesh Balasubramanian (M.S.)	Shape memory effect studies in electrochemically deposited Co- Ni alloy thin films	Feb. 2004
Mitul Patel (M.S.)	System Design Through Coupled Subsystem Selection	Feb. 2004
Guoshi Li (M.S.)	Application of Model-Error Control Synthesis to the Control of a Pneumatic Muscle Actuator System	Sep. 2003
Vincent Chanron (M.S.)	A study of convergence in decentralized design	Sep. 2002
Adeline de Villardi, (M.S.)	A set-based approach to facilitate distributed design	Sep. 2002
Ulrich Staehlin (M.S.)	Closed Loop Input Shaping Controllers	Sep. 2002

Research Supervision (Cont'd)

- **McGill University, Montreal, Canada,
Department of Mechanical Engineering**

M. Eng. (Thesis), McGill University

Waseem Khan	Distributed and Modular Forward Dynamic Simulation	Feb. 2003
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	of Parallel Manipulators	
Michel Abou-Samah	A Kinematically Compatible Framework for Collaboration of Multiple Nonholonomic Wheeled Mobile Robots	Dec. 2001
Xichun Nie	Design of Reconfigurable Manipulation Assist Aids by Fourier Methods	Dec. 2000

Undergraduate Research, McGill University

Robert Johnson	Senior Design Project: Shape Optimization of a Compliant Cantilever Beam for Path Following	Jun. 2001
Yeow-Wei Pang	Honors Thesis: Fourier Methods for Synthesis of CSC Mechanisms	Dec. 1999

Committee Membership, McGill University

Erick Dupuis (Ph.D.)	A general framework for the manual teleoperation of kinematically redundant space-based manipulators	Jun. 2001
Eric Martin, (Ph.D.)	Dynamic interaction of a space manipulator with its base attitude controller	Sep. 2000

Research Grant Support

Active

09/2009-08/2011	ISTARE: Intelligent Spatio-Temporal Activity Reasoning Engine Defense Advanced Research Projects Agency Investigators: J.Corso (PI), Y.Fu, V. Krovi (15%), W.Ceusters, M. Petropoulos	\$2,208,369.
09/2009-08/2011	II-NEW: Acquisition of BCI - A Biomedical Computing Infrastructure Computing Research Infrastructure, National Science Foundation Investigators: V. Chaudhary (PI), T. Furlani, V. Krovi (20%), J. Corso, K. Hoffmann	\$ 588,554.
04/2008-03/2011	CRI:IAD A Real-Time Haptic Immersive Virtual Environment Computing Research Infrastructure, National Science Foundation Investigators: V. Krovi (PI – 75%) & F. Mendel, Including REU Supplement	\$ 376,000.

Prior

10/2007-12/2008	Vertebrate Mastication Testbed: Virtual & Mechanical Prototypes Mars Pet Foods Investigators: F. Mendel (PI), A. Patra & V. Krovi (33 %)	\$ 195,000.
10/2007 - 09/2008	New York State Center for Engineering Design and Industrial Innovation NYSTAR Grant , State of New York Investigators: K. Lewis (PI), K. English, H.Stenger, V. Krovi (10%)	\$ 250,000.
02/2004-	CAREER: Cooperative Payload Transport by Robot Collectives	\$ 524,000.

01/2010	CAREER Grant , Robotics & Computer Vision, National Science Foundation Investigators: V. Krovi (PI – 100%) Including REU Supplement	
10/2006 - 09/2007	New York State Center for Engineering Design and Industrial Innovation <i>NYSTAR Grant</i> , State of New York Investigators: K. Lewis (PI), K. English, M. Karwan, C. Bloebaum, V. Krovi (10%)	\$ 250,000.
06/2006- 05/2007	Virtual Musculoskeletal Cadaver Case-Studies for Gross Anatomy <i>UBIT Proposal, Office of the CIO, University at Buffalo</i> Investigators: F. Mendel (PI), V. Krovi (50%)	\$ 10,000.
07/2005 – 12/2006	Scale Effects on Musculoskeletal Design in Terrestrial Crabs <i>Research and Creative Activities Proposal</i> , VP, Research, University at Buffalo Investigators: S. Medler (PI), V. Krovi (35%), S. White and K. Hulme	\$ 48,000.
11/2005	Mechatronics 2-Day Workshop for Fisher-Price <i>Short Course</i> , The Center for Industrial Effectiveness, University at Buffalo Investigators: V. Krovi (PI – 100%)	\$ 11,440.
10/2005 - 09/2006	New York State Center for Engineering Design and Industrial Innovation Center <i>NYSTAR Grant</i> , State of New York Investigators: C. Bloebaum (PI), K. English, M. Karwan, K. Lewis, V. Krovi (10%)	\$ 250,000.
06/2005 – 05/2006	Integrating Technology and Design in Architecture Curriculum <i>Education Technologies Grant</i> , VP, Educational Technology, University at Buffalo Investigators: S. Vassigh (PI), K. Mackay and V. Krovi (50%)	\$ 8,500.
07/2004 - 09/2005	New York State Center for Engineering Design and Industrial Innovation Center <i>NYSTAR Grant</i> , State of New York Investigators: C. Bloebaum (PI), K. English, M. Karwan, K. Lewis, V. Krovi (10%)	\$ 250,000.
2004-2005	The Vertebrate Analyzer: A simulator of form/function/behavior of extant/extinct vertebrates <i>Research and Creative Activities Proposal</i> , VP Research, University at Buffalo Investigators: V. Krovi (PI – 40%) F. Mendel, K. Hulme, A. Patra and D. Pendergast	\$ 28,000.
2003-2004	Teleoperated Virtual Access Laboratories (WEBLABS) <i>Education Technologies Grant</i> , VP, Educational Technology, University at Buffalo Investigators: V. Krovi (PI – 100%)	\$ 3,300.
2002-2003	EDS PLM-Suite: Solid-Edge, Jack, Unigraphics NX, e-Factory, I-DEAS, Teamcenter <i>In-kind software grant</i> , Electronic Data Systems Inc. <i>University List Price for Installation/ 1st year maintenance fees (Waived per grant).</i> Investigators: V. Krovi (PI– 100%)	\$ 53,400.
2002-2003	Xilinx Suite: Digilab, Sysgen and ISE Foundation Xilinx Systems	\$ 5,280.

In-kind hardware and software grant, Xilinx Corp.

University List Price for Installation and 1st year maintenance fees (Waived per grant).

Investigators: V. Krovi (PI- 100%)

- 2002-2003 **User-Customized Haptic Rehabilitation Environment (UCHRE)** \$ **48,000.**
Research and Creative Activities Proposal, VP Research, University at Buffalo
Investigators: V. Krovi (PI – 50%) and N. Fisher
- 2002-2003 **Web-based Virtual Prototyping Tutorials/Case-Studies** \$ **6,600.**
Education Technologies Grant, VP Educational Technology, University at Buffalo
Investigators: V. Krovi (PI- 100%)
- 2001 **ADAMS: Dynamic Analysis Suite** \$ **1,000.**
In-kind software grant, Mechanical Dynamics Inc.
Installation and 6-month maintenance fees (Waived per grant).
Investigators: V. Krovi (PI- 100%)
- 1999-2003 **Minimal Complexity Manipulation Assistive Devices** **CDN \$ 67,200.**
(ended Sept. ***Individual New Researcher***, Natural Science & Eng. Research Council of Canada
2001) Investigators: V. Krovi (PI- 100%) [**McGill Univ.**]
- 2000-2001 **Petro Canada Young Innovator Award** **CDN \$ 16,000.**
(ended Sept. Investigators: V. Krovi (PI- 100%) [**McGill Univ.**]
2001)
- 2000-2003 **Computation Visualization and Realization Laboratory** **CDN \$ 482,000.**
(ended Sept. ***New Opportunities Award***, Canadian Foundation for Innovation
2001) Investigators: X. Chang, L. Cortelezzi, V. Krovi (25%), K. Siddiqi [**McGill Univ.**]
- 2000-2002 **Cooperation Frameworks for Actively Articulated** **CDN \$ 45,000.**
(ended Sept. ***Wheeled Vehicles***
2001) ***Nouveaux Chercheur***, Le Fonds Formation de Chercheurs et l'Aide à la Recherche
Investigators: V. Krovi (PI – 100%) [**McGill Univ.**]
- 2000-2003 **Computational Kinematics** **CDN \$ 145,000.**
(ended Sept. ***Equipe***, Le Fonds pour la Formation de Chercheurs et l'Aide à la Recherche
2001) Investigators: J. Angeles, V. Krovi (30%) and P. Zsombor-Murray [**McGill Univ.**]

Publications

Patents

- [P1] Kumar, V., Wellman, P., and Krovi, V., “*Adaptive mobility system*,” ***United States Patent 5,513,716***. *Appl. No.:* 239,951, *Filed:* May 9, 1994, *Granted:* May 7, 1996.

Book Chapters (Supervised Students are bolded)

- [B3] **Lee, L.-F.** and Krovi, V., "Performance Evaluation of Potential Field based Distributed Motion Planning Methods for Robot Collectives," **Motion Planning**, Ed. Xing-Jian Jing, In-Tech Publishing, Vienna, ISBN 978-953-7619-01-5, June 2008.
- [B2] Krovi, V., and Kumar, V., "*Rapid Design and Prototyping of Customized Rehabilitation Aids*," **Encyclopedia of Microcomputers**, Eds. A. Kent and J. G. Williams, Marcel Dekker, New York, September 1999.
- [B1] Kumar, V., Rahman, T., and Krovi, V., "*Assistive Devices for People with Motor Disabilities*," **Wiley Encyclopaedia of Electrical and Electronics Engineering**, Ed. J. G. Webster, March 1999.

Invited Journals/Editorials

- [IJ4] Krovi, V., Goldfarb, M., and Laumond, J.-P., "*Editorial: Focused Section on Anthropomorphism in Mechatronic Systems*," **IEEE/ASME Transactions on Mechatronics**, Vol. 14, No. 6, December 2009. doi: [10.1109/TMECH.2009.2033594](https://doi.org/10.1109/TMECH.2009.2033594)
- [IJ3] Agrawal, S. K., Krovi, V. and O'Malley, M., "*Editorial: Special Section on ASME IMECE ARDC 2006 Machines for Human Assistance and Augmentation*," **International Journal of Robotics Research**, Vol. 27, No. 2, pp.231-231, February 2008. URL: [doi:10.1177/0278364907085556](https://doi.org/10.1177/0278364907085556)
- [IJ2] Agrawal, S. K., and Krovi, V., "*Guest Editorial: Introduction to the Focused Section on Biomimetics and Novel Aspects in Robotics*," **IEEE/ASME Transactions on Mechatronics**, Vol. 11, No. 2, pp. 117- 118, April 2006. URL: [doi: 10.1109/TMECH.2006.871146](https://doi.org/10.1109/TMECH.2006.871146)
- [IJ1] Agrawal, S. K., Krovi, V., and O'Malley, M., "*Guest Editorial: Special Issue on Novel Robotics and Control*," **ASME Journal of Dynamic Systems Measurement and Control**, Vol. 128, No. 1, pp. 1-2, March 2006. URL: [doi: 10.1115/1.2171717](https://doi.org/10.1115/1.2171717).

Journal Articles (Accepted and Published) (Supervised Students are bolded)

- [J24] **Tang, C-P., Miller, P.,** Krovi, V., Ryu, J-C. and Agrawal, S., "*Differential Flatness-based Planning and Control of a Wheeled Mobile Manipulator – Theory and Experiment*," **IEEE/ASME Transactions on Mechatronics**, In Press, August 2010. doi: [10.1109/TMECH.2010.2066282](https://doi.org/10.1109/TMECH.2010.2066282)
- [J23] **Shah, H. L., Tripathi, S., Lee, L.-F.,** and Krovi, V., "*Role of Automated Symbolic Generation of Equations of Motion to Enhance Robotics Education*", **ASEE Computers in Education Journal**, July-September 2010, Vol. 1, No. 3, pp. 2-20.
- [J22] **Lee, L.-F., Narayanan, M.S., Kannan, S.,** Mendel, F. C. and Krovi, V., "*Rehabilitation Program Refinement Using Virtual Musculoskeletal Simulations*," **IEEE Transactions on Robotics**, Vol. 25, No. 3, pp. 634 – 38, June 2009. doi: [10.1109/TRO.2009.2019780](https://doi.org/10.1109/TRO.2009.2019780)
- [J21] **White, G.D., Bhatt, R. M., Tang, C-P.,** and Krovi, V., "*Experimental Evaluation of Dynamic Redundancy Resolution in a Nonholonomic Wheeled Mobile Manipulator*," **IEEE/ASME Transactions on Mechatronics**, Vol. 14, No. 3, pp. 349 – 357, June 2009. doi: [10.1109/TMECH.2008.2008802](https://doi.org/10.1109/TMECH.2008.2008802)

- [J20] **Bhatt, R.M., Tang, C-P., Lee, L-F., and Krovi, V.,** “A Case for Scaffolded Virtual Prototyping Tutorial Case-Studies in Engineering Education,” **International Journal of Engineering Education**, Vol. 25, No.1, pp.84-92, January 2009. URL: <http://www.ingentaconnect.com/content/intjee/ijee/2009/00000025/00000001/art00011>.
- [J19] **Bhatt, R.M., Tang, C-P., and Krovi, V.,** “Formation Optimization for a Fleet of Wheeled Mobile Robots – A Geometric Approach,” **Robotics and Autonomous Systems**, Vol. 57, No. 1, pp. 102-120, January 2009. [doi:10.1016/j.robot.2006.12.012](https://doi.org/10.1016/j.robot.2006.12.012).
- [J18] Krovi, V. and **Nie, X.,** “Design of Reconfigurable Coupled-Serial Chain Based Manipulation Assistive Aids,” **Robotics and Computer-Integrated Manufacturing**, Volume 24, No. 3, pp. 345-358, June 2008. [doi:10.1016/j.rcim.2007.01.003](https://doi.org/10.1016/j.rcim.2007.01.003).
- [J17] **del Signore, M.J., Bhatt, R.M., and Krovi, V.,** “Musculoskeletal Analysis of Felid Jaw Mechanisms using Screw-Theory,” **Mechanism and Machine Theory**, Vol. 43, No. 2, pp. 147-159, February 2008. [doi:10.1016/j.mechmachtheory.2007.02.005](https://doi.org/10.1016/j.mechmachtheory.2007.02.005)
- [J16] **Khan, W.A., Tang, C-P., and Krovi, V.,** “Modular and Distributed Forward Dynamic Simulation of Constrained Mechanical Systems - A Comparative Study”, **Mechanism and Machine Theory**, Vol. 42, No. 5, pp. 558-579, May 2007. [doi:10.1016/j.mechmachtheory.2006.05.002](https://doi.org/10.1016/j.mechmachtheory.2006.05.002)
- [J15] **White, G.D., Bhatt, R.M., and Krovi, V.,** “Dynamic Redundancy Resolution in a Nonholonomic Wheeled Mobile Manipulator,” **Robotica**, Special Issue on Mobile Manipulators: Basic Techniques, New trends & Applications, Vol. 25, No. 2 pp. 147-156, March 2007. [doi:10.1017/S0263574706003328](https://doi.org/10.1017/S0263574706003328)
- [J14] **Tang, C-P., and Krovi, V.,** “Manipulability based Configuration Evaluation of Cooperative Payload Transport by Mobile Manipulator Collectives,” **Robotica**, Vol. 25, No. 1, pp. 29-42, January 2007. [doi:10.1017/S0263574706002979](https://doi.org/10.1017/S0263574706002979).
- [J13] **Bhatt, R.M., and Krovi, V.,** “DynaFlexPro for Maple – A Review,” **IEEE Control Systems**, Vol. 26, No. 6, pp. 127-138, December 2006. [doi: 10.1109/MCS.2006.252839](https://doi.org/10.1109/MCS.2006.252839).
- [J12] **Abou-Samah, M., Tang, C-P., Bhatt, R.M., and Krovi, V.,** “A Kinematically Compatible Framework for Cooperative Payload Transport System by Multiple Mobile Manipulators,” **Autonomous Robots**, Vol. 21, No. 3, pp. 227-242, November 2006. [doi:10.1007/s10514-005-9717-9](https://doi.org/10.1007/s10514-005-9717-9).
- [J11] **Jadhav, C., Nair, P. and Krovi, V.,** “Individualized Interactive Home-based Haptic Telerehabilitation,” **IEEE Multimedia Systems**, Special Issue on Haptic User Interfaces in Multimedia Systems, Vol. 13, No. 3, pp. 2-9, July 2006.
- [J10] **Tang, C-P., Bhatt, R.M., Abou-Samah, M., and Krovi, V.,** “A Screw-Theoretic Analysis Framework For Payload Manipulation By Mobile Manipulator Collectives,” **IEEE/ASME Transactions on Mechatronics**, Vol. 11, No. 2, pp. 169- 178, April 2006.
- [J09] **Jun, S-K., White, G.D. and Krovi, V.,** “Kinetostatic Design Considerations for an Articulated Leg-Wheel Locomotion Subsystem,” **ASME Journal of Dynamic Systems Measurement and Control**, Vol. 128, No. 1, pp. 112-121, March 2006.
- [J08] **Khan, W. A., Krovi, V., Saha, S.K., and Angeles, J.,** “Modular and Recursive Kinematics and Dynamics for Parallel Manipulators,” **Multibody Systems Dynamics**, Vol. 14, No. 4, pp. 419–455, December 2005.

- [J07] **Khan, W. A.**, Krovi, V., Saha, S.K., and Angeles, J., “*Recursive Kinematics and Inverse Dynamics for a Planar 3R Parallel Manipulator*,” **ASME Journal of Dynamic Systems Measurement and Control**, Vol. 127, No. 4, pp. 529–536, December 2005.
- [J06] **Nie, X.**, and Krovi, V., “*Fourier Methods for Kinematic Synthesis of Coupled Serial Chain Mechanisms*,” **ASME Journal of Mechanical Design**, Vol. 127, No. 2, pp. 232–241, March 2005.
- [J05] Krovi, V., Ananthasuresh, G. K., and Kumar, V., “*Kinematic and Kinetostatic Synthesis of Planar Coupled Serial Chain Mechanisms*,” **ASME Journal of Mechanical Design**, Vol. 124, No. 2, pp.143-155, June 2002.
- [J04] Krovi, V., Ananthasuresh, G. K., and Kumar, V., “*Kinematic Synthesis of Spatial R-R Dyads for Path Following With Applications to Coupled Serial Chain Mechanisms*,” **ASME Journal of Mechanical Design**, Vol.123, No. 3, pp. 359-366, September 2001.
- [J03] Krovi, V., Kumar, V., Ananthasuresh, G. K., and Vezien, J-M., “*Design and Virtual Prototyping of Rehabilitation Aids*,” **ASME Journal of Mechanical Design**, Vol. 121, No. 3, pp. 456-458, September 1999.
- [J02] Krovi, V., and Kumar, V., “*Modeling and Control of a Hybrid Locomotion System*,” **ASME Journal of Mechanical Design**, Vol. 121, No. 3, pp. 448-455, September 1999.
- [J01] Wellman, P., Krovi, V., Kumar, V., and Harwin, W., “*Design of a Wheelchair with Legs for People with Motor Disabilities*,” **IEEE Transactions on Rehabilitation Engineering**, Vol. 3, No. 4, pp. 343 - 53, December 1995.

Refereed Conference Publications (Supervised Students are bolded)

- [C55] **Tripathi, S., Shah, H. L., Lee, L.-F.**, and Krovi, V., “Role of Automated Symbolic Generation of Plant Models in Control Education,” Proceedings of the **2010 ASME Dynamic Systems and Control Conference (DSCC2010)**, Cambridge, Massachusetts, September 13-15, 2010.
- [C54] **Shah, H., Narayanan, M.S.**, and Krovi, V., “CAD-Enhanced Workspace Optimization for Parallel Manipulators: A Case Study,” Proceedings of **2010 IEEE Conference on Automation Science and Engineering (CASE 2010)**, Toronto, Ontario, Canada, August 21-24, 2010. **(WINNER OF THE BEST POSTER AWARD)**
- [C53] **Agarwal, P., Narayanan, M.S., Lee, L.-F.**, Mendel, F.C., and Krovi, V., “Simulation-Based Design of Exoskeletons using Musculoskeletal Analysis,” Proceedings of the **2010 ASME International Design Engineering Technical Conferences (IDETC 2010)**, Montréal, Quebec, Canada, August 15-18, 2010. **(WINNER OF THE BEST PAPER AWARD)**
- [C52] **Narayanan, M.S. Chakravarty, S., Shah, H. L.**, and Krovi, V., “Kinematic- Static- And Workspace Analysis of a 6- P-U-S Parallel Manipulator,” Proceedings of the **2010 ASME International Design Engineering Technical Conferences (IDETC 2010)**, Montréal, Quebec, Canada, August 15-18, 2010.
- [C51] **Shah, H. L., Tripathi, S., Lee, L.-F.**, and Krovi, V., “Role of Automated Symbolic Generation of Equations of Motion in Mechanism and Robotics Education,” Proceedings of the **2010 ASME International Design Engineering Technical Conferences (IDETC 2010)**, Montréal, Quebec, Canada, August 15-18, 2010.

- [C50] **Lee, L.-F., Narayanan, M.S.,** Mendel, F., Karam, P. and Krovi, V., “Kinematics Analysis of In-Parallel 5 DOF Haptic Device,” Proceedings of **2010 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM 2010)**, Montréal, Quebec, Canada, July 6-9, 2010.
- [C49] **Yu, K., Lee, L-F.,** and Krovi, V., “Enhanced Trajectory Tracking Performance with a Lower-Bound Stiffness Controller for Cable-Robot Systems,” Proceedings of the **2010 IEEE International Conference on Robotics and Automation (ICRA2010)**, Anchorage, Alaska, May 3 - 8, 2010.
- [C48] **Miller, P.T., Lee, L-F,** and Krovi, V., “Output Synchronization for Teleoperation of a Wheeled Mobile Robot,” Proceedings of **2009 ASME Dynamic Systems and Control Conference**, DSCC2009-2637, Hollywood, CA, October 12-14, 2009.
- [C47] **Yu, K., Lee, L-F.,** and Krovi, V., “Simultaneous Trajectory tracking and stiffness control of cable actuated parallel manipulator,” Proceedings of the **2009 ASME Design Engineering Technical Conferences**, DETC2009-87457, San Diego, CA, August 30 - September 2, 2009.
- [C46] **Tang, C.P, Bhatt, R.M.** and Krovi, V., “Cooperative Payload Transport by Robot Collectives,” Invited Session Paper, Proceedings of the **2009 IEEE Conference on Automation Science and Engineering**, Bangalore, India, August 22-25 2009.
- [C45] **Tang, C.P, Miller, P.T.,** Krovi, V., Ryu, J.-C., and Agrawal, S., “Kinematic Control Of A Nonholonomic Wheeled Mobile Manipulator – A Differential Flatness Approach,” Proceedings of **2008 ASME Dynamic Systems and Control Conference**, DSCC2008-218, Ann Arbor, MI, October 20-22, 2008.
- [C44] **Su, H,** and Krovi, V., “Decentralized Dynamic Control Of A Nonholonomic Mobile Manipulator Collective: A Simulation Study,” Proceedings of **2008 ASME Dynamic Systems and Control Conference**, DSCC2008-131, Ann Arbor, MI, October 20-22, 2008.
- [C43] **Fu, Q.,** and Krovi, V., “Articulated Wheeled Robots: Exploiting Reconfigurability and Redundancy,” Proceedings of **2008 ASME Dynamic Systems and Control Conference**, DSCC2008-130, Ann Arbor, MI, October 20-22, 2008.
- [C42] **Lee, L-F.,** and Krovi, V., “Musculoskeletal Simulation-based Parametric Study of Optimal Gait Frequency in Biped Locomotion,” Proceedings of the **IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob 2008)**, Phoenix, AZ, October 19-22, 2008. **(WINNER OF THE BEST POSTER AWARD)**
- [C41] **Narayanan, M.S., Kannan S., Lee, L-F.,** and Krovi, V., “Virtual Musculoskeletal Scenario-testing Case Studies,” Proceedings of the **Virtual Rehabilitation 2008**, Vancouver, Canada, August 25-27, 2008.
- [C40] **Naik, A.P., Lee, L-F.,** and Krovi, V., “Study of Vehicle Dynamics Modeling Fidelity on Haptic Collaboration in Steer-by-Wire Systems,” Proceedings of the **2007 ASME International Mechanical Engineering Congress and Exposition**, IMECE2007-41908, Seattle, WA, November 11 -15, 2007.
- [C39] **White, G.D.,** and Krovi, V., “Motion and Force Control in a Nonholonomic Mobile Manipulator,” Proceedings of the **2006 ASME International Mechanical Engineering Congress and Exposition**, IMECE2006-14703, Chicago, IL, November 5 -10, 2006.

- [C38] **Lee, L-F.**, and Krovi, V., "Virtual Musculoskeletal Analysis-based Refinement of Rehabilitation Programs," Proceedings of the **2006 IEEE International Workshop on Virtual Rehabilitation**, New York, NY, August 29 -30, 2006.
- [C37] **Lee, L-F.**, and Krovi, V., "A Standardized Testing-Ground for Artificial Potential-Field based Motion Planning for Robot Collectives," Proceedings of the **2006 Performance Metrics for Intelligent Systems Workshop**, Gaithersburg, MD, August 21 -23, 2006.
- [C36] **del Signore, M.J., Bhatt, R. M.**, and Krovi, V., "A Screw-Theoretic Analysis Framework For Musculoskeletal Systems," Proceedings of the **2006 ASME Design Engineering Technical Conferences**, DETC2006-99248, Philadelphia, PA, September 10 -13, 2006.
- [C35] **Bhatt, R.M., Tang, C-P., Abou-Samah, M.**, and Krovi, V., "A Screw-Theoretic Analysis Framework For Payload Manipulation By Mobile Manipulator Collectives," Proceedings of the **2005 ASME International Mechanical Engineering Congress and Exposition**, IMECE2005-81525, Orlando, Florida, November 5-11, 2005.
- [C34] **Bhabrawala, T.**, and Krovi, V., "Shape Recovery from Medical Data Using Extended Superquadrics," Proceedings of the **2005 ASME Design Engineering Technical Conferences**, DETC2005-84738, Long Beach, California USA, September 24-28, 2005,
- [C33] **del Signore. M.**, Mendel, F. and Krovi, V., "Virtual Prototyping and Hardware-in-the-Loop Testing for Musculoskeletal System Analysis," Proceedings of the **2005 IEEE International Conference on Mechatronics and Automation**, Niagara Falls, Ontario, Canada, July 29-August 1, 2005.
- [C32] **Patwardhan, S.S.**, Bloebaum C.L, and Krovi, V., "Using Anthropometric Modeling for Optimal Ergonomic Considerations in Automobile Interior Design," Proceedings of the **2005 SAE Digital Human Modeling for Design and Engineering Symposium**, Paper No. 2005-01-2718, Iowa City, Iowa, June 14-16, 2005.
- [C31] **Lee, L-F., Bhatt, R.M.**, and Krovi, V., "Comparison of Alternate Methods for Distributed Motion Planning of Robot Collectives Within a Potential-Field Framework," Proceedings of the **2005 IEEE International Conference on Robotics and Automation**, Barcelona, Spain, April 18-22, 2005.
- [C30] **Jun, S-K.**, and Krovi, V., "Design Considerations For An Articulated Leg-Wheel Locomotion Subsystem," Proceedings of the **2004 ASME International Mechanical Engineering Congress and Exposition**, IMECE2004-59428, Anaheim, California, November 13-19, 2004.
- [C29] **Tang, C-P.**, and Krovi, V., "Performance Evaluation of Cooperative Payload Transport by a System of Wheeled Mobile Manipulators," Proceedings of the **2004 ASME Design Engineering Technical Conferences**, DETC2004-57476, Salt Lake City, Utah, September 28 - October 2, 2004.
- [C28] Krovi, V., Rae, W., and **Nowak, C.**, "Flight Data Recorder for the American Football," Proceedings of the **5th International Conference on the Engineering of Sport**, Davis, California, September 13-16, 2004.
- [C27] **Jadhav, C.**, and Krovi, V., "A Low-Cost Framework for Individualized Interactive Telerehabilitation," **26th Annual International Conference in IEEE Engineering in Medicine and Biology Society**, Vol. 2, pp.3297 – 3300, San Francisco, California, September 1-5, 2004.

- [C26] **Bhatt, R.M., Tang, C-P.,** and Krovi, V., “*Geometric Motion Planning and Formation Optimization for a Fleet of Nonholonomic Mobile Robots,*” Proceedings of the **2004 IEEE International Conference on Robotics and Automation**, New Orleans, Louisiana, April 26 - May 1, 2004.
- [C25] **Tang, C-P., Bhatt, R.M.,** and Krovi, V., “*Decentralized Kinematic Framework for Payload Transportation by a System of Mobile Manipulators,*” Proceedings of the **2004 IEEE International Conference on Robotics and Automation**, New Orleans, Louisiana, April 26-May 1, 2004.
- [C24] **Jadhav, C.,** and Krovi, V., “*In-Vivo Estimation of Unknown Upper-Limb Kinematic Parameters,*” Proceedings of the **11th National Conference on Machines and Mechanisms**, (NaCoMM-2003), New Delhi, India, December 18-19, 2003.
- [C23] **Khan, W. A.,** Krovi, V., Saha, S.K., and Angeles, J., “*Recursive Kinematics and Inverse Dynamics for Parallel Manipulators,*” Proceedings of the **2003 ASME International Mechanical Engineering Congress and Exposition**, IMECE2003-42868, Washington D.C., November 15 - 21, 2003.
- [C22] **Nair, P.K., Jadhav, C.,** and Krovi, V., “*Development and Testing of a Low-Cost Diagnostic Tool for Upper Limb Dysfunction,*” Proceedings of **2003 IEEE/RSJ International Conference on Intelligent Robotics and Systems**, Las Vegas, Nevada, October 27-31, 2003.
- [C21] **Bhatt, R.M., Tang, C-P., Lee, L-F,** and Krovi, V., “*Web-based Self-paced Virtual Prototyping Tutorials,*” Proceedings of the **2003 ASME Design Engineering Technical Conferences**, DETC2003/CIE-48201, Chicago, Illinois, September 2 - 6, 2003.
- [C20] **Jun, S-K.,** and Krovi, V., “*The SmartCar Project: Development and Implementation of a Modular Scaled Testbed,*” Proceedings of the **2003 ASME Design Engineering Technical Conferences**, DETC2003/CIE-48258, Chicago, Illinois, September 2 - 6, 2003.
- [C19] **Abou-Samah, M.,** and Krovi, V., “*Decentralized Kinematic Control of a Cooperating System of Mobile Manipulators,*” Proceedings of the **2002 ASME International Mechanical Engineering Congress and Exposition**, IMECE2002-32691, New Orleans, Louisiana, November 17 - 22, 2002.
- [C18] **Khan, W. A.,** and Krovi, V., “*Comparison of Two Alternate Methods for Distributed Forward Dynamic Simulation of a Four-Bar Linkage,*” Proceedings of the **Workshop on Fundamental Issues and Future Research Directions for Parallel Mechanisms and Manipulators**, Eds. C. M. Gosselin and I. Ebert-Uphoff, Quebec City, Canada, October 3–4, 2002.
- [C17] **Abou-Samah, M.,** and Krovi, V., “*Optimal Configuration Selection for a Cooperating System of Mobile Manipulators,*” Proceedings of the **2002 ASME Design Engineering Technical Conferences**, DETC2002/MECH-34358, Montreal, Canada, September 29 - October 2, 2002.
- [C16] **Nie, X.,** and Krovi, V., “*Passive Reconfigurable Manipulation Assistive Aids,*” Proceedings of the **2001 IEEE/RSJ International Conference on Intelligent Robots and Systems**, Vol. 2, pp. 1036-42, Maui, Hawaii, October 29-November 3, 2001.
- [C15] **Nie, X.,** and Krovi, V., “*Design of Passive Reconfigurable Manipulation Assistive Aids,*” Proceedings of the **2001 ASME Design Engineering Technical Conferences**, DETC2001/DAC-21087, Pittsburgh, Pennsylvania, September 9-12, 2001.

- [C14] **Pang, Y.-W.**, and Krovi, V., “*Kinematic Synthesis of Coupled Serial Chain Mechanisms for Planar Path Following Tasks using Fourier Methods*,” Proceedings of the **2000 ASME Design Engineering Technical Conferences**, DETC2000/MECH-14188, Baltimore, Maryland, September 10-13, 2000.
- [C13] **Pang, Y.-W.**, and Krovi, V., “*Fourier Methods For Synthesis Of Coupled Serial Chain Mechanisms*,” In **7th International Symposium on Advances in Robot Kinematics**, Piran-Portoroz, Slovenia, June 26 - 30, 2000.
- [C12] Krovi, V., Ananthasuresh, G. K., and Kumar, V., “*Kinematic Synthesis of Spatial R-R dyads for Path Following Revisited using the Rotation Matrix Approach*,” Proceedings of the **1999 ASME Design Engineering Technical Conferences**, DETC99/DAC-8670, Las Vegas, Nevada, September 12-15, 1999.
- [C11] Song, P., Krovi, V., Kumar, V., and Mahoney, R., “*Design and Virtual Prototyping of Human-Worn Manipulation Devices*,” Proceedings of the **1999 ASME Design Engineering Technical Conferences**, DETC99/CIE-9029, Las Vegas, Nevada, September 12-15, 1999.
- [C10] Song, P., Krovi, V., Kumar, V., R. Bajcsy and Mahoney, R., “*Design of Human-Worn Assistive Devices for People with Disabilities*,” Proceedings of the **Sixth International Conference on Rehabilitation Robotics**, pp. 122-128, Stanford, California, July 1-2, 1999.
- [C09] Krovi, V., Ananthasuresh, G. K., and Kumar, V., “*Synthesis of Spatial Two-Link Coupled Serial Chains*,” Proceedings of the **1998 ASME Design Engineering Technical Conferences**, DETC98/MECH-5890, Atlanta, Georgia, September 13-16, 1998.
- [C08] Krovi, V., Ananthasuresh, G. K., and Kumar, V., “*Kinetostatic Synthesis of Coupled Serial Chains*,” Proceedings of the **1998 ASME Design Engineering Technical Conferences**, DETC98/MECH-5977, Atlanta, Georgia, September 13-16, 1998.
- [C07] Krovi, V., Haulin, I., Vezien, J-M., Kakadiaris, I., Pito, R., Enciso, R., Kumar, V., Ananthasuresh, G.K., and Bajcsy, R., “*Design and Virtual Prototyping of a Rehabilitation Devices*,” **Video Proceedings of the 1998 International Conference on Robotics and Automation**, Leuven, Belgium, May 16-21, 1998.
- [C06] Krovi, V., Ananthasuresh, G. K., and Kumar, V., “*Synthesis of Coupled Multi-Link Serial Chain Mechanisms*,” Proceedings of the **5th National Applied Mechanisms & Robotics Conference**, AMR97-031, Cincinnati, Ohio, October 12-15, 1997.
- [C05] Krovi, V., Feehery, P., Heinrichs, T., Ternus, J., and Kumar, V., “*Design and Virtual Prototyping of a Head Controlled Feeder*,” Proceedings of the **5th National Applied Mechanisms & Robotics Conference**, AMR97-027, Cincinnati, Ohio, October 12-15, 1997. (Recipient of the Procter & Gamble Best Student Paper Award.)
- [C04] Krovi, V., Kumar, V., Ananthasuresh, G. K., and Vezien, J-M., “*Design and Virtual Prototyping of Rehabilitation Aids*,” Proceedings of the **1997 ASME Design Engineering Technical Conferences**, DETC97/DFM-4361, Sacramento, California, September 14-17, 1997.
- [C03] Krovi, V., and Kumar, V., “*Optimal Traction Control in a Wheelchair with Legs and Wheels*,” Proceedings of the **4th National Applied Mechanisms and Robotics Conference**, AMR95-030, Cincinnati, Ohio, December 10-14, 1995. (Recipient of the Procter & Gamble Best Student Paper Award.)

- [C02] Krovi, V., Wellman, P., and Kumar, V., “*Design of a Walking Wheelchair for the Motor Disabled*,” Proceedings of the **4th International Conference on Rehabilitation Robotics**, pp. 125-31, Wilmington, Delaware, June 10-12, 1994.
- [C01] Wellman, P., Krovi, V., and Kumar, V., “*An Adaptive Mobility System for the Disabled*,” Proceedings of the **1994 IEEE International Conference on Robotics and Automation**, pp. 2006-11, San Diego, California, May 8-13, 1994.

Presentations and Workshops

- **The conference presentations listed above were made either by a supervised graduate student in my presence or by me – this list is not being repeated here for brevity.**
- Cooperative Payload Transport by Robot Collectives, Algorithmic and Composable Automation, IEEE Conference on Automation Science and Engineering, Bangalore, India, August 23-25 2009.
- Cooperative Payload Transport by Robot Collectives, Mechanical Engineering, Rochester Institute of Technology, Rochester, NY, May 8, 2009.
- "Advanced Research Techniques in Mechatronics: Vehicle Dynamic Modeling in Steer-By-Wire Systems", Maplesoft e-Symposium Series, Streaming QuickTime, March 18 2008 <http://www.maplesoft.com/company/webinars/view.aspx?SID=5744&sli=1>
- "Shape Recovery from Medical Data Using Extended Superquadrics", Departments of Biophysics and Radiation Medicine, Roswell Park Cancer Institute, March 11 2008.
- “Cooperative Payload Transport by Robot Collectives”, Mechanical Engineering, Ohio State University, Columbus, OH, Nov. 17, 2006.
- “Cooperative Payload Transport by Robot Collectives”, MAE-GSA Future of Research Seminar, Mechanical and Aerospace Engineering, University at Buffalo, Buffalo, NY, Nov. 3, 2005.
- “Overview of Robotics and Haptics at University at Buffalo”, Dean’s Council, School of Engineering and Applied Sciences, University at Buffalo, Buffalo, NY, Apr. 21, 2005.
- “Cooperative Payload Transport by Robot Collectives,” Mechanical and Aerospace Engineering, Rutgers University, NJ. March 24, 2005
- “Optimal Configuration for a System of Mobile Manipulators,” Colloquium Series, Computer Science and Engineering Dept., University at Buffalo, Buffalo, NY, Oct. 11, 2002.
- “Collaboration Frameworks For Multiple Mobile Manipulators,” 2002 Army Workshop On Integrated System Approaches To Future Combat Systems (ISAFCS 2002), Washington D.C., May 17, 2002.
- “Reconfigurable Manipulation Assistive Aids,” Department of Mechanical and Aerospace Engineering, State University of New York, Buffalo, NY, February 2001.
- “Assistive Aids for Augmenting Human Manipulation,” Canadian Space Agency Workshop on Space Robotics, St-Hubert, Quebec, Canada. August 27, 1999.
- “Virtual and Physical Prototyping of One-of-a-kind User-Customized Assistive Devices,” Department of Mechanical Engineering, McGill University, Montreal, Canada, April 1999.

- “Support Tools for the Design and Virtual Prototyping of One-of-a-kind Assistive Devices,” (with P. Song, V. Kumar, R. Bajcsy and R. Mahoney), National Science Foundation Design and Manufacturing Grantees Conference, Long Beach, CA. January 5-8, 1999.
- “Coupled Serial Chain Mechanisms: Design and Optimization” (with V. Kumar and G. K. Ananthasuresh), National Science Foundation Design and Manufacturing Grantees Conference, Long Beach, CA, January 5-8, 1999.
- “Rapid Prototyping of Rehabilitation Aids for the Physically Disabled” (with V. Kumar, R. Bajcsy and R. Mahoney), National Science Foundation Design and Manufacturing Grantees Conference, Seattle, WA, January 6-9, 1997.
- “All Terrain Hybrid Wheelchair” (with V. Kumar), Third Town Square Exhibition, Photonics East 1995 Symposium, SPIE – The International Society for Optical Engineering, Philadelphia, PA, October 24-26, 1995.
- “All Terrain Wheelchair” (with P. Wellman and V. Kumar), First Annual Robotic Wheelchair Exhibition, 14th International Joint Conference on Artificial Intelligence, Montreal, Canada, August 20-25, 1995.
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