

Sunil K. Agrawal, Ph.D.

Department of Mechanical Engineering
University of Delaware, Newark, DE 19716
Lab: Mechanical Systems Laboratory, 134 Spencer
Phone: (302)-831-8049, Fax: (302)-831-3619
Email: Agrawal@udel.edu
Website: <http://mechsys4.me.udel.edu>
(Updated: October 10, 2008)

Education:

Ph.D. in Mechanical Engineering, Stanford University, Stanford, CA, 1990
M.S. in Mechanical Engineering, Ohio State University, Columbus, OH, 1986
B.S. in Mechanical Engineering, Indian Institute of Technology, Kanpur, 1984

Professional Experience:

5/02-present: Professor of Mechanical Engineering, *University of Delaware*
4/96-4/02: Associate Professor of Mechanical Engineering, *University of Delaware*
8/96-date: Secondary Appointment, Biomech. & Movement Science Program, *Univ. of Delaware*

6/07- present: Robotics and Control Consultant, *Schlumberger Corporation*
7/07-8/07: Visiting Professor, Mechanical Engineering, *University of New South Wales*, Sydney.
12/06: Visiting Professor, *National Chung Cheng University*, Taiwan

8/05-3/06: Consultant, *Bally Ribbon Mills*, Bally, PA
6/04-7/04: Visiting Professor, Electrical Engineering, *ADFA, Canberra, Australia*
1/03-9/04: Guest Researcher, *Intelligent Systems Division, NIST*
6/03-8/03: Visiting Professor, *Technical University Darmstadt*, Germany.

9/02-1/03: Consultant, *DLR, Inst. for Robotics and Mechatronics*, Wessling, Germany
6/02-8/02: Visiting Professor, *Technical University of Darmstadt*, Germany.
3/02-6/02: Consultant, *DLR, Inst. for Robotics and Mechatronics*, Wessling, Germany

1/00-12/02: Consultant, *Pathway Technologies*, Philadelphia
3/01-9/01: Senior Scientist (IPA), *Munitions Directorate, Eglin AFB*, Florida
6/15/00-7/5/00: Visiting Fellow, Electrical Engineering, *ADFA, Canberra, Australia*
3/00 – 4/00: Visiting Researcher, Mechatronics Division, *CINVESTAV-IPN, Mexico*

3/99-12/00: Consultant, *Xerox Palo Alto Research Center*, Palo Alto, California
1/98-5/98: Visiting Associate, Control and Dynamic Systems, *Caltech, Pasadena, CA*

8/95-3/96: Associate Professor of Mech. Eng., *Ohio University, Athens, OH*
9/90-7/95: Assistant Professor of Mech. Eng., *Ohio University, Athens, OH*
8/95-12/95: Humboldt Research Fellow, *DLR, Oberpfaffenhofen, Germany*
8/94-12/94: Humboldt Research Fellow, *DLR, Oberpfaffenhofen, Germany*
6/94-8/94: AFOSR Summer Faculty Fellow, *WPAFB, Dayton*

7/88-9/88: *General Motors Research Lab* Summer Intern, Warren, MI
1/87-8/90: Research Assistant, Robotics Laboratory, *Stanford University*
9/84-9/86: University Graduate Fellow, *Ohio State University*, Columbus, OH

External Awards and Honors:

- Alexander von Humboldt U.S. Senior Scientist Award, Germany 2007
- American Society of Mechanical Engineers Distinguished Lecturer, 2004-2007
- MSC Software Simulation Award for the technical paper "Motion Planning of a Tractor with a Steerable Trailer Using Differential Flatness", Awarded by ASME Design Engineering Division, Mechanisms and Robotics Committee at the 31st ASME Mechanisms & Robotics Conf. 2007.
- Fellow, American Society of Mechanical Engineers, 2004.
- Biomimicry Prize for the technical paper "Biologically Inspired Design of Small Flapping Wing Air Vehicles Using 4-Bar Mechanisms and Quasi-Steady Aerodynamics", Awarded by Mech. and Robotics Committee, 28th ASME Mechanisms and Robotics Conf. 2004.
- Fulbright Scholar Award, Fulbright Foundation, 2002-2003 (declined).
- Friedrich Wilhelm Bessel Research Award, Alexander von Humboldt Foundation, Germany, 2002.
- NSF Presidential Faculty Fellow Award, White House, 1994.
- Fritz and Dolores Russ Research Award, Ohio University, 1994.
- Alexander von Humboldt Research Fellow, 1994
- NSF Research Initiation Award, 1991.
- Best All Rounder Student Gold Medal, IIT Kanpur, 1984.

Keynote Presentations at Professional Meetings:

- NIST Performance Metrics for Intelligent Systems Workshop, Aug 19-21, 2008, Gaithersburg, VA, USA
"Robotic Exoskeletons for Gait Assistance and Training of the Motor Impaired"
http://www.isd.mel.nist.gov/PerMIS_2008/plenary.htm
- International Conference on Intelligent Systems, Dec 1-3, 2008, Bahrain
"Exoskeletons for Gait Assistance and Training of Motor Impaired Subjects"
<http://www.icis-2008.org/speakers.htm>
- United Cerebral Palsy Foundation 2008 Conference, Washington DC
"Early Mobility to Infants with Special Needs – Baby Robots"
http://www.ucp.org/ucp_general.cfm/1/12438
- IEEE Workshop on Advanced Robotics and Its Social Impacts, Dec 9-11, 2007, Hsinchu
"Exoskeletons for Gait Assistance and Training of the Motor Impaired"
<http://arso.cn.nctu.edu.tw/>
- International Mechanical Engineering Conference and Exposition of the ASME, 2006, Chicago, Robotics Technical Committee of the Dynamic Systems and Control Division
"Passive and Active Exoskeletons for Gait Training of Motor Impaired Patients"
- National Conference on Control and Dynamical Systems, IIT, Bombay, Jan 2005
"Cable Suspended Robots: Dynamics and Control"
- Workshop on Constraints in Control, CC 1999, Alexandria, VA
"Planning and Optimization of Dynamic Systems Using Built-in Structures"

Selected Invited Workshop Presentations:

- Workshop on Lower Extremity Exoskeletons, IEEE BIOROB, Oct 19-22, 2008, Pasadena
"Exoskeletons for Gait Assistance and Training of the Motor-Impaired"
<http://www.ieee-biorob.org/tutorial.php>
- Workshop on Agricultural Robotics: Towards autonomous agriculture of tomorrow, IEEE Intl. Conference on Robotics and Automation, May 19, 2008, Pasadena
"A Streamlined Approach to Future Autonomous Farming"
- Workshop on Wearable Robots, IEEE Intl. Conference on Robotics and Automation, May 19, 2008, Pasadena
"Exoskeletons for Gait Assistance and Training of the Motor-Impaired"
http://www.iai.csic.es/www_icra08/
- Robo Business Conference 2008 Conference, Pittsburgh, April 8-9, 2008
"Exoskeletons for Gait Training"

- <http://www.robobusiness.com/about/>
- *EURON Winter School on Rehabilitation Robotics*, March 30-April 4, 2008, Elche, Spain
“Exoskeletons for Gait Assistance and Training of the Motor Impaired”
<http://www.isa.umh.es/vr2/euron08/program.htm>
- *International Conference on Infant Studies* March 27-March 29, 2008, Vancouver
“Psychological Antecedents & Consequences of Powered Mobility in Infants”
<http://www.isisweb.org/>
- *IEEE Symposium on Special Environment Robot Technology*, Jan 30, 2008, Tohoku University, Japan
“Autonomous Robots for Mobility and Handling: Integration of Control and Design”
- *EURON Winter School on Parallel Robots*, March 25-30, 2007, Benidorm, Spain
“Control of Cable-Driven Parallel Robots”
<http://isa.umh.es/vr2/euron07/program.htm>
- ICRA Workshop “Collision-Free Motion Planning for Dynamic Systems”, Rome, 4-10-07
“Differential Flatness Based Planning and Control of Classes of Mobile Vehicles”
- IDGA Workshop *UAV Summit - Combat and Micro*, Washington DC, March 2005.
“Flapping Wing Micro Air Vehicles”

Selected Invited Talks at Universities and Research Laboratories 2008:

- *Northwestern University*, Jan 10, 2008 (Host: Prof. Kevin Lynch)
Weblink (<http://www.mech.northwestern.edu/events/index.php?t=0&s=0>)
- *Massachusetts Institute of Technology*, Jan 22, 2008 (Host: Prof. Harry Asada)
Title: Robotic Exoskeletons for Gait Assistance and Training of Motor Impaired
- *Schlumberger Fuchinobe Tech Center (Japan)*, Jan 29, 2008 (Host: Dr. H. Tashiro)
Title: Autonomous Robots for Mobility and Handling: Integration of Control and Design
- *Ohio State University ME Seminar Series*, Feb 15, 2008 (Host: Prof. Jim Schmiedeler)
Weblink (<http://www.mecheng.osu.edu/event/2008/02/01/month/all/all/1>)
- *Univ. of Pennsylvania Grasp Laboratory Seminar*, Feb 22, 2008 (Host: Prof. Vijay Kumar)
Weblink (<http://www.grasp.upenn.edu/seminar/index.html>)
- *Johns Hopkins University, Pi Tau Sigma Seminar, Mechanical Engineering*, March 13, 2008 (Host: Prof. Noah Cowan)
Title: Robotics for Neuro-motor Training - Exoskeletons & Powered Mobility for Infants
Weblink (<http://www.me.jhu.edu/Spring2008Schedule.htm>)
- *University of Stuttgart*, July 29, 2008 (Host: Prof. Oliver Sawodny)
Title: Design of Differentially Flat Systems: New Paradigms Integrating Control and Design
- *Schlumberger SRPC Paris*, July 7, 2008 (Host: Prof. Fathi Ghorbel)
Title: Towards New Robotic Paradigms Integrating Control within Design

Special Issue Editor in Journals:

- *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, Feb-Dec 2008
“Lower Extremity Exoskeletons for Assistance and Training of the Human Gait”
<http://tnsre.bme.jhu.edu/index.html>
- *International Journal of Robotics Research*, March 2008
“Machines for Human Augmentation and Assistance”
- *IEEE Transactions of Mechatronics*, April 2006
“Biomimetics and Novel Aspects in Robotics”
- *ASME J of Dynamic Systems Measurement and Control*, March 2006
“Novel Robotics and Control”

Editorial Board in Journals:

- *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, Associate Tech Editor, Dec 2007-date
- *Mechanics Based Design of Structures and Machines*, Technical Editor, 2002-2007
- *Journal of Dynamic Systems Measurement and Control, Transactions of the ASME*, Associate Tech. Editor, 6/04-6/07.

- *Journal of Mechanical Design, Transactions of the ASME*, Associate Tech. Editor, 8/00-8/03.
- *IEEE Transactions of Control Systems Technology*, Associate Tech. Editor, 1/01-12/02.
- *IEEE Transactions of Robotics and Automation*, Associate Tech. Editor, 12/00 – 12/01.
- *Multi-body Systems Dynamics*, Editorial Board, Kluwer Academic Publishers, 1996-2003.
- *IEEE Control Systems Society*, Conference Editorial Board, 1/00-12/00.

Conference Organization and Professional Roles:

- *Executive Program Committee, IEEE BioRob 2008*, Biomedical Robotics and Bio-mechatronics, Oct 2008, Scottsdale
<http://www.ieee-biorob.org/>
- *Program Committee, Robotics: Science and Systems Conference*, June 2008, Zurich
<http://www.roboticsconference.org/>
- *Program Chair, IEEE Int. Conf. on Mechatronic and Embedded Systems and Applications*, Oct 2008, Beijing
http://www.ezconf.net/index.php?co_id=5
- *Program Committee, ASME Dynamic Systems and Control Conf.*, Oct 2008, Ann Arbor.
<http://www.dsc-conference.org/>
- *Symposium Chair, 32nd ASME Mechanisms and Robotics, IDETC 2008*
<http://www.asmeconferences.org/IDETC08/CallForPapersDetail.cfm>
- *Scientific Committee, 2nd Intl. Workshop on Fundamental Issues and Future Directions for Parallel Machines and Manipulators*, Montpellier, France, Sept 2008.
<http://www.lirmm.fr/paralle2008/committees.htm>
- *Symposium Chair, Robot Kinematics and Motion Planning, 31st ASME Mechanisms and Robotics, IDETC 2007*
- *Symposium Chair, Machines for Human Augmentation and Rehabilitation, IEEE/ASME Conference on Mechatronics and Embedded Systems, IDETC 2007*
- *Program Committee Co-Chair, International Conference on Mechanical Engineering and Mechanics*, Nov 2007, Wuxi, China
- *Chair, Technical Committee on Mechanisms and Robotics, ASME Design Division, 2006*
- *Member of Technical Committee, BioRob 2006, Pisa.*
- *Chair of Robotics Technical Panel of ASME Dynamic System and Control Division, 2003-2006.*
- *Member of Program Committee, IEEE International Conference on Robotics and Automation (ICRA) 2006.*
- *IEEE/ASME Transactions on Mechatronics, Journal Management Board, 2006-2007.*
- *Panel Member, Academic Program Review Board, UD Mathematical Sciences, 2006.*
- *Conference Chair, ASME Mechanisms and Robotics Conference, IDETC 2005.*
- *Co-Chair of International Conference on Mechanical Engineering and Mechanics, 2005, Nanjing*
- *Technical Committee, IUTAM Symposium on Vibration and Control of Nonlinear Mechanisms and Structures, 2005.*
- *Program Chair, ASME Mechanisms and Robotics Conference, IDETC 2004.*
- *Member of Program Committee, IEEE International Conference on Robotics and Automation (ICRA) 2003.*
- *Member of Program Committee, IEEE International Conference on Robotics and Automation (ICRA) 2002.*
- *Chair of Dynamic Symposium, ASME Mechanisms and Robotics Conference, IDETC 2002.*

- *Member of Program Committee, Workshop on Future Research Directions for Parallel Mechanisms and Manipulators*, Quebec 2002.
- *Member of Program Committee, IEEE International Conference on Robotics and Automation (ICRA)* 2001.
- *Member of Program Committee, IEEE Conference on Intelligent Robots and Systems (IROS)* 2001.
- *Member of Program Committee, IEEE International Conference on Robotics and Automation (ICRA)* 2000.
- *Member of Program Committee, IEEE Conference on Control Applications* 2000

Feature Articles in UD Newspaper UDaily (also in local/national newspapers)

- *NSF Funds Research on Infants, Robots, Oct 13, 2008*
Weblink (<http://www.udel.edu/udaily/2009/oct/robots100708.html>)
- *Babies Driving Robots at University of Delaware, Nov 9, 2007*
Weblink (<http://www.udel.edu/PR/UDaily/2008/nov/robot110907.html>)
(Featured in many local and national newspapers, television shows, and internet sites)
- *Robots Help Stroke Patients, Sept 14, 2007*
Weblink (http://mechsys4.me.udel.edu/docs/robots_help_stroke_patients.pdf)
- *UD's Agrawal Recipient of Humboldt Award, May 3, 2007*
Weblink (<http://www.udel.edu/PR/UDaily/2007/may/humboldt050307.html>)
- *Small Devices Fly Like Birds, Jan 8, 2004 (UD Press Release)*
Weblink (<http://www.udel.edu/PR/NewsReleases/2004/jan/1-8-04/birds.html>)
(Featured in many local and national newspapers).
Video story featured by Discovery's Science Channel on the show *TechKnowledge*)
- *UD's Robotics Expert Receives Bessel Award in Berlin, Aug 4, 2003*
Weblink (<http://www.udel.edu/PR/UDaily/2004/engpages/agrawal.html>)
- *UD's Professor Wins Award to do Research in Germany, Feb 25, 2002*
Weblink (<http://www.udel.edu/PR/UDaily/01-02/agrawal022502.html>)
- *Executive Robots: Programming may Help Think in Space, Jan 9, 1997*
Weblink (<http://www.udel.edu/PR/UpDate/97/16/12.html>)
- *Seeking Relief for Parkinson's Sufferers - NSF-supported research aims to give tremor sufferers a steadier hand: NSF Engineering Online News, 2/2000.*

Publications

A. Books

- *Optimization of Dynamic Systems*, Kluwer Academic Publishers, Dordrecht, Hardbound, ISBN 0-7923-5681-0, April 1999, 240 pp.
Authors: Sunil K. Agrawal, University of Delaware & Prof. Brian C. Fabien, Mechanical Engineering, University of Washington, Seattle.
- *Differentially Flat Systems*, Marcel Dekker (Control Engineering Series) (Hardbound, ISBN 0-8247-5470-0, June 2004; Pages: 467)
Authors: Prof. Hebertt Sira-Ramirez, Department of Electrical Engineering, CINVESTAV-IPN, Mexico and Sunil K. Agrawal

B. Journal Papers: Under Review

- S. K. Agrawal, V. Dubey, J. Gangloff, E. Brackbill, and V. Sangwan, "Design and Optimization of a Cable-Driven Upper Arm Exoskeleton", Under Review for *Journal of Medical Devices, Transactions of the ASME*, 2009.
- Banala, S. K., Agrawal, S. K., Kulpe, A., Sangwan, V., Scholz, J., Krishnamurthy, V., Hsu, W. L., Kim, S. H., "Novel Gait Adaptation and Neuro-motor Training Results Using an Active Leg Exoskeleton (ALEX)", Under Review for *IEEE Trans. on Robotics*, 2009.

- V. Dubey and S. K. Agrawal, "Design of an Upper Arm Exoskeleton for Gravity Balancing and Minimization of Transmitted Forces", Under Review for *Mechanisms and Machine Theory*, 2009.
- Lynch A., Ryu, J.C., Agrawal, S., Galloway, J.C., "Power mobility training for an infant with spina bifida", Under review for *Physical Therapy*, 2009.
- Ryu, J. C. and Agrawal, S. K., "Planning and Control of Under-actuated Mobile Manipulators using Differential Flatness", Under Review for *Autonomous Robots*, 2009.
- Franch, J. and Agrawal, S. K., "On sufficient conditions to keep Differential flatness under addition of new inputs", Under Review for *International Journal of Control*, 2009.
- Sangwan, V., Ryu, J. C., and Agrawal, S. K., "Robustness of Flatness Based Controller Against Parametric Uncertainties for a Class of Under-Actuated Planar Robots", Under Review for *IEEE Trans. on Robotics*, 2009.
- Agrawal, S. K., Pathak, K., Franch, J., Lampariello, R. and Hirzinger, G., "A Differentially Flat Open-Chain Space Robot with Arbitrarily Oriented Joint Axes and Two Momentum Wheels at the Base", Under Review for *IEEE Trans. on Automatic Control*, 2009.
- Franch, J., Sangwan, V., and Agrawal, S. K., "Differential Flatness of a Class of Planar n-DOF Robot Manipulators Driven by 1 or 2 Actuators", Under Review for *IEEE Trans. on Automatic Control*, 2009.
- Tang, C. P., Miller, P. T., Krovi, V., Ryu, J. C. and Agrawal, S. K., "Kinematic Control of a Non-holonomic Wheeled Mobile Manipulators - A Differential Flatness Approach", Under Review for *Journal of Mechanisms and Robotics, Transactions of the ASME*, 2009.
- Ryu, J. C. and Agrawal, S. K., "Integrated Planning and Control of a Car-like Mobile Robot with Slip Using Differential Flatness", Under review for *IEEE Trans. on Control Systems Technology*, 2009.
- K. K. Mankala, S. K. Banala, and S. K. Agrawal, "Novel Swing-Assist Unmotorized Exoskeletons for Gait Training", Under review for *Journal of Neuro-Engineering and Rehabilitation*, 2009.

C. Refereed Journal Papers: Published or Accepted

2009

- S. K. Banala, S. H. Kim, S. K. Agrawal, J. P. Scholz, "Robot Assisted Gait Training with Active Leg Exoskeleton (ALEX)", *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, Vol. 17, No. 1, 2009, 2-8.
- S. H. Kim, S. K. Banala, S. K. Agrawal, V. Krishnamoorthy, and J. P. Scholz, "Robot-assisted Gait Training Aids Adaptation in Healthy Individuals", Accepted and under revision, *Experimental Brain Research*, 2009.
- M. McDonald and S. K. Agrawal, "Design of a Bio-Inspired Spherical Four-Bar Mechanism for Flapping-Wing Micro Air Vehicle Applications", Accepted and under Revision for *Journal of Mechanisms and Robotics, Transactions of the ASME*, 2009.
- A. Agrawal and S. K. Agrawal, "Design of Bio-Inspired Flexible Wings for Flapping-Wing MAV Applications", Accepted and under Revision for special issue on Biomimetics in *Advanced Robotics*, 2009.

2008

- S. K. Agrawal and V. Sangwan, "Differentially Flat Design of Under-Actuated Open-Chain Planar Robots", to appear in *IEEE Transactions on Robotics*, Vol. 24, No. 6, 2008, 1445-1450.
- V. Krishnamoorthy, W-L Hsu, W-L, T.M. Kesar, D. L. Benoit, S. K. Banala, S.K., R. Perumal, V. Sangwan, S. A. Binder-Macleod, S. K. Agrawal, and J. P. Scholz, "Gait Training following stroke: A pilot study combining a gravity-balanced orthosis device, functional electrical

stimulation and visual feedback”, *Journal of Neurologic Physical Therapy*, Vol. 232, December 2008, 192-202.

- A. P. Schmalz and S. K. Agrawal, “Dynamic Workspace and Active Tensegrity Structures”, *ASME Journal of Mechanical Design, Transactions of the ASME*, Vol. 130, December 2008.
- J. C. Galloway, J.C. Ryu, S. K. Agrawal, “Babies driving robots: Self-generated mobility in very young infants”, *Intelligent Service Robotics*, Vol. 1, No. 2, 2008, pp. 123-134 .
- K. K. Mankala and S. K. Agrawal, “Dynamic Modeling of a Satellite Tethered System using Newton’s Laws and Variational Principles”, *ASME Journal of Vibration and Acoustics*, Vol. 130, No. 1, Feb 2008, pp. 014501.
- J. Franch and S. K. Agrawal, “Design of Differentially Flat Planar Space Robots and Their Planning and Control”, *International Journal of Control*, 2008.
- J. C. Ryu, K. Pathak, and S. K. Agrawal, “Control of a Passive Mobility Assist Robot”, *Journal of Medical Devices, Transactions of the ASME*, Vol. 2, No.1, 2008, pp. 011002.
- J. C. Ryu, J. Franch, and S. K. Agrawal, “Motion Planning of a Tractor with a Steerable Trailer Using Differential Flatness”, *Journal of Nonlinear and Computational Dynamics, Transactions of the ASME*, Vol. 3, No. 3, 2008, pp 031003.
- S. K. Agrawal, V. Krovi, and M. O’Malley, “Editorial: Special Section on ASME IMECE ARDC 2006 machines for Human Assistance and Augmentation”, *International Journal of Robotics Research*, Vol. 27, No. 2, 2008, Page 231.

2007

- S. K. Agrawal, S. Banala, A. Fattah, V. Sangwan, V. Krishnamoorthy, J. P. Scholz, and W. L. Hsu, J. P. Scholz,, “Assessment of Motion of a Swing Leg and Gait Rehabilitation with a Gravity Balancing Exoskeleton”, *IEEE Transactions on Neural systems and Rehabilitation Engineering*, Vol. 15, No. 3, September 2007, p 410-420
- A. Agrawal and S. K. Agrawal, “An Energy Efficient Manipulator Design Approach: Application To A Leg In Swing Phase”, *Journal of Mechanical Design, Transactions of the ASME*, Vol. 129, No. 5, May, 2007, p 512-519
- K. K. Issac and S. K. Agrawal, “An investigation into the use of springs and wing motions to minimize the power expended by a pigeon-sized mechanical bird for steady flight”, *Journal of Mechanical Design, Transactions of the ASME*, Vol. 129, No. 4, April, 2007, p 381-389
- S. K. Agrawal and J. Ryu, “Design of Dissipative and Stable Assist Robots *Journal of Mechanical Design, Transactions of the ASME*, Vol. 129, December, 2007, p 1251-1255.
- A. Agrawal, V. Sangwan, S. Banala, S. K. Agrawal, and S. Binder-Macleod, “Design of a novel two degree-of-freedom ankle-foot orthosis”, *Journal of Mechanical Design, Transactions of the ASME*, v 129, n 11, November, 2007, p 1137-1143

2006

- S. Banala, S. K. Agrawal, A. Fattah, V. Krishnamoorthy, W. L. Hsu, J. P. Scholz, K. Rudolph, “Gravity Balancing Leg Orthosis and its Performance Evaluation”, *IEEE Trans. on Robotics*, Vol. 22, No. 6, 2006, 1228-1237.
- S. Oh., K. Pathak, S. K. Agrawal, H. R. Pota, and M. Garratt, “Approaches for a tether-guided landing of an autonomous helicopter”, *IEEE Transactions on Robotics*, Vol. 22, No. 3, 2006, 536-544.
- S. Oh and S. K. Agrawal, “Generation of Feasible Set Points and Control of a Cable Suspended Robot”, *IEEE Transactions on Robotics*, Vol. 22, No. 3, 2006, 551-558.
- A. Agrawal and S. K. Agrawal, “An Approach to Identify Joint Motions for Dynamically Stable Walking”, *Journal of Mechanical Design, Transactions of the ASME*, Vol. 128, May 2006, 649-653.
- A. Fattah and S. K. Agrawal, “Design of a passive gravity-balanced assistive device for sit-to-stand tasks”, *Journal of Mechanical Design, Transactions of the ASME*, Vol. 128, Sept 2006, 1122-1129.
- S. K. Agrawal and A. Fattah, “Motion control of a novel planar biped with nearly linear dynamics”, *IEEE Transactions on Mechatronics*, Vol. 11, Number 2, April 2006, 162-168.

- S. McIntosh, S. K. Agrawal, Z. A. Khan, "Design of a Mechanism for Biaxial Rotation of a Wing for a Hovering Vehicle", *IEEE Transactions on Mechatronics*, Vol. 11, Number 2, April 2006, 145-153.
- R. Madangopal, Z. A. Khan, and S. K. Agrawal, "Energetics Based Design of Small Flapping Wing Micro Air Vehicles", *IEEE Transactions on Mechatronics*, Vol. 11, No. 4, 2006, 433-437.
- K. Pathak and S. K. Agrawal, "Band-Limited Trajectory Planning and Tracking for certain Dynamically-Stabilized Autonomous Robots", *ASME Journal of Dynamic Systems Measurement and Control*, Vol. 28, 2006, 106-111.
- S. Oh, J. Ryu and S. K. Agrawal, "Dynamics and Control of a Helicopter Carrying a Payload using a Cable Suspended Robot", *Journal of Mechanical Design, Transactions of the ASME*, Vol. 128, September 2006, 1113-1121.
- S. Oh and S. K. Agrawal, "The feasible workspace analysis of a set point control for a cable-suspended robot with input constraints and disturbances", *IEEE Transactions on Control System Technology*, Vol. 14, No. 4, 2006, 735-742.
- A. Fattah and S. K. Agrawal, "On the Design of Reaction-less 3-DOF Planar Parallel Mechanisms", *Mechanisms and Machine Theory*, Vol. 41, No. 1, 2006, pp 70-82.
- K. K. Mankala and S. K. Agrawal, "Equilibrium-to-Equilibrium Maneuvers of Flexible Electrodynamic Tethers in Equatorial Orbits", *AIAA Journal of Spacecrafts and Rockets*, Vol. 43, No. 3, 2006, 651-658.
- Y. Zhang and S. K. Agrawal, "Lyapunov Controller Design for Transverse Vibration of a Cable-Linked Transporter System", *Multi-body System Dynamics*, Vol. 15, No. 3, 2006, 291-308.
- S. K. Agrawal, V. Krovi, and M. O'Malley, "Special Issue on Novel Robotics and Control – Guest Editorial", *IEEE Transactions on Mechatronics*, Vol. 11, Number 2, April 2006, 117-118
- S. K. Agrawal and V. Krovi, "Guest Editorial – Introduction to the Focused Section on Biomimetics and Novel Aspects in Robotics", *ASME Journal of Dynamic Systems Measurement and Control*, Vol. 28, 2006, 1-2.

2005

- A. Agrawal and S. K. Agrawal, "Design of Gravity Balancing Leg Orthosis Using Non-Zero Free Length Springs", *Mechanisms and Machine Theory*, Vol. 40, Issue 6, 2005, 693-709.
- R. Madangopal, Z. Khan, and S. K. Agrawal, "Biologically Inspired Design of Small Flapping Wing Air Vehicles Using Four Bar Mechanisms and Quasi-Steady Aerodynamics", *Journal of Mechanical Design, Transactions of the ASME*, Vol. 127, 2005, 809-816.
- S. Banala and S. K. Agrawal, "Design and Optimization of a Mechanism for Out of Plane Insect Wing Like Motion With Twist", *Journal of Mechanical Design, Transactions of the ASME*, Vol. 127, 2005, 841-844.
- K. Pathak and S. K. Agrawal, "An Integrated Path-Planning and Control Approach for Nonholonomic Unicycles using Switched Local Potentials", *IEEE Transactions on Robotics*, Vol. 21, No. 6, 2005, 1201-1207.
- K. Pathak, J. Franch, and S. K. Agrawal, "Velocity and Position Control of a Wheeled Inverted Pendulum by Partial Feedback Linearization", *IEEE Transactions of Robotics*, Vol. 21, No. 3, 2005, 505-513.
- Y. Hao and S. K. Agrawal, "Planning and Control of UGV Formations in a Dynamic Environment: A Practical Framework with Experiments", *Robotics and Autonomous Systems*, Vol. 51, 2005, 101-110.
- Y. Hao and S. K. Agrawal, "Formation Planning and Control of UGVs with Trailer", *Autonomous Robots*, Vol. 19, No. 3, 2005, 257-270.
- S. Oh, K. Mankala, S. K. Agrawal, and J. Albus, "Dynamic Modeling and Robust Controller Design of a 2-Stage Parallel Cable Robot", *Multi-body System Dynamics*, Vol. 13, No. 4, 2005, 385-399.
- S. Oh and S. K. Agrawal, "A Reference Governor Based Controller for a Cable Robot Under Input Constraints", *IEEE Transactions on Control Systems Technology*, Vol. 13, No. 4, 2005, 639-645.

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- A. Fattah and S. K. Agrawal, "On the Design of Planar Reaction-less Parallel Mechanisms", *ASME Mechanisms and Robotics Conference, IDETC*, 2004.

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- K. Mankala and S. K. Agrawal, "Dynamic Modeling and Simulation of Satellite Tethered Systems", in proceedings, *ASME Conference on Vibration and Noise, IDETC*, 2003.

- K. Mankala and S. K. Agrawal, "Dynamic Modeling and Simulation of Impact in Tether Net/Gripper Systems", In Proceedings, ASME Conference on Vibration and Noise, IDETC 2003.
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- Y. Hao, B. Laxton, S. K. Agrawal, E. Lee, and E. Benson, "Planning and Control of UGV Formations In a Dynamic Environment: A Practical Framework with Experiments", In proceedings, IEEE Conference on Robotics and Automation, Taipei, 2003.
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- S. K. Agrawal, J. Yan, and J. Franch, "Dynamics and Control of an Expanding Wheel Using Differential Flatness", In Proceedings, NATO ASI on Virtual Nonlinear Multi-body Systems, Prague, 2002.
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- Sunil K. Agrawal and T. Veeraklaew, "A New Procedure for Dynamic Optimization of a Class of Linear Systems with Boundary Constrains", In Proceedings, *3rd International Conference on Motion and Vibration control*, 1996.

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- Sunil K. Agrawal and R. Garimella, “Path Planning Algorithms for a Free-Floating Closed-Chain Planar Manipulators”, In Proceedings, *ASME 22nd Biennial Mechanisms Conference*, 1992.
- Sunil K. Agrawal and J. Rambhaskar, “Kinematics Singularities of Free-Floating Open-Chain Planar Manipulators”, In Proceedings, *ASME 22nd Biennial Mechanisms Conference*, 1992.
- Sunil K. Agrawal, G. Desmier, “Model of the Human Spine: Forward and Inverse Kinematics”, In Proceedings, *ASME 22nd Biennial Mechanisms Conference*, 1992.
- Sunil K. Agrawal, J. Gunasekera and J. C. Malas, “Optimization of Microstructure Evolution: Application to Extrusion”, In Proceedings, *ASME Winter Annual Meeting and Exposition*, 1992.
- Sunil K. Agrawal and S. Li, “Kinematics of the Human Spine: A Solid Model and Reachability Studies”, In Proceedings, *Advances in Bioengineering ASME Winter Annual Meeting*, 1992.
- Sunil Kumar Agrawal and R. Pandravada, “Inverse Kinematic solutions of a rolling disk between two planar manipulators”, In Proceedings, *ASME 22nd Biennial Mechanisms Conference*, 1992.

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- Sunil K. Agrawal, “Workspace Boundaries of In-parallel Manipulator Systems”, In Proceedings, *International Conference on Advanced Robotics*, 1991.
- Sunil K. Agrawal and R. Garimella, “Inverse kinematic solutions of free-floating closed-chain planar manipulators”, In Proceedings, *17th ASME Design Automation Conference*, 1991.
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- Sunil Kumar Agrawal, Rao Garimella, Glenn Desmier, “Optimal workspace designs of free-floating planar manipulators”, *NASA Technical Memorandum*, N. 103274, 1990, p 1653-1658.
- Sunil K. Agrawal, “Equations of Motion of In-Parallel Manipulator Systems”, In Proceedings, *Dynamic Systems and Control Division, ASME Winter Annual Meeting*, 1990.
- Sunil K. Agrawal, “Rate Kinematics of In-Parallel Manipulator Systems”, In Proceedings, *IEEE International Conference on Robotics and Automation*, 1990.
- Sunil K. Agrawal and B. Roth, “Statics of in-parallel manipulator systems”, In Proceedings, *21st ASME Biennial Mechanism Conference*, 1990.

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- C. W. Wampler and S.K. Agrawal, "An Implementation of Inverse Kinematic Functions for Control of A Redundant Wrist", In Proceedings, *IEEE International Conference on Robotics and Automation*, 1988.
- K.J. Waldron and S.K. Agrawal, "Impulsive Model for a Quadruped Running Machine", In Proceedings, *Dynamic System and Control Division, ASME Winter Annual Meeting*, 1988.
- O. Khatib and S. K. Agrawal, "Isotropic and Uniform Inertial and Acceleration Characteristics: Issues in the Design of Redundant Manipulators", In Proceedings, *IUTAM/IFAC Symposium*, 1988.

E. Patents and Applications:

- *Upper Arm Wearable Exoskeleton*, Provisional Patent Application submitted, Serial No. 61/100,407, 2008.
- *Intelligent Powered Mobility for Special Needs Children*, Provisional patent Application submitted, Serial No. 12/245,169, 2008.
- *Passive Swing Assist Exoskeletons for Motor-Incomplete Spinal cord Injury patients*, patent Application submitted, 2007.
- *Active Leg Exoskeleton for Gait Rehabilitation of Motor Impaired Patients*, Patent Application submitted, 2007.
- *Apparatus for Gravity Balancing Orthosis*, Provisional Application No. 11/113,729, April 25, 2005, Final patent application submitted.
- *Passive Gravity Balancing Assistive Device for Sit-to-stand Tasks*, Provisional Patent filed, May, 2005.
- *Two degree-of-freedom Ankle Foot Orthosis Device*, Provisional Patent Application No. 60/690,857, June 15, 2005.
- *Design of a Mechanism for Biaxial Rotation of a Wing for a Hovering Vehicle*, Provisional Patent Application Submitted, November 9, 2005.
- *Single Degree-of-freedom Polyhedral Expanding Structures*, Provisional Application No. 60/250,662, Feb. 2001.
- *Autonomous Rolling Robot*, US Patent No. 6,414,457 B1; Issued July 2, 2002.

Research Grants:

A. Active

- *Robot Enhanced Mobility: The Capacity for Your Infants To Learn Real World Navigation, And Its Effect On Perception, Action And Cognition Development*, **National Science Foundation**, Division of Behavioral and Cognitive Sciences, 2008-2010, (PI: Galloway and Co-PI: Agrawal), \$324,000.
- *Robotic Exoskeletons, FES, and Biomechanics: Treating Movement Disorders*, **National Institute of Health - Bioengineering Research Partnership Program (R01)**, 2008-2013, (PI: Agrawal, 3 other investigators from ME and PT), \$3,000,040.
- *Dynamic Design of Flapping Wing Near-Hover Micro Air Vehicles*, **National Science Foundation**, Dynamic Systems Program, 2006-2009, PI: Agrawal, Single Investigator grant, \$240,000.
- *RI: Collaborative Research: Robust Ornithopter Flight - From Engineering Models to Cooperative Indoor Maneuvers*, **National Science Foundation**, Robotics Program, 2007-2010, UD Single Investigator PI: Agrawal, \$290,000, (UC Berkeley PI: Ron Fearing).
- **Schlumberger Corporation Gift Program**, 2008, PI: Agrawal, \$60,000.

B. Pending

None

C. Supported

- *Passive Exoskeleton Designs for Swing Assistance of Spinal Cord Injury Patients*, **National Institute of Disability Research** subcontract through Rehab Institute of Chicago, 2006-2008, UD Single Investigator PI: Agrawal, \$110,000.

- *Development of an Exoskeletons for Passive Swing Assistance of Subjects with Stroke*, **National Institute of Health R24 Grant** through Rehab Institute of Chicago, 2006-2008, UD Single Investigator PI: Agrawal, \$90,000.
- *Aerodynamic Characterization and Design of Flapping Wing Micro Air Vehicles*, **Army Research Office**, 2005-2008, PI: Agrawal, Single Investigator Grant, \$213,000.
- *Planning, Simulation, and Control of a Rear-steered Mobile Vehicle: Robo-Chair*, **National Institute of Standards and Technology**, 2006-2007, PI: Agrawal, Single Investigator Project, \$48,750.
- *FES and Biomechanics: Treating Movement Disorders*, **National Institute of Health Biomechanics Research Partnership Program**, 2002-2007, Co-PI, *One of 6 investigators from UD*, \$3,105,867.
- *Cable Suspended Robots - Coordination, Control, and Configuration Design*, **National Science Foundation**, 2001-2006, PI: Agrawal (Single Investigator), Co-PI: Elena Messina: NIST Intelligent Systems Division, \$335,000.
- *Cooperative Unmanned Aerial Vehicles: Planning, Coordination, and Control*, **National Science Foundation**, 2000-2005, PI: Agrawal, Single Investigator project, \$220,000.
- *Tether Deployed Systems in Orbit: Dynamics, Simulation, and Control*, **NASA** (subcontract through Tennessee Tech. Univ.), 2004-2005, PI: Agrawal, Single Investigator Project, \$46,000.
- *Study of Effects of Wing Kinematics on Dynamics of Flapping Wing Micro Air Vehicles*, Short term Innovative Research Grant Award, **Army Research Office**, 2004-2005, PI, Single Investigator Project, \$30,000.
- *Trajectory Planning of Indoor and Outdoor Vehicles*, **National Institute of Standards and Technology**, 2003-2005, PI, Single Investigator Project, \$67,500.
- *Metrics for Intelligent Systems Design: Long Reach Material Handling Using Cable Cranes*, **NIST/MEL**, 2002-2005, PI: Agrawal, Single Investigator Project, \$75,000
- *Neutralization of Underground Buried Facilities*, **Air Force Research Laboratory (Munitions Directorate)**, Winner of National Campus Challenge Competition, 2003-2004, PI: Agrawal (two other collaborators), \$150,000.
- *Cooperative Munitions: Planning, Coordination, and Optimization*, **Air Force Research Laboratory**, 2000-2003, PI: Agrawal, Single Investigator Project, \$198,000.
- *Intelligent Software & Animation Tools for RCS Architecture Based Development*, *SBIR Phase 2 Subcontract to UD from Pathways Technology*, **NIST**, PI: Agrawal, Single Investigator Project, 2002-2004, *Single Investigator Project*, \$75,000.
- *Dynamic Schedulers for Automated Processing in Robot Work Cells*, **Dynamic Devices Inc. and Delaware Research Partnership Program**, 1999-2002, PI: Agrawal, Single Investigator Project, \$120,000.
- *New Technologies for Sub-Micro liter Fluid Handling in Biotech Applications*, **Dynamic Devices Inc. and Delaware Research Partnership**, 2001-2002, PI: Agrawal, *Single Investigator Project*, \$60,000.
- *Intelligent Software for Animation Tools for RCS Architecture Based Developments*, *SBIR Phase 1 Subcontract to UD from Pathways Technology*, **NIST**, 2000, PI: Agrawal, *Single Investigator Project*, \$25,000.
- *Presidential Faculty Fellows*, **National Science Foundation award from WHITE HOUSE**, 1994-2002, PI: Agrawal, *Single Investigator Project*, \$500,000.
- *Automated Optimal Trajectory Planner*, *SBIR Phase I Subcontract to UD from Analytical Mechanics Associates*, **National Science Foundation**, 1997, PI: Agrawal, *Single Investigator Project*, \$25,000.
- *A Study of Robots in a Free-floating Work Environment*, Dynamic Systems and Control Division, **National Science Foundation**, 1994 -1997, PI: Agrawal, *Single Investigator Project*, \$140,000.
- *A Study of Free-floating Closed-Chain Planar Manipulators*, Research Initiation Award, Dynamic Systems and Control Division, **National Science Foundation**, 1991-1993, PI: Agrawal, *Single Investigator Project*, \$80,000.

Post-Doctoral Scholars & Visitors (1996-date)

- Dr. H. Pota, 11/07 –12/07, Visiting Professor, Department of Electrical Engineering, University of New South Wales, University College, Canberra, Australia. (Research Topic: *Robust Control of Infinite Dimensional Systems*).
- Dr. J. Franch, 9/07-10/07, Visiting Scholar, Dept. of Applied Mathematics and Telematics, UPC, Spain. (Research Topic: *Differential Flat Designs of Under-actuated Robots*).
- Dr. Venkatesh Dubey, 4/07-10/07 and 4/08-10/08, Visiting Professor, Department of Industrial and Product Design, Bournemouth University, England. (Research Topic: *An Upper-arm Wearable Exoskeleton*)
- Dr. Abbas Fattah, 10/15/01-6/30/05, Visiting Professor, Department of Mechanical Engineering, Isfahan University of Technology, Iran. (Research Topic: *Rehabilitation Robots*)
- Prof. Kurien Issac, 6/04-5/05, Visiting Scholar, Department of Mechanical Engineering, Indian Institute of Technology, Bombay, India. (Research Topic: *Energy Efficient Designs of Flapping-wing Micro-Air Vehicles*).
- Dr. J. Franch, 9/05-10/05, Visiting Scholar, Dept. of Applied Mathematics and Telematics, UPC, Spain. (Research Topic: *Differential Flat Designs of Under-Actuated Space Robots*).
- Dr. Jay Kaupitiya, 1/05-2-05, Visiting Scholar, Dept. of Mechatronics, University of New South Wales. (Research Topic: *Robotic Wheelchair Navigation and Control*).
- Dr. Himanshu Pota, 12/04-1-05, Visiting Scholar, Dept. of Electrical Engineering, University of New South Wales. (Research Topic: *Tethered Helicopter Landing and Control*).
- Dr. J. Franch, 9/04-10/04, Visiting Scholar, Dept. of Applied Mathematics and Telematics, UPC, Spain. (Research Topic: *Differential Flat Designs of Spatial Space Robots*).
- Eduardo Rocon de Lima, 11/03-12/03, Visiting Scholar, Dept. of Industrial Automation, UPM, Spain. (Research Topic: *Tremor Suppression using Robotic Aids*).
- Dr. J. Franch, 10/03-11/03, Visiting Scholar, Dept. of Applied Mathematics and Telematics, UPC, Spain. (Research Topic: *Differential Flat Designs of Planar Space Robots*).
- Dr. A. Ferreira, 11/03-12/03, Visiting Scholar, Institute of Military Engineering, Department of Mechanics, Rio de Janeiro, Brazil. (Research Topic: *Dynamics and Control of Partial Feedback Linearizable Systems*).
- Dr. J. Franch, 9/1/02-9/31/02, Visiting Scholar, Dept. of Applied Mathematics and Telematics, UPC, Spain. (Research Topic: *Differential Flatness and Mechanical Systems*).
- Dr. T. Veeraklaew, 10/1/02-11/1/02, Visiting Scholar, Dept. of Mechanical Engineering, Royal Thai Military Academy, Bangkok. (Research Topic: *Dynamic Optimization*).
- Dr. D. Zlatanov, 12/7/02 – 1/15/03, Visiting Scholar, Dept. of Mechanical Engineering, Laval University, Canda. (Research Topic: *Classification of Convex Screw Sets*).
- Dr. J. Franch, 01/01-02/01, Visiting Scholar, Dept. of Applied Mathematics and Telematics, UPC, Spain. (Research Topic: *Feedback Linearization of Interconnected Systems*).
- Prof. H. Sira-Ramirez, 10/01-11/01, Visiting Professor, Department of Electrical Engineering, CINVESTAV, Mexico City, Mexico (Research Topic: *Flatness, Coordination, and Control*)
- Prof. Y. Caya, 10/01-11/01, Visiting Scholar, Department of Applied Mathematics, University of South Western Australia, Adelaide, Australia. (Research Topic: *Optimal Control in Biological Systems*)
- Dr. H. Pota, 12/00 –1/01, Visiting Professor, Department of Electrical Engineering, University of New South Wales, University College, Canberra, Australia. (Research topic: *Planning and Optimization of Cable-actuated Systems*).
- Dr. J. Franch, 8/00-9/00, Visiting Scholar, Dept. of Applied Mathematics and Telematics, UPC, Spain. (Research Topic: *Transformation of Optimal Control Lagrange Problems to Mayer Problems with Feedback Linearized State Equations*).
- M. A. Kroeger, 10/00-12/00, Visiting Scholar, Department of Systems and Control Engineering, Universidad Politecnica de Cartagena, Spain. (Research Topic: *Climbing Parallel Robots*).
- Dr. M. Schlemmer, 6/98-5/99, Feodor Lynen Scholar, Alexander von Humboldt Foundation, Germany. (Research Topic: *Optimal Planning of Dynamic Systems under Constraints*).

- H. Burkhardt, Visiting Scholar, 12/98 – 5/99, University of Stuttgart, Germany. (Research Topic: *Trajectory Optimization of Arienne Rockets*).
- Dr. F. Pfister, 3/97-2/98, Feodor Lynen Scholar, Alexander von Humboldt Foundation, Germany. (Research Topic: *Study of Spatial Mechanisms with Symmetry*).

Ph.D. Dissertations Supervised (1996-date):

- Banala, S., *Lower Extremity Exoskeletons for Gait Rehabilitation of Motor-Impaired Patients*, Dept. of Mechanical Engineering, University of Delaware, December 2007.
- Mankala, K., *Satellite Tethered Systems: Dynamics and Control*, Dept. of Mechanical Engineering, University of Delaware, May 2006.
- Oh, S., *Cable Suspended Robots: Control Approaches and Applications*, Dept. of Mechanical Engineering, University of Delaware, April 2006.
- Pathak, K., *Switched Potential Fields for Navigation and Control of Nonholonomic and Under-actuated Autonomous Mobile Robots*, Dept. of Mechanical Engineering, University of Delaware, Dec 2005.
- Zhang, Y., *Modeling and Control of a Flexible Cable Transporter System with Arbitrary Axial Velocity*, Dept. of Mechanical Engineering, University of Delaware, June 2004.
- Hao, Y., *A Practical Framework for Formation Panning and Control of Multiple Unmanned Ground Vehicles*, Dept. of Mechanical Engineering, University of Delaware, June 2004.
- Pledgie, S., *An Integrated Approach to the Design of Linear Dynamic Network based Systems*, Biomechanics and Movement Science, University of Delaware, Sept 2002.
- Ferreira, A., *Aspects of Flatness Based Optimal Planning and Control of Dynamic Systems*, Dept. of Mechanical Eng., University of Delaware, August 2001.
- Faiz, N., *Real-time and Optimal Trajectory Generation for Nonlinear Systems*, Dept. of Mechanical Engineering, University of Delaware, Feb 1999.
- Veeraklaew, T., *Extensions of Optimization Theory and New Computational Approaches for Higher-Order Dynamic Systems*, Dept. of Mechanical Engineering, University of Delaware, Dec. 1999. (Nominated as *Outstanding dissertation in Science and Engineering*, 1999-2000).
- Xu, X., *New Approaches to Optimization of Linear Time-Varying Systems and Classes of Nonlinear Systems*, Dept. of Mechanical Engineering, University of Delaware, Feb 1999.
- Annapragada, M., *Optimal N-body Operations in a Free-floating Work Environment*, College of Engineering, Ohio University, June 1999.

Current Ph.D. Students:

- Khan, Z., *Design of Flapping Wing Micro Air Vehicles*, Dept. of Mechanical Engineering, University of Delaware, Expected 12/08.
- Ryu, J., *Design and Control of Under-actuated Mobile Manipulators and other Wheeled Vehicles*, Dept. of Mechanical Engineering, University of Delaware, Expected 12/08.
- Sangwan, V., *Design of Bipedal Robots Using Differential Flatness and Limit Cycles*, Dept. of Mechanical Engineering, University of Delaware, Expected 2/09.
- Bhambhani, V., *Design of Upper Extremity Wearable Exoskeletons for Training and Assistance*, Dept. of Mechanical Engineering, University of Delaware, Expected 12/11.
- Mao, Y., *Modeling and Control of Infinite Dimensional Systems*, Dept. of Mechanical Engineering, University of Delaware, Expected 12/11.
- Chen, Xi, *Mobility Enhancement of Infants Using Robots*, Dept. of Mechanical Engineering, University of Delaware, Expected 12/11.

M.S. Students Supervised (1996-date, 15 theses supervised at Ohio University 1990-1995):

- Celenk, M., *Study of Gait Perturbation Using a Joint Locking Orthosis*, Dept. of Mechanical Engineering, University of Delaware, Expected 3/09.
- McDonald, M., *Design of a Single degree-of-freedom Spherical Mechanism for Flapping Wings in MAV Applications*, Dept. of Mechanical Engineering, University of Delaware, Expected 12/08.

- Agrawal, Arun, *Design of Bio-inspired Flexible Flapping Wings for MAV Applications*, Dept. of Mechanical Engineering, University of Delaware, 2008.
- Schmalz, A., *Classification, Analysis, and Control of Planar Tensegrity Structures for Robotic Applications*, Dept. of Mechanical Engineering, University of Delaware, Aug. 2006.
- Fader, J., *Design of a Novel, Four Degree of Freedom, Flapping Mechanism for Aerial Vehicles*, M. S. Thesis, Dept. of Mechanical Engineering, University of Delaware, August 2006.
- Agrawal, A., *Exoskeletal Orthosis: Design and Rehabilitation*, Dept. of Mechanical Engineering, University of Delaware, May 2005
- McIntosh, S., *Design of Flapping Mechanisms for Biaxial Rotation of the Wings for Micro Air Vehicles*, Dept. of Mechanical Engineering, University of Delaware, September 2005.
- Khan, Z., *Experimental Investigation and Modeling of Flapping Wing Aerodynamics*, M.S. Thesis, Dept. of Mechanical Engineering, University of Delaware, Jan 2005.
- Madangopal, R., *Energetics Based Design of Flapping Wing Micro Air Vehicles*, Dept. of Mechanical Engineering, University of Delaware, October 2004.
- Sleight, R., *Modeling and Control of an Autonomous HMMwV*, Dept. of Mechanical Engineering, University of Delaware, August 2004.
- Pusey, J., *Design of Cable Suspended Robots*, Dept. of Mechanical Engineering, University of Delaware, Dec 2003.
- Alp, A. Basar, *Cable-suspended Parallel Robots*, Department of Mechanical Engineering, University of Delaware, June 2001.
- Kumar, S., *Study of Single Degree-of-freedom Polyhedral Structures*, Dept. of Mechanical Engineering, University of Delaware, September 2001.
- Patel, S., *Dynamic Scheduling of Robotic Work Cells*, Dept. of Mechanical Engineering, University of Delaware, January 2001.
- Bhattacharya, S., *Design, Experiment, and Motion Planning of Spherical Rolling Robots*, Dept. of Mechanical Eng., University of Delaware, August 1999.
- King, B., *Towards Improvements in Physical Damping For Haptic Interfaces*, Dept. of Mechanical Engineering, University of Delaware, June 1999.
- Gokce, A., *Center of Mass of Linkages Using Auxiliary Parallelograms*, Dept. of Mechanical Engineering, University of Delaware, Dec. 1998.
- Pledge, S., *Tremor Suppression Through Force Feedback*, Biomechanics and Movement Science Program, University of Delaware, May 1998.
- Rao, R., *A Robotic Test-bed for Physical Therapy*, Dept. of Mechanical Engineering, University of Delaware, Dec. 1998.

Undergraduate Research Supervised (1996- date):

- Hadi Fattah, *Simulation of of Bipeds*, UD Science and Engineering Scholar, Summer 2005.
- Andy Seagraves, *Design of Grasshopper Motivated Robots*, UD Science and Engineering Scholar, Summer 2005.
- Matt McDonald, *Design and Prototyping of Flapping Wing Machines*, NASA Space Grant Scholar, Summer 2004.
- John Hamnett *Gravity Balanced Sit-to-stand Rehabilitation Machine*, UD Science and Engineering Scholar, Summer 2004.
- John Fitzgibbons, *Design of Leg Orthoses*, NASA Space Grant Scholar, 2003-2004.
- Benjamin Laxton, *Environment Mapping for Mobile Robot Groups Using Sonar Sensors*, 2003-2004.
- Mark Deaver, *Design and Prototyping of a Spatial Gravity Balanced Machine*, UD Science and Engineering Scholar, Summer 2003.
- Matt McDonald, *Design and Prototyping of Flapping Wing Machines*, UD Science and Engineering Scholar, Summer 2003.
- Lauren McIlwain, *Design of a Planar Cable Suspended Robot*, UD Science and Engineering Scholar, Summer 2002.

- John Fitzgibbons, *Design of a 3-Wheel Vehicle with Expanding Wheels*, UD Science and Engineering Scholar, Summer 2002.
- Sylvia Pineda, *Design of a Reaction-less Planar Robot*, Summer Intern, 2002.
- Benjamin Laxton, *Mapping the Environment of a Mobile Robot Using Sonar and IR Sensors*, UD Science and Engineering Scholar, Summer 2002.
- Jonathan Watts, *Design of a Hummingbird Flying Robot*, Summer Intern, 2002.
- Ed Lee, *Calibrating of a Camera Sensor for Mobile Robots*, Summer 2001.
- Jared Rochester, *Design of a Ground Vehicle with Expanding Wheels*, UD Science and Engineering Scholar, Summer 2001.
- David Forney, *Design for Sub-microliter Fluid Handling Pipettes*, UD Science and Engineering Scholar, Summer 2001.
- Ed Lee, *Programming of Groups of Wheeled Robots*, Summer 2001.
- Jason Pusey, *Design of a Cable Suspended Robot*, Summer 2000.
- Glen Gardner, *A Gravity Balanced Exercise Device*, Summer 1999. Winner of Nowinski Undergraduate Research Award, 2000.
- John Mercurio, *Expandagons: How They Function*, Winter 2000.
- Patrick Downey, *A Multi-Vehicle Lego Test-bed*, University of Delaware, UD Science and Engineering Scholar, Summer 1999.

Invitation to be a Session Chair at Conferences:

- ASME Mechanisms and Robotics Conference: 1990, 1992, 1994, 1998, 2000, 2002, 2004, 2005, 2006, 2007, 2008.
- IEEE Conference on Robotics and Automation (ICRA): 1996, 2000, 2001, 2002, 2003, 2004, 2005, 2007, 2008.
- American Control Conference (ACC): 1993, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005.

Middle/High School Programs:

- Designed and conducts the robotics module in *NewArc Academy*, a yearly summer program for 4th-8th grade students (1998-date)
- *Governor's School of Excellence* 1999-2006: Introduced robotics to high-school students.
- *MathCount* 1999-2005: Robotics demonstrations to school kids.

Course Offerings (2 a year selected as per the needs):

- MEEG 867 : Differential Flatness: Planning, Optimization, and Control
- MEEG 621: Optimization of Dynamic Systems
- MEEG 671: Introduction to Robotics
- MEEG 427: Systems Analysis and Control
- MEEG 311: Vibration and Control

Contributions to Local Chapter of the ASME:

- *Section Chairman, Delaware Region, 2003-2004*
- *Section Vice Chairman, Delaware Region, 2000-2002.*
- *Faculty Advisor, Student Chapter, Ohio University, 1991-1993.*