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I. EARNED DEGREES

1997, Ph.D. Mechanical Engineering, Massachusetts Institute of Technology
1992, M.S. Mechanical Engineering, Stanford University
1990, B.S. Mechanical Engineering, Massachusetts Institute of Technology

II. EMPLOYMENT

Georgia Institute of Technology (8/98 – present) Atlanta, GA
Professor of Mechanical Engineering (2014-Present). Associate Professor (2004-2014). Assistant Professor (1998-2004). Head of Automation and Mechatronics Group (2006-2010). Develop curriculum and teach courses in mechanical design, dynamics, controls, and rehabilitation engineering. Develop research programs and proposals. Direct research of graduate students, undergraduate students, and postdoctoral researchers in the areas of dynamics, vibration suppression, spacecraft control, crane control, and active seating technology. Advise SME, ASME, and CanSat student groups. Held visiting appointments at MIT, Stanford, the Tokyo Institute of Technology, and Polytechnic University of Madrid.

InVekTek, Inc. (12/15 – present) Atlanta, GA
Co-Founder and CTO. Develop and commercialize control systems for robotic and industrial material-handling systems. The control systems are embedded in motor drives to reduce unwanted machine motion.

Google, Inc. (9/15 – 12/19) Mountain View, CA
Pennington Advisor mechanical engineer to Google's augmented reality (Daydream) and Advanced Technology and Projects (ATAP) facilities. Perform mechanical design and analysis of consumer products and wearable devices. Perform failure and hazard analyses. Direct and perform research activities on human-motion measurement, human-machine interactions, actuation system design, and activity monitoring.

Stanford University (3/18 – 7/19) Stanford, CA
Visiting Professor in the Department of Mechanical Engineering. Deliver lectures on product design, safety analysis, and sensors. Advise student design teams.

CAMotion Cranes, Inc. (9/08 – 11/2013) Atlanta, GA
Co-Founder and Board Member. Developed and commercialized crane-control technology. Controllers improve crane safety, throughput, and ease of operation. Sold company to PaR Systems in Nov. 2013.

Massachusetts Institute of Technology (9/10 – 6/11) Cambridge, MA
Taught graduate-level controls course. Supervised research projects. Developed textbook on command-shaping control methods.

Polytechnic University of Madrid (5/10 – 8/10) Madrid, Spain

Taught course in manufacturing controls. Supervised construction of experimental equipment. Developed international collaborative research projects.

Tokyo Institute of Technology (10/05 – 4/06) Tokyo, Japan
Visiting Associate Professor in Center of Excellence in Robotics. Taught advanced control course. Conducted experiments with robotic crane. Developed research proposals with Japanese collaborators.

Massachusetts Institute of Technology (6/97 – 7/98) Cambridge, MA
Postdoctoral Fellow in the NSF Center for Innovation in Product Development. Directed the development of an internet-controlled machine. Conducted research in design process optimization. Taught senior-level design course.

Convolve, Inc. (4/92 - 8/94) Armonk, NY
Managed NSF sponsored research project investigating techniques for improving the measurement of manufactured parts. Developed computer simulations of several dynamic systems including: robots, coordinate measuring machines, car seats, and NASA weather balloons. Designed control systems for automated machines. Designed data acquisition system using a laser interferometer.

Apple Computers, Inc. (6/91 - 3/92) Santa Clara, CA
Designed and performance evaluation tests for the Audio-Visual 14" Monitor. Designed and constructed test equipment. Organized, interpreted and reported test results produced by product evaluation team. Made design recommendations based on test results and dynamic simulations.

Walt Disney World (Summer '90) Orlando, FL
Designed components for the Space Mountain rehabilitation project. Conducted tests and made design and maintenance recommendations for the Star Tours and Body Wars simulator cabin doors. Performed stress analysis of the Star Jets base plate and specified welds. Designed IR sensor mount and cable management for the Norway Pavilion water ride. Formulated repair procedures for Pirates of the Caribbean roller bearings.

Artificial Intelligence Laboratory (12/87 - 6/90) Cambridge, MA
Developed computer simulations of flexible robots. Performed research on a command shaping method to eliminate vibration in computer controlled machines. Performed robotic experiments to verify controller's robustness to modeling errors and changing configurations. Verified new control theory by performing simulations of the space shuttle's robotic arm. The control methods were tested on-orbit in Space Shuttle Endeavour.

Cable News Network (Summer '89) Atlanta, GA
AAAS Mass Media Science and Engineering Fellow. Wrote several stories for CNN Science and Technology. Field producer on stories covering the Starship 1 aircraft and an international climate study. Produced a story reporting on a car seat that lowers impact forces during head-on collisions.

Riverside Cement Company (Summer '88) Riverside, CA
Cement lab technician. Designed and performed experiments to test mechanical properties of cement. Operated a wide range of equipment including forklifts, cement pumps, sand sifters, trucks, climatic test chambers, and compression testing machines.

Bill's Asphalt Repair (8/85-8/87) Springfield, OR
Developed bids and executed construction projects involving asphalt and concrete structures. Operated heavy machinery including: dump trucks, paving machines, steam rollers, and compactors.

III. TEACHING

A. Individual Student Guidance

Postdoctoral Fellows

- 1) Dr. Kris Kozak. June '03-Dec. '03, "Development of a Hyperactive Seat." Currently at Southwestern Research Institute.
- 2) Dr. Joshua Vaughan. Jan. 2010–August 2012, "Development of an Aerospace Manufacturing Center." Currently professor at University of Louisiana-Lafayette.
- 3) Dr. Christopher Adams. Jan. '19-present, "Input Shaping Mobile Crane Controllers"

Ph.D. Students:

Current Students

- 1) Alison Jenkins, Started Spring '20

Graduated Students

Ph.D. Students:

- 1) Kris Kozak. Started Fall '99. Passed qualifier examination Fall '00. Ph.D. awarded May '03, "Investigation of Input Shaping for Parallel Manipulators." Currently at Southwestern Research Institute. (coadvised with Dr. Ebert-Uphoff).
- 2) Erika Biediger-Ooten. Started Fall '98. M.S. Dec. '00. Passed qualifier examination Fall '01. Ph.D. awarded May '05, "Vibration Reduction Using Command Generation in Formation Flying Satellites." Currently Engineer at Exxon-Mobil.
- 3) Mike Robertson. Started Fall '98. M.S. May '01. Passed qualifier examination Spring '02. Ph.D. awarded May '05, "Command Generation for Tethered Satellite Systems". Currently Professor at the Naval Academy
- 4) Joel Fortgang. Started Fall '99. M.S. May '02. Passed qualifier examination Spring '02. Ph.D. awarded May '06. "Combined Mechanical and Command Design for Micro-Milling Machines".
- 5) John Huey. Started Fall '01. M.S. August '03. Passed qualifier examination Fall '03. Ph.D. awarded August '06. "Concurrent Design of Feedback and Command Shaping Control". Currently Controls Engineer - GE Aviation.
- 6) Jason Lawrence. Started Fall '00. M.S. August '02. Passed qualifier examination Fall '03. Ph.D. awarded August '06. "Control of Tower Cranes", Currently Mechanical Engineer at Lexmark.
- 7) Joshua Vaughan. Started Fall '02. M.S. May '04, Ph.D. awarded August '08 "Dynamics and Control of Mobile Cranes". Currently professor at University of Louisiana-Lafayette.
- 8) Khalid Sorensen. Started Fall '03. M.S. May '05, Ph.D. awarded August '08. "Combined Feedback Control and Command Shaping of a Bridge Crane."
- 9) Adan Vela. Started Fall '06. Ph.D. awarded Dec. '11. "Bounds on Controller Taskload Implementing Conflict-Resolution Algorithms in an Airspace."
- 10) Kelvin Peng, Started Spring '08, Ph.D. awarded Dec. '13, "Methods for Improving Crane Performance and Ease of Use."
- 11) Ehsan Maleki, Started Fall '08, Ph.D. awarded Dec. '13, "Control of Human-Operated Machinery with Flexible Dynamics."
- 12) James Potter, Started Fall '09, Ph.D. awarded Dec. '13, "Input-Shaped Manual Control of Helicopters with Suspended Payloads."
- 13) Arto Kivila, Started Fall '13, Ph.D. awarded Aug. '17, "Modeling, Estimation and Control for Serial Flexible Robot Arms."
- 14) Daichi Fujioka, Started Fall '10, Ph.D. awarded Aug. '17, "Input-Shaped Model Reference Control for Flexible Systems."

- 15) Christopher Adams, Started Fall '12, Ph.D. awarded Dec. '18, "Modeling and Control of Backdrivable Flexible Systems"
- 16) Ali AlSaibie, Started Fall '12, Ph.D. awarded Dec. '18, "Mechatronic Design of Micro Autonomous Underwater Vehicles for Confined Spaces"
- 17) Arnolando Castro, Started Spring '16, Ph.D. awarded Dec. '19, "Dynamics and Control of Self-Balancing Transporters"

M.S. Students:

Current Students

- 1) Colin Lyman
- 2) Joo-Won Kang

Graduated Students

M.S. Students:

- 1) Mike Kenison. Graduated Dec. '99 - "Command Generation in Control System Design for Systems with Parameter Variations." Currently Development Engineer, Schlumberger.
- 2) Karen Grosser. Graduated May '00 - "Input Shaping for Telerobotic Manipulators." Currently Development Engineer, Schlumberger.
- 3) Erika Ooten. Graduated Dec. '00 - "Command Generation for Flexible Systems Using Numerator Dynamics and Sliding Mode Control." Currently Engineer at Exxon-Mobil.
- 4) Kris Kozak. Graduated Aug. '01 - "Dynamic Analysis of Parallel Manipulators and Digital Input Shaper Computation Using Linear Optimization." Currently a Post-doc at Tsinghua University.
- 5) Mike Robertson. Graduated May '01. "Methods for Generating Deflection-Limiting Commands." Currently Post-doc at Air Force Research Lab.
- 6) Joel Fortgang. Graduated May '02 - "Concurrent Design of Input Shaping and Vibration Absorbers."
- 7) Jason Lawrence. Graduated August '02 - "Using Input Shaping to Optimize Point-to-Point Motions in PD Controlled Systems with Coulomb Friction."
- 8) Raynald Eloundou. Graduated August '02 - "Investigation of Various Reference Commands for Vibration Reduction." Currently Mechanical Engineer at Hitachi.
- 9) John Huey. Graduated August '03. "Dynamics and Vibration Control of Large Area Manipulators."
- 10) Sam Klooster. Graduated Spring '04. "Design of an Active Safety Seat." Currently mechanical engineer at Lockheed Martin.
- 11) Joshua Vaughn. Graduated Spring '04. "Active and Semi-Active Control to Counter Vehicle Payload Variation." (coadvised with Dr. Nader Sadegh)
- 12) Khalid Sorensen. Graduated Spring '05. "A Combined Feedback and Command Shaping Controller for Improving Positioning and Reducing Cable Sway in Cranes"
- 13) Vlad Patrangenaru. Graduated Spring '06. "Design of Active Wheelchair Seats to Compensate for Extensor Tone in Children."
- 14) Azeem Meruani, Spring '06. "Tweel Technology Tires for Wheelchairs and Instrumentation for Measuring Everyday Wheeled Mobility"
- 15) David Blackburn. Graduated Summer '06. "Control of Space Tethers."
- 16) Jim Kitchen. Graduated Summer '06. "Design of an Dynamic Wheelchair Seat."
- 17) Ray Manning. Graduated Spring '08 "Improving the Control of Two-Mode Flexible Systems with Input Shaping"
- 18) Jon Danielson. Graduated Summer '08 "Mobile Boom Crane Dynamics and Control"

- 19) Andreas Rauch, Graduated Summer '08 "Stability Analysis of Mobile Boom Cranes"
- 20) Daichi Fujioka, Graduated Summer '10, "Dynamic Stability of Mobile Boom Cranes"
- 21) Kelvin Peng, Graduated Fall '09, "Interfaces and Control Systems for Intuitive Crane Control"
- 22) Ehsan Maleki, Graduated Summer '10, "Dynamics and Control of a Small-Scale Mobile Boom Crane"
- 23) Brice Pridgen, Graduated May '11, "Comparison of Polynomial Profiles and Input Shaping for Industrial Applications"
- 24) Arnaldo Castro, Graduated Summer '12, "Modeling and Dynamic Analysis of a Two-Wheeled Inverted-Pendulum"
- 25) Christopher Adams, Graduated Summer '12, "Modeling and Control of Helicopters Carrying Suspended Loads"
- 26) Eileen Hernandez, Graduated Fall '12, "Dynamic Characterization and Analysis of Aerial Lifts"
- 27) Arto Kivila, Graduated Aug. '13, "Touchscreen Interfaces for Machine Control and Education"
- 28) Alex Miller, Graduated Dec. '13, "Dynamics and Control of Dual-Hoist Cranes Moving Distributed Payloads"
- 29) Athony Garcia, Graduated Dec. '14, "Improved Friction, Contact and Dynamic Simulation Model to Study the Behavior of Payloads During Off-Centered Crane Lifts"
- 30) John Harber, Graduated May '16, "A Dual Hoist Robot Crane for Large Area Sensing"
- 31) Sima Rishmawi, Graduated May '16, "Tip-Over Stability Analysis of Crawler Cranes in Heavy Lifting Applications"
- 32) Yujia Yang Graduated May '17, "Automated Longitudinal Payload Lift-up Using Bridge Cranes"
- 33) Nickolas Johnson, Graduated May'17, "Control of a Folding Quadrotor with a Slung Load Using Input Shaping."
- 34) Franziska Schlagenhauf, Graduated Aug. '17, "A Kinematic Upper Body Model for Evaluating Clothing"
- 35) Xiaoshu Liu, Graduated Dec. '17, "Numerical Investigation of Affordable 2D Lidar Sensors for Autonomous Driving Under a Specially-Structured Driving Environment"

Undergraduate Research Assistants:

- 1) Kanako Abe, Hafeez Alam, Ulf Andresen, Derek Bastien, Fernando Bazerghi, Dustin Bergman, Dwayne Bobb (SURE - Morehouse College), Carrie Boles, Justis Brogan, Jeff Clement, Maria Cox (SURE), Jon Danielson, Chuck Devane, Raynald Eloundou, Adrian Erb (Swiss), Matthew Falkenberg (PURA), Brian Fatkin, Jonathon Fonseca, Craig Forest, Damien Gaudry, Terry Hall, Samir Idnani, Walker Inman, Taft Jones (SURE), Paul Jurek, Attir Khalid, Dooroo Kim, Jae-Hyung Kim, Nathan Knight, Bumsoo Lee, Caitlyn Leksana, Earl Lewis, Alan Martin, Timothy Melano (SURE – Berkeley), Ben Myers, Chad Nicholson, Patrick Opdenbosch, Adnan Pandjou, Jessica Powell, April Pritchard (SURE), Devshan Renganathan, Caroline Rhee, Nathan Ritz, Nick Sabogal, Prachi Sahoo, Dushyant Sharma, Varun Sharma (PURA), Kimberly Sheafe (SURE – Stanford), Anderson Smith (PURA), Jonathon Smith, Josh Spiers, Christoph Stäheli (Swiss), Lee Stokes, Art Terdpravat, Brandon Terrell, Rory Thomas (SURE – John Hopkins), Andrew Timm, Adam Vela (SURE – Berkeley), Rolf Weiss (Swiss), Amber Welsh, Kevin Yang, Aika Yano, Jieun Yoo.

B. Other Teaching Activities

- a) **Courses Developed:** *ME 6404 - Advanced Control System Design and Implementation.* Course was completely overhauled, updated, and expanded for the Fall of 2001. The result was essentially a new course. A book, *Command Generation for Dynamic Systems*, was written to compliment the course

curriculum. A portable robotic bridge crane was constructed so that this course could be taught at Georgia Tech Lorraine in the fall of 2004. Siemens sponsored the crane construction and also a two-day conference at GTL that centered on the crane and the associated curriculum development: <http://singhose.marc.gatech.edu/SiemensGTL/>. A portable tower crane was also constructed for the course. The tower crane was used at Tokyo Tech for 2 years. Students conducted remote operation tests via the internet. The course was also taught at MIT during the fall of 2010 in conjunction with Professor Warren Seering of MIT. The course was expanded in the fall of 2011 to include a distance learning curriculum that uses remote-operated labs.

- b) Laboratory Experiments Developed:** The new version of Advanced Control System Design and Implementation has a major laboratory component. An entire sequence of laboratory projects were developed for the course using the large bridge crane in the MARC building and hardware in the Love Building hydraulics laboratory. The crane in the MARC building has been equipped with oscillation-reducing technology that is taught in ME6404. The crane was also used as a testbed in the senior-level experimental engineering course, ME4055. Several laboratory projects were developed for ME2110, Creative Decisions and Design. A paper describing these developments was presented at the 2nd IFAC Conference on Mechatronic Systems. A two-week curriculum on PLC programming was developed along with PLC workstations to conduct laboratory activities. Hands-on control experiments for ME4452 (Control Systems) were developed to utilize the NI MyRIO controller along with a flexible-beam experimental setup.
- c) Interactive Instructional Materials Developed:** Dr. Singhose has developed interactive textbooks for both introductory mechanical design (with an emphasis on mechatronics) and advanced control system implementation (with an emphasis on command-shaping control). Features of interactive textbooks include: embedded videos that can be viewed with the tap of a finger, picture slideshows, user-controlled simulations, and interactive charts that accept user input and provide immediate feedback. Dr. Singhose has also developed a series of remote-operated experimental cranes and aerial lifts that have been used extensively in educational activities.

IV. SCHOLARLY ACCOMPLISHMENTS

A. Book and Book Chapters

- [1] J. Vaughan and W. Singhose, "Advances in Delays and Dynamics at Springer," in *The Influence of Time Delay on Crane Operator Performance*. 2014
- [2] W. Singhose, "Trajectory Planning for Flexible Robots," in *CRC Robotics and Automation Handbook*, T. Kurfess, Ed.: CRC Press, 2004.
- [3] W. Singhose and W. Seering, "Control of Flexible Manipulators with Input Shaping Techniques," in *Flexible Robot Manipulators: Modelling, Simulation and Control*, M. O. Tokhi and A. K. M. Azad, Eds. Stevenage, UK: The Institution of Engineering and Technology, 2008, pp. 235-257.
- [4] W. Singhose and J. Donnell, *Introductory Mechanical Design Tools*: www.lulu.com/content/3365814, 978-0-9842210-4-2, 2009.
- [5] W. Singhose, J. Donnell, and D. Frakes, *Introductory Biomechanical Design Tools*: www.lulu.com/content/8235890, 978-0-9842210-5-9, 2010.
- [6] W. Singhose and W. Seering, *Command Generation for Dynamic Systems*: www.lulu.com/content/621219, 978-0-9842210-0-4, 2010.
- [7] M. A. Lau and W. E. Singhose, "Optimal Control of Dynamical Systems," in *Applications of Spreadsheets in Education The Amazing Power of a Simple Tool*, M. L. a. S. Sugden, Ed.: Bentham Science Publishers Ltd., 2011, pp. 41-63.

- [8] W. Singhose, J. Donnell, and Y. Hu, *Introductory Mechanical Design Tools (in Chinese)*. Wuhan, China: Huazhong University of Science and Technology Press, 978-7-5609-7926-7, 2012.

B. Refereed Publications

Journal Articles

- [1] W. Singhose, W. Seering, and N. Singer, "Residual Vibration Reduction Using Vector Diagrams to Generate Shaped Inputs," *ASME J. of Mechanical Design*, vol. 116, no. June, pp. 654-659, 1994.
- [2] W. Singhose, K. Bohlke, and W. Seering, "Fuel-Efficient Pulse Command Profiles for Flexible Spacecraft," *AIAA J. of Guidance, Control, and Dynamics*, vol. 19, no. 4, pp. 954-960, 1996.
- [3] W. Singhose, S. Derezinski, and N. Singer, "Extra-Insensitive Input Shapers for Controlling Flexible Spacecraft," *AIAA J. of Guidance, Control, and Dynamics*, vol. 19, no. 2, pp. 385-91, 1996.
- [4] W. Singhose and N. Singer, "Effects of Input Shaping on Two-Dimensional Trajectory Following," *IEEE Trans. on Robotics and Automation*, vol. 12, no. 6, pp. 881-887, 1996.
- [5] W. Singhose, N. Singer, and W. Seering, "Improving Repeatability of Coordinate Measuring Machines with Shaped Command Signals," *Precision Engineering*, vol. 18, no. April, pp. 138-146, 1996.
- [6] L. Y. Pao and W. E. Singhose, "Verifying Robust Time-Optimal Commands for Multi-Mode Flexible Spacecraft," *AIAA J. of Guidance, Control, and Dynamics*, vol. 20, no. 4, pp. 831-833, 1997.
- [7] W. Singhose, A. Banerjee, and W. Seering, "Slewing Flexible Spacecraft with Deflection-Limiting Input Shaping," *AIAA J. of Guidance, Control, and Dynamics*, vol. 20, no. 2, pp. 291-298, 1997.
- [8] W. Singhose and L. Pao, "A Comparison of Input Shaping and Time-Optimal Flexible-Body Control," *IFAC Control Engineering Practice*, vol. 5, no. 4, pp. 459-467, 1997.
- [9] W. Singhose, L. J. Porter, T. D. Tuttle, and N. C. Singer, "Vibration Reduction Using Multi-Hump Input Shapers," *ASME J. Dynamic Systems, Measurement, and Control*, vol. 119, no. June, pp. 320-326, 1997.
- [10] W. Singhose, N. Singer, and W. Seering, "Time-Optimal Negative Input Shapers," *ASME J. Dynamic Systems, Measurement, and Control*, vol. 119, no. June, pp. 198-205, 1997.
- [11] W. E. Singhose, E. A. Crain, and W. P. Seering, "Convolved and Simultaneous Two-Mode Input Shapers," *IEEE Control Theory and Applications*, vol. 144, no. Nov., pp. 515-520, 1997.
- [12] W. E. Singhose, L. Y. Pao, and W. P. Seering, "Slewing Multi-Mode Flexible Spacecraft Using Zero Derivative Robustness Constraints," *AIAA J. of Guidance, Control, and Dynamics*, vol. 20, no. 1, pp. 204-206, 1997.
- [13] A. K. Banerjee and W. E. Singhose, "Command Shaping in Tracking Control of a Two-Link Flexible Robot," *AIAA J. of Guidance, Control, and Dynamics*, vol. 21, no. 6, pp. 1012-1015, 1998.
- [14] L. Y. Pao and W. E. Singhose, "Robust Minimum Time Control of Flexible Structures," *Automatica*, vol. 34, no. 2, pp. 229-236, 1998.
- [15] N. C. Singer, W. E. Singhose, and W. P. Seering, "Comparison of Filtering Methods for Reducing Residual Vibration," *European Journal of Control*, vol. 5, no. 2, pp. 208-219, 1999.
- [16] W. Singhose, B. Mills, and W. Seering, "Closed-Form Methods for Generating On-Off Commands for Undamped Flexible Structures," *AIAA J. of Guidance, Control, and Dynamics*, vol. 22, no. 2, pp. 378-82, 1999.

- [17] W. Singhose, T. Singh, and W. Seering, "On-Off Control with Specified Fuel Usage," *ASME J. Dynamic Systems, Measurement, and Control*, vol. 121, no. 2, pp. 206- 212, 1999.
- [18] K. Grosser and W. Singhose, "Command Generation for Reducing Perceived Lag in Flexible Telerobotic Arms," *JSME International Journal*, vol. 43, no. 3, pp. 755-761, 2000.
- [19] R. A. Masterson, W. E. Singhose, and W. P. Seering, "Setpoint Generation for Constant-Velocity Motion of Space-Based Scanners," *AIAA J. of Guidance, Control, and Dynamics*, vol. 23, no. 5, pp. 892-895, 2000.
- [20] W. Singhose, L. Porter, M. Kenison, and E. Kriikku, "Effects of Hoisting on the Input Shaping Control of Gantry Cranes," *IFAC Control Engineering Practice*, vol. 8, no. 10, pp. 1159-1165, 2000.
- [21] A. Banerjee, N. Pedreiro, and W. Singhose, "Vibration Reduction for Flexible Spacecraft Following Momentum Dumping with/without Slewing," *AIAA J. of Guidance, Control, and Dynamics*, vol. 24, no. 3, pp. 417-428, 2001.
- [22] M. Kenison and W. Singhose, "Concurrent Design of Input Shaping and Proportional Plus Derivative Feedback Control," *ASME J. of Dynamic Systems, Measurement, and Control*, vol. 124, no. 3, pp. 398-405, 2002.
- [23] U. Andresen and W. Singhose, "A Simple Procedure for Modifying High-Speed Cam Profiles for Vibration Reduction," *ASME J. of Mechanical Design*, vol. 126, no. Nov., pp. 1105-1108, 2004.
- [24] K. Kozak, I. Ebert-Uphoff, and W. Singhose, "Locally Linearized Dynamic Analysis of Parallel Manipulators and Application of Input Shaping to Reduce Vibrations," *ASME J. of Mechanical Design*, vol. 126, no. Jan., pp. 156-168, 2004.
- [25] W. Singhose, E. Biediger, Y.-H. Chen, and B. Mills, "Reference Command Shaping Using Specified-Negative-Amplitude Input Shapers for Vibration Reduction," *ASME J. of Dynamic Systems, Measurement, and Controls*, vol. 126, no. March, pp. 210-214, 2004.
- [26] J. Fortgang and W. Singhose, "Design Of Vibration Absorbers For Step Motions and Step Disturbances," *ASME J. of Mechanical Design*, vol. 127, no. March, pp. 160-163, 2005.
- [27] J. Fortgang and W. Singhose, "Concurrent Design of Vibration Absorbers and Input Shapers," *ASME J. Dynamic Systems, Measurement, and Control*, vol. 127, no. September, pp. 329-335, 2005.
- [28] J. Lawrence, W. Singhose, and K. Hekman, "Friction-Compensating Input Shaping for Vibration Reduction," *ASME J. of Vibration and Acoustics*, vol. 127, no. August, pp. 307-14, 2005.
- [29] T. Watanabe, H. A. Fujii, H. Kojima, and W. Singhose, "Design of Electric Current Profile for Electrodynamic Tether System by Input Shaping Method (In Japanese)," *J. of the Japan Society for Aeronautical and Space Sciences*, vol. 53, no. 623, pp. 569-576, 2005.
- [30] S.-W. Hong, V. Patrangenaru, W. Singhose, and S. Sprigle, "Identification of Human-Generated Forces on Wheelchairs During Total-Body Extensor Thrusts," *Clinical Biomechanics*, vol. 21, no. 8, pp. 790-798, 2006.
- [31] S.-W. Hong, V. Patrangenaru, W. Singhose, and S. Sprigle, "A Method for Identifying Human-Generated Forces During an Extensor Thrust," *Int. J. of Precision Engineering and Manufacturing*, vol. 7, no. 3, pp. 66-71, 2006.
- [32] A. Khalid, J. Huey, W. Singhose, J. Lawrence, and D. Frakes, "Human Operator Performance Testing Using an Input-Shaped Bridge Crane," *ASME J. of Dynamic Systems, Measurement, and Control*, vol. 128, no. 4, pp. 835-841, 2006.

- [33] K. Kozak, W. Singhose, and I. Ebert-Uphoff, "Performance Measures For Input Shaping and Command Generation," *ASME J. Dynamic Systems, Measurement, and Control*, vol. 128, no. 3, pp. 731-6, 2006.
- [34] J. d. J. Márquez, J. Fortgang, W. Singhose, and J. M. Perez, "Optimización del Proceso de Microfresado Mediante La Reducción de Vibraciones Empleando Técnicas de Generación de Ordenes de Movimiento," *Revista Internacional de Información Tecnológica*, vol. 17, no. 6, pp. 3-6, 2006.
- [35] M. Robertson, K. Kozak, and W. Singhose, "Computational Framework for Digital Input Shapers Using Linear Optimization," *IEE Control Theory and Applications*, vol. 153, no. 3, pp. 314-322, 2006.
- [36] W. Singhose, E. Biediger, H. Okada, and S. Matunaga, "Closed-Form Specified-Fuel Commands for On-Off Thrusters," *AIAA J. of Guidance, Control, and Dynamics*, vol. 29, no. 3, pp. 606-11, 2006.
- [37] W. Singhose, E. Biediger, H. Okada, and S. Matunaga, "Experimental Verification of Real-Time Control for Flexible Systems with On-Off Actuators," *ASME J. of Dynamic Systems, Measurement, and Controls*, vol. 128, no. 2, pp. 287-96, 2006.
- [38] W. Singhose, J. Lawrence, K. Sorensen, and D. Kim, "Applications and Educational Uses of Crane Oscillation Control," *FME Transactions*, vol. 34, no. 4, pp. 175-183, 2006.
- [39] K. A. Hekman and W. E. Singhose, "A Feedback Control System for Suppressing Crane Oscillation with On-Off Motors," *Int. Journal of Control, Automation, and Systems*, vol. 5, no. 3, pp. 223-233, 2007.
- [40] H. Kojima and W. Singhose, "Adaptive Deflection Limiting Control for Slewing Flexible Space Structures," *AIAA J. of Guidance, Control, and Dynamics*, vol. 30, no. 1, pp. 61-67, 2007.
- [41] S.-W. Park, S.-W. Hong, H.-S. Choi, and W. Singhose, "Discretization Effects of Real-Time Input Shaping in Residual Vibration Reduction for Precise XY Stage (in Korean)," *Trans. of the Korean Society of Machine Tool Engineers*, vol. 16, no. 4, pp. 71-78, 2007.
- [42] M. J. Robertson and W. E. Singhose, "Specified-Deflection Command Shapers for Second-Order Position Input Systems," *ASME J. Dynamic Systems, Measurement, and Control*, vol. 129, no. 6, pp. 856-859, 2007.
- [43] K. Sorensen, W. Singhose, and S. Dickerson, "A Controller Enabling Precise Positioning and Sway Reduction in Bridge and Gantry Cranes," *IFAC Control Engineering Practice*, vol. 15, no. 7, pp. 825-837, 2007.
- [44] Y.-G. Sung and W. Singhose, "Closed-Form Specified-Fuel Commands for Two Flexible Modes," *AIAA J. of Guidance, Control, and Dynamics*, vol. 30, no. 6, pp. 1590-6, 2007.
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- [307] J. Vaughan, J. Yoo, N. Knight, and W. Singhose, "Dynamics and Control of Multiple Cranes with a Connected Payload," in *Int. Congress on Sound and Vibration*, Vilnius, Lithuania, 2012.
- [308] J. Vaughan, J. Yoo, and W. Singhose, "Using Approximate Multi-crane Frequencies for Input Shaper Design," in *Int. Conference on Control, Automation and Systems*, Jeju, Korea, 2012.
- [309] B. Xiao, Q. Hu, and W. Singhose, "Adaptive Compensation Control for Spacecraft Attitude Stabilization with Actuator Misalignment and Faults," in *AIAA Guidance, Navigation, and Control Conference*, Minneapolis, MN, 2012.

- [310] C. Adams, W. Singhose, and D. Kim, "A System-Dynamics-Based Hazard Analysis of Inverted-Pendulum Human Transporters," in *ASME Dynamic Systems and Control Conference*, Stanford, CA, 2013.
- [311] A. AlSaibie and W. Singhose, "Experimental Testing of Liquid Slosh Suppression in a Suspended Container with Compound Pendulum Dynamics," in *Asian Control Conference*, Istanbul, Turkey, 2013.
- [312] A. Castro, C. Adams, and W. Singhose, "Dynamic Response Characteristics of a Two-Wheeled Inverted-Pendulum Transporter," in *IEEE Conf. on Decision and Control*, Florence, Italy, 2013.
- [313] D. Frakes, C. Zwart, and W. Singhose, "Analyzing Accident Videos with Optical Flow and Physically-Based Constraints," in *ASME Summer Bioengineering Conference*, Sunriver, OR, 2013.
- [314] Y. Hu, W. Singhose, B. Wu, L. Zhou, and L. He, "Practice Competence Training in Mechatronics Engineering Education under the Cooperation Project Between HUST and GATECH," in *Int. Conference on Engineering Education and Research*, Marrakesh, Morocco, 2013.
- [315] Y. Hu, B. Wu, J. Vaughan, and W. Singhose, "Oscillation Suppression for an Energy Efficient Bridge Crane Using Input Shaping " in *Asian Control Conference*, Istanbul, Turkey, 2013.
- [316] A. Kivila, C. Porter, and W. Singhose, "Human Operator Studies of Portable Touchscreen Crane Control Interfaces," in *IEEE Int. Conference on Industrial Technology* Cape Town, South Africa, 2013.
- [317] A. Kivila and W. Singhose, "Touchscreen Crane Control Interfaces with Oscillation Suppression," in *IEEE Conf. on Decision and Control*, Florence, Italy, 2013.
- [318] E. Maleki and W. Singhose, "Maximizing the Swing of a Human-Operated Wrecking Ball," in *IEEE Int. Conference on Industrial Technology*, Cape Town, South Africa, 2013.
- [319] E. Maleki, W. Singhose, J. Hawke, and J. Vaughan, "Dynamic Response of a Dual-Hoist Bridge Crane," in *ASME Dynamic Systems and Control Conference*, Stanford, CA, 2013.
- [320] K. C.-C. Peng and W. Singhose, "Low-Oscillation Command Switch-Times for Relay-Driven Cranes with Asymmetrical Acceleration and Deceleration," in *Asian Control Conference*, Istanbul, Turkey, 2013.
- [321] J. J. Potter, C. J. Adams, and W. Singhose, "An Experimental Remote-Controlled Helicopter with Suspended Load," in *2013 Int. Symp. on Mechatronics and its Applications*, Amman, Jordan, 2013.
- [322] J. J. Potter, R. Simpson, and W. Singhose, "Dynamic Modeling and Simulation of a Remote-Controlled Helicopter with a Suspended Load," in *ASME Dynamic Systems and Control Conference*, Stanford, CA, 2013.
- [323] W. Singhose, J. Donnell, and A. Kivila, "Development of an Interactive Textbook for Introductory Mechanical Design," in *Int. Symp. on Mechatronics and its Applications*, Amman, Jordan, 2013.
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- [325] D. Fujioka and W. Singhose, "Control Effort Reduction Analysis of Zero-Vibration Model Reference Control for Controlling a Nonlinear Plant," in *American Control Conference*, Portland, OR, 2014.
- [326] Y. Hu, L. Ling, T. Kurfess, W. Singhose, and B. Wu, "International Collaboration Teaching Method for Mechatronic Innovation Decision-making and Design Tools," in *International Conference on Engineering Education and Research*, Hamilton, Canada, 2014.

- [327] Y. Hu, W. Singhose, T. Kurfess, B. Wu, J. R. Mayor, and J. A. Donnell, "Introductory Mechatronics Creative Decision and Design Tools—the Design and Realization of a Mechatronics Course," in *ICEE/ICIT Conference on Engineering Education and International Conference on Information Technology*, Riga, Latvia, 2014.
- [328] H. Liu and W. Singhose, "Tip-over stability of crawler cranes with moveable counterweights," in *International Scientific Conference Heavy Machinery*, Zlatibor, Serbia, 2014.
- [329] A. Miller, P. Sarvepalli, and W. Singhose, "Dynamics and Control of Dual-Hoist Cranes Moving Triangular Payloads," in *ASME Dynamic Systems and Control Conference*, San Antonio, TX, 2014.
- [330] J. Potter, W. Singhose, A. AlSaibie, and A. Kivila, "Fostering Global Collaboration between Engineering Students through a Robotic Design Competition," in *Hawaii Education and STEM Conference*, Honolulu, HI, 2014.
- [331] J. J. Potter and W. Singhose, "Reduced-Modification Input Shapers for Manually Controlled Systems with Flexibility," in *American Control Conference*, Portland, OR, 2014.
- [332] W. Singhose, J. Donnell, and A. Kivila, "An Interactive Textbook for Introductory Engineering Design," in *Int. Conference on Computer Supported Education*, Barcelona, Spain, 2014.
- [333] W. Singhose, D. Kim, and J. Vaughan, "Post-Ejection Failure Mode of Post Driving Machines," in *International Scientific Conference Heavy Machinery*, Zlatibor, Serbia, 2014.
- [334] W. Singhose, A. Kivila, and W. Seering, "Development of an Interactive Textbook for Command-Shaping Control Methods," in *Hawaii Education and STEM Conference*, Honolulu, HI, 2014.
- [335] D. Fujioka, M. Shah, and W. Singhose, "Robustness Analysis of Input-Shaped Model Reference Control on a Double-Pendulum Crane," in *American Control Conference*, Chicago, IL, 2015.
- [336] D. Fujioka and W. Singhose, "Input-Shaped Model Reference Control of a Nonlinear Time-Varying Double-Pendulum Crane," in *Asian Control Conference*, Kota Kinabalu, Malaysia, 2015.
- [337] D. Fujioka and W. Singhose, "Performance Comparison of Input-Shaped Model Reference Control on an Uncertain Flexible System," in *IFAC Workshop on Time Delay Systems*, Ann Arbor, MI, 2015.
- [338] A. Garcia, W. Singhose, and A. Ferri, "Dynamics and Control of Off-Centered Crane Lifts," in *Asian Control Conference*, Kota Kinabalu, Malaysia, 2015.
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- [341] Y. Hu, T. Kurfess, W. Singhose, D. Frakes, and B. Wu, "Design of a Hands-on Mechatronic Project Integrated into an Introductory Course," in *19th Int. Conf. on Engineering Education*, Zagreb, Croatia, 2015.
- [342] A. Kivila, J. Potter, and W. Singhose, "Manual Tracking Using Touchscreen Interfaces," in *Asian Control Conference*, Kota Kinabalu, Malaysia, 2015.

- [343] R. Mar, A. Goyal, V. Nguyen, T. Yang, and W. Singhose, "Combined Input Shaping and Feedback Control of a Double-Pendulum System Subject to External Disturbances," in *Dynamic Systems and Control Conference*, Columbus, OH, 2015.
- [344] K. Peng and W. Singhose, "Prediction and Measurement of Payload Swing from Off-Centered Crane Lifts," in *ASME IDETC, 11th International Conference on Multibody Systems, Nonlinear Dynamics, and Control*, Boston, MA, 2015.
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- [346] S. Rishmawi and W. Singhose, "Static Tip-Over Stability of Crawler Cranes with Moveable Counterweights," in *International Conference on Material Handling, Constructions and Logistics*, Vienna, Austria, 2015.
- [347] W. Singhose, K. Peng, A. Garcia, and A. Ferri, "Dynamics and Control of Crane Payload Lift-off and Lay-down Operations," in *International Conference on Material Handling, Constructions and Logistics*, Vienna, Austria, 2015.
- [348] Y. Hu, D. Han, L. Ling, T. Kurfess, W. Singhose, and J. Vaughan, "Case Study: Comparison of Project-based, Creative Engineering Courses at Georgia Tech and Huazhong University of Science and Technology," in *Int. Conf. on Engineering Education and Research*, Sydney, Australia, 2016.
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- [350] A. S. Miller, W. Singhose, and U. Glauser, "Integrating PLC Theory and Programming into Advanced Controls Courses," in *American Control Conference*, Boston, MA, 2016.
- [351] S. Rishmawi and W. Singhose, "Control of Robotic Crawler Cranes in Tandem Lifting Operations," in *Future Technologies Conference*, Vancouver, Canada, 2017.
- [352] F. Schlagenhauf, P. P. Sahoo, and W. Singhose, "Comparison of Single-Kinect and Dual-Kinect Motion Capture of Upper-Body Joint Tracking," in *Asian Control Conference*, Gold Coast, Australia, 2017.
- [353] A. Castro, A. AlSaibie, A. Kivila, and W. Singhose, "A Rocket-Launched Folding Quadrotor," in *Submitted to the 2017 International Conference on Unmanned Aircraft Systems*, Miami, FL.
- [354] A. Castro, W. Singhose, X. Liu, K. Sorensen, and E. C. Kwak, "Modeling and Experimental Testing of Hoverboard Dynamic Behavior," in *ASME Dynamic Systems and Control Conference*, Tysons Corner, Virginia, 2018.
- [355] S. Grazioso, G. D. Gironimo, W. Singhose, and B. Siciliano, "Input Predictive Shaping for Vibration Control in Flexible Systems," in *IEEE Conference on Control Technology and Applications*, Kohala Coast, Hawai'i, USA, 2017.
- [356] N. Johnson and W. Singhose, "Dynamics and Modeling of a Quadrotor with a Suspended Payload " in *Accepted to the 2018 Applied Aerodynamics Conference*, Atlanta, GA.
- [357] A. Kivila, W. Book, and W. Singhose, "Modeling Spatial Multi-link Flexible Manipulator Arms Based on System Modes," in *Submitted to the 2017 IEEE Conference on Decision and Control*, Melbourne, Australia.
- [358] P. P. Sahoo and W. Singhose, "Effects of Input Shaping on Impact Loads During Collisions Involving Flexible Robots," in *Accepted to the 2018 IEEE ICCA*, Anchorage, Alaska.
- [359] F. Schlagenhauf and W. Singhose, "Comparison of Sway Reduction Controllers for Construction Cranes," in *Accepted to the 2018 IEEE ICCA*, Anchorage, Alaska.

- [360] F. Schlagenhauf, S. Sreeram, and W. Singhose, "Comparison of Kinect and Vicon Motion Capture of Upper-Body Joint Angle Tracking," in *Accepted to the 2018 IEEE ICCA*, Anchorage, Alaska.
- [361] K. Sorensen and W. Singhose, "Wheeled Inverted Pendulum Control and Slip Dynamics," in *Accepted to the 2018 IEEE ICCA*, Anchorage, Alaska.

Other Publications

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- [364] W. Singhose and N. Singer, "Initial Investigations into the Effects of Input Shaping on Trajectory Following," in *American Control Conference*, Baltimore, MD, 1994, vol. 3, pp. 2526-32.
- [365] W. E. Singhose and N. C. Singer, "Improving Coordinate Measuring Machine Repeatability with Input Shaping," in *NSF Design and Manufacturing Grantees Conf.*, Cambridge, MA, 1994, pp. 467-8.
- [366] A. K. Banerjee and W. E. Singhose, "Minimum Time Fuel Efficient Maneuver of Flexible Spacecraft with Vibration Amplitude Constraint," in *AAS Astrodynamics Specialist Conf.*, Halifax, Nova Scotia, 1995, vol. AAS 95-318.
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- [371] W. E. Singhose, W. P. Seering, and A. Banerjee, "An Evaluation of Fuel-Efficient On-Off Input Shaping with Deflection Limiting," in *AIAA/AAS Astrodynamics Specialist Conf.*, San Diego, CA, 1996.
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- [373] H. J. S. Feder, W. E. Singhose, and W. P. Seering, "Input Shaping for Collision Avoidance with Robotic Manipulation of Suspended Payloads," in *11th Symposium on Structural Dynamics and Control*, Blacksburg, VA, 1997.
- [374] N. Singer, W. Singhose, and E. Krikkku, "An Input Shaping Controller Enabling Cranes to Move Without Sway," in *ANS 7th Topical Meeting on Robotics and Remote Systems*, Augusta, GA, 1997, vol. 1, pp. 225-231.
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- [377] A. Banerjee and W. Singhose, "Vibration Reduction for Flexible Spacecraft Following Momentum Dumping with/without Slewing," in *AAS/AIAA Astrodynamics Specialist Conference*, Girdwood, AK, 1999.
- [378] L. French, W. Singhose, and W. Seering, "An Expert System for the Design of Input Shapers," in *IEEE Conference on Control Applications*, Kohala, Hawaii, 1999.
- [379] K. Grosser and W. Singhose, "Command Generation for Flexible Telerobotic Arms," in *International Symposium on Motion and Vibration Control in Mechatronics*, Tokyo, Japan, 1999.
- [380] E. Ooten and W. Singhose, "Time-Optimal Commands for Sequential Motions of Flexible Systems with Numerator Dynamics," in *International Symposium on Motion and Vibration Control in Mechatronics*, Tokyo, Japan, 1999.
- [381] M. Robertson and W. Singhose, "Initial Guess Schemes for Generating Deflection-Limiting Commands," in *AAS/AIAA Astrodynamics Specialist Conference*, Girdwood, AK, 1999.
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- [385] D. Frakes and W. Singhose, "Geometrically Constrained Optical-flow Based Tracking for the Extraction of Kinematic Data from Video," in *Fifth Int. Symp. on Computer Methods in Biomechanics and Biomedical Engineering*, Rome, Italy, 2001.
- [386] K. Kozak, I. Ebert-Uphoff, P. A. Voglewede, and W. Singhose, "Concept Paper: On the Significance of the Lowest Linearized Natural Frequency of a Parallel Manipulator as a Performance Measure for Concurrent Design," in *Workshop on Fundamental Issues and Future Research Directions for Parallel Mechanisms and Manipulators*, Quebec City, Quebec, Canada, 2002.
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- [391] W. Singhose, M. Robertson, T. Watanabe, H. Kojima, and A. Banerjee, "Tether-Based Actuators for Space Applications," in *2003 International Workshop on Advanced Sensors, Structural Health Monitoring, and Smart Structures*, Yokohama, Japan, 2003.

- [392] T. Watanabe, T. Makida, H. A. Fujii, H. Kojima, and W. Singhose, "An Application of Input Shaping for Electrodynamic Tether System," in *AIAA/AAS Astrodynamics Specialist Conference*, Providence, Rhode Island, 2004.
- [393] A. Banerjee, W. Singhose, and D. Blackburn, "Orbit Boosting of an Electrodynamic Tethered Satellite with Input-Shaped Current," in *AAS/AIAA Astrodynamics Specialist Conference*, Lake Tahoe, CA, 2005.
- [394] W. Singhose and D. Kim, "Robustness of Command-Shaping Control on Flexible Systems," in *Spring Research Conference on Statistics in Industry and Technology*, Chicago, IL, 2011.

D. Invited Presentations

Keynote and Plenary Lectures

- 9/23/15 "Dynamics and Control of Crane Payload Lift-off and Lay-Down Operations", XXI Triennial Int. Conference on Material Handling, Constructions, and Logistics, Vienna, Austria
- 10/27/14 "Using Mechatronics to Improve Human Operation of Complex Dynamic Systems", Int. Conference on Mechanics and Control Engineering, Asheville, NC
- 10/18/12 "Improving Human Operation of Oscillatory Dynamic Systems", Int. Conference on Control, Automation and Systems, Jeju, South Korea
- 10/19/06 "Crane Oscillation Control: Applications and Educational Uses", Int. Conference on Material Handling, Constructions, and Logistics, Belgrade, Serbia

Other Invited Lectures

- 3/2/20 "Legal Considerations of Sensor use in Emerging Technology," Google, Mountain View, CA
- 4/24/19 "Ethical Considerations of Sensor Use," Stanford University, Palo Alto, CA
- 11/29/18 "Killer Robots: Why You Will not be Owning a Self-Driving Car", Stanford University, CA
- 10/12/18 "Georgia Tech ARLISS Team", University of Oregon, Eugene, OR
- 2/26/18 "Command Generation for Flexible Systems", University of California, Berkeley, Berkeley, CA
- 10/3/16 "Oscillation Control Using Input Shaping Technology", Hankyong University, Anseong, South Korea
- 9/29/16 "Input Shaping Control Technologies", Shanghai Jiao Tong University, Shanghai, China
- 4/21/16 "Improving Manufacturing Machines with Command Shaping", Mercedes Manufacturing Facilities, Vance, AL
- 1/25/16 "Commercialization of University-Developed Technology", University of Chicago Booth School of Business, Chicago, IL
- 9/25/15 "Applications of Input Shaping Control Methods", Czech Technical University, Prague, Czech Republic
- 3/25/15 "Oscillation Control of Suspended Loads Using Command Shaping", Boeing BR&T – Vertical Lift, Mesa, AZ
- 1/22/15 "Building a Culture of Active Learning in Mechatronics", Kumoh National Institute of Technology, Gumi, South Korea
- 1/19-1/23/15 "Special Lectures on Mechatronics by Foreign Distinguished Professor", Kumoh National Institute of Technology, Gumi, South Korea
- 9/26/14 "Building a Culture of Active Learning", Georgia Tech Zeigler Lecture
- 8/4/14 "NI myRIO Design Real Systems, Fast: 2014 Student Project Success", Panelist, NI Week, Austin, TX
- 3/19/14 "Input Shaping for Oscillation Reduction in the Digital World", Auburn University
- 11/16/13 "Improving Machine Motion with Command Shaping", Wuxi Zhong Ding Logistics, Wuxi, China

11/14/13 “Improving Manufacturing Machines with Command Shaping”, HUST-Wuxi Research Institute, Wuxi, China

11/13/13 “Analyzing Accident Videos of Inverted-Pendulum Human Transporters”, Huazhong University of Science and Technology, Wuhan, China

4/15/13 “Control of Large Flexible Spacecraft, Robots, and Cranes”, Budapest University of Technology and Economics, Budapest, Hungary

4/15/13 “Recue Robot: An International Student Design Collaboration”, University of Patras, Patras, Greece

10/17/12 “Active Learning Methods for Mechanical Engineering”, Yeungnam College, Daegu, South Korea

6/26/12 “Command-Shaping Control of Flexible Aerospace Systems”, Beijing Institute of Technology Beijing, China

6/18-21/12 “Introductory Creative Decision and Design Tools for Mechatronics”, Huazhong University of Science and Technology, Wuhan, China

11/8/11 “Advanced Crane Control to Improve Safety and Ergonomics”, Boeing Research and Technology Ergonomics Road Show, Everett, WA

5/6/11 “Creative Decisions and Design: An Innovative Design Course at Georgia Tech”, Aalto University, Helsinki, Finland

4/25/11 “Creative Decisions and Design: An Innovative Design Course at Georgia Tech”, Chosun University, Gwangju, Korea

4/21/11 “Controlling Large Flexible Structures with Command Shaping”, Konkuk University, Seoul, Korea

4/19/11 “Command Shaping Control of Large Flexible Structures”, Shanghai Maritime University, Shanghai, China

4/18/11 “Creative Decisions and Design: An Innovative Design Course at Georgia Tech”, Huazhong University of Science and Technology, Wuhan, China

4/18/11 “Controlling Large Flexible Structures with Command Shaping”, Huazhong University of Science and Technology, Wuhan, China

4/1/11 “Command Shaping Control of Large Flexible Systems”, University of Parma, Parma, Italy

7/12/10 “Command Shaping Control of Large Flexible Systems”, University Carlos III, Madrid, Spain

6/18/10 “Advanced Crane Control Lab at Georgia Tech”, KoneCranes, Hyvinkää, Finland

5/3/10 “Command Shaping Control of Flexible Systems”, University Castilla-La Mancha, Ciudad Real, Spain

12/16/09 “Control of Cranes and Spacecraft using Command Shaping”, University of Sydney, Sydney, Australia

11/25/09 “The ASU Experience: Interfacing with the Machines“, Arizona State University, Tempe, AZ

11/25/09 “Interfaces and Control Systems for Intuitive Crane Control”, Arizona State University, Tempe, AZ

10/6/09 “Using Competitions in Mechatronics Engineering Education at Georgia Tech”, Chosun University, Kwangju, Korea

4/20/09 “Advanced Command Shaping Control of Cranes, Robots, and Spacecraft”, Instituto Automatico de Industriales, Madrid, Spain

11/25/08 “Command Shaping Control of Cranes, Robots, and Spacecraft”, Kyung Hee University, Suwon, Korea.

11/24/08 “Command Shaping Control of Cranes, Robots, and Spacecraft”, Seoul National University, Seoul, Korea.

11/21/08 “Command Shaping Control of Cranes, Robots, and Spacecraft”, Korean Atomic Energy Research Institute, Deajon, Korea.

11/20/08 “Control of Tip-Over Instability”, Kumoh National Institute of Technology, Gumi, Korea.

8/10/08 “Engineering Teaching Methods at Georgia Tech”, Shandong Jianzhu University, Jinan, China.

8/10/08 “Using Command Shaping to Control Robots, Spacecraft, and Cranes”, Shandong Jianzhu University, Jinan, China.

8/8/08 “Control of Robots, Spacecraft, and Cranes Using Command Shaping”, Northeastern Forest University, Harbin, China.

8/7/08 “Engineering Teaching Methods at Georgia Tech”, Northeastern Forest University, Harbin, China.

8/4/08-8/8/08 “Command Shaping for Dynamic Systems”, Harbin Institute of Technology, Harbin, China.

5/28/07, “A Design Course at Georgia Tech: Creative Decisions & Design”, Center of Excellence in Robotics, Kumoh National Institute of Technology, Gumi, Korea.

5/24/07, “Making Robots and Cranes Move Very Fast with Command Shaping”, Northwest Forest University, Harbin, China.

5/23/07, “Making Robots and Cranes Move Very Fast with Command Shaping”, Harbin Institute of Technology, Harbin, China.

3/19/07, “Crane Dynamics and Control: Applications and Educational Uses”, Center of Excellence in Robotics, Tokyo Tech, Tokyo, Japan.

9/1/2006, “Crane Oscillation Control by Command Shaping”, Ishikawajima Harima Heavy Industries, Yokohama, Japan.

4/20/06, “High-Speed Motion Control Using Command Shaping”, Toshiba Corporate Research & Development Center, Tokyo, Japan.

1/25/2006, “Command Shaping for Cranes and Other Flexible Systems”, University of Tokyo, Tokyo, Japan.

1/18/06, “Research Topics for Gantry Robots”, Kumoh National Institute of Technology, Gumi, South Korea.

12/13/05, “An Introduction to Command Shaping for Flexible Systems”, Center of Excellence in Robotics, Tokyo Tech, Tokyo, Japan.

8/12/05, “Advanced Command Shaping for Nonlinear Systems and On-Off Actuators”, Kumoh National Institute of Technology, Gumi, South Korea.

8/11/05, “An Introduction to Command Shaping for Flexible Systems”, Kumoh National Institute of Technology, Gumi, South Korea.

8/10/05, “An Introduction to Command Shaping for Flexible Systems”, Korea Institute of Machinery & Materials, Deajon, South Korea.

8/9/05, “Command Shaping for Flexible Systems”, Pusan National University, Busan, South Korea.

11/29/04, “Improving Machine Speed and Accuracy by Command Shaping”, Metz, France.

10/27/04 – “Improving the Speed of Cranes, Robots, and Micro Mills by Command Shaping”, Instituto Automatico de Industriales, Madrid, Spain

4/15/04 – “Undergraduate Research in Mechanical Engineering”, Meeting of Congressional Staffers, Georgia Tech Conference Center, Atlanta, GA.

3/10/04 – “Design of Physical Mechanisms to Reduce Unwanted Dynamics”, Nihon University, Tokyo, Japan.

1/29/04 – "Georgia Tech CanSat Team", Southeastern Space Grant Consortia Director’s Meeting, Atlanta, GA.

10/23/03 - "Control of Flexible Spacecraft Using Command Shaping ", Georgia Tech IEEE meeting Atlanta, GA.

8/7/02 - "Rapid Motion of Crane-Like Structures", Tsukuba University, Tsukuba, Japan.

10/15/02 - "Designing Commands to Reduce Vibration in Mechanical Systems", ETSII de Madrid, Madrid, Spain.

10/14/02 - "Designing Commands to Reduce Vibration in Mechanical Systems", University of Vigo, Vigo, Spain.

8/13/02 - "Command Shaping for Flexible Structures", Tokyo Metropolitan Institute of Technology, Tokyo, Japan.

7/29/02 - “Controlling Flexible Spacecraft through Command Shaping”, ISAS Astrodynamics Symposium Invited Speaker, Sagamihara, Japan.

7/13/02- "Using Input Shaping with On/Off Actuators", Laboratory for Space Systems, Tokyo Institute of Technology, Tokyo, Japan.

7/6/02- "Tutorial on Input Shaping for Moving Flexible Structures", Laboratory for Space Systems, Tokyo Institute of Technology, Tokyo, Japan.

3/18/02 - "Command Shaping Overview and Application to Hard Disk Drive Servo Control", Hitachi Corporation, Odawara, Japan.

3/15/02 - "Command Shaping for Vibration Reduction: Overview and Application to Hard Disk Drive Servo Control", IEE Committee Meeting for Mass Storage Servo, Nagoya, Japan.

10/27/00 - "Robotics Research at Georgia Tech." Waseda University, Tokyo, Japan.

10/24/00 - "Robotics Research at Georgia Tech." Tokyo Institute of Technology, Tokyo, Japan.

10/23/00 - "Robotics Research at Georgia Tech." Kyushu University, Fukuoka, Japan.

10/16/00 - "How to Properly Motivate Robots." MIT Club of Atlanta, Georgia Tech.

2/27/99 - "Making Machines Move Very Fast With Command Generation." American University in Cairo, Cairo, Egypt.

E. Other Scholarly Accomplishments

Patents

- 1) Singhose, W., Singer, N., Rappole, W., Derezinski, S., and Pasch, K., 1997, "Methods and Apparatus for Minimizing Unwanted Dynamics in a Physical System," vol. June 10: U.S. Patent 5,638,267, granted June 10, 1997.
- 2) R. Eloundou, W. Singhose, "Command Generation Combining Input Shaping and Smooth Baseline Commands", U.S. Patent 6,920,378, granted July 19, 2005.
- 3) K. L. Sorensen, W. Singhose, and S. Dickerson, "Combined feedback and command shaping controller for multistate control with application to improving positioning and reducing cable sway in cranes " U.S. Patent 7,970,521, June 28, 2011
- 4) W. Singhose and D. Kim, "Methods and Systems for Double-Pendulum Crane Control," U.S. Patent 8,235,229, August 7, 2012
- 5) W. Singhose, and Joshua Vaughan, “Methods and Systems for Improvong Positioning Accuracy”, U.S. Patent App. 61/352,598, June 8, 2010.
- 6) W. Singhose and Chen Chih Peng, “Crane Control Systems and Method”, U.S. Patent App. SU 2013/0032561 A1, Feb. 7, 2013.
- 7) Khalid Sorensen and William Singhose, “Crane Motion Control”, U.S. Patent 9,776,838, Oct. 3, 2017

Conferences Organized

NSF Planning Visit: Large Flexible Space Structures, Tokyo Japan, 12/11-12/15/2005.

Siemens Automation and Drives Conference at Georgia Tech Lorraine, 11/29-11/30/04.

Conference Sessions Organized

“Command Shaping in Mechatronics.” 7th Mechatronics Forum International Conference, 2000, Atlanta, GA.

“Tutorial: Input Shaping and Time Delay Control of Maneuvering Flexible Structures.” 2002 American Controls Conference, Anchorage, AK.

Hosting Professors/Postdocs/Graduate Students

1) Prof. Seong-Wook Hong, Kumoh National University, Kumi, Korea, Feb. 2004-Feb. 2005.

2) Prof. Juan de Juanes Marquez, Escuela Tecnica Superior de Ingenieros Industriales (ETSII), Madrid, Spain, June 2005-Dec. 2005.

3) Prof. Yoon-Gyeoung Sung, Chosun University, Gwangju, Korea, July 2006-August 2007.

4) Prof. Mingxiao Dong, Shandong Jianzhu University, China, Dec 2007-May 2008

5) Ji Sup Joon, Division Director, Advanced Fuel Cycle System Eng., Korea Atomic Energy Research Institute, Korea, September 2008-September 2009

6) Prof. Zhang Yizhuo, North East Forestry University, Harbin, China, Dec. 2009 – Dec. 2010

7) Prof. Youmin Hu, Huazhong University of Science & Technology, Wuhan, China, Jan. 2010-Jan 2011

8) Prof. Kyoungseok Park, Kumoh National Institute of Technology, Gumi, Korea, June 2010-June 2011

9) Prof. Jie Huang, Beijing Institute of Technology, August 2014-July 2015

10) Prof. Dongjoo Kim, Kumoh National Institute of Technology, Gumi, Korea, Feb. 2016 - Feb. 2017

11) Stanislao Grazioso, Università degli Studi di Napoli "Federico II", Napoli, Italy, August 2016-Dec. 2016

Conference Sessions Chaired

2007 American Control Conference, New York, NY

2006 ICAMEM, Tunis, Tunisia

2004 Japan-USA Symposium on Flexible Automation, Denver, CO.

2004 American Control Conference, Boston, MA.

2003 American Control Conference, Denver, CO.

2002 2nd IFAC Conference on Mechatronic Systems, Berkeley, CA.

2002 6th International Conference on Motion and Vibration Control, Saitama, Japan

2002 Japan-USA Symposium on Flexible Automation, Hiroshima, Japan.

2002 American Control Conference, Anchorage, AK.

1999 IEEE Conference on Control Applications, Kona, HA.

1998 IEEE Conference on Control Applications, Trieste, Italy.

1995 IFToMM Ninth World Congress on the Theory of Machines and Mechanisms, Milan, Italy.

V. SERVICE

A. Professional Contributions

1) Journals

Int. Journal of Control, Automation, and Systems (IJCAS), Editorial Board Member, 2005-Present
Mechatronics, Associate Editor, 2008

Control Engineering Practice, Designated Editor, 2007-2010

2) Conferences

Asian Control Conference, Associate Editor of Contributed Papers, 2017

Int. Symposium on Flexible Automation, Program Chair, 2008

IEEE/ASME Int. Conference on Advanced Intelligent Mechatronics, Program Committee, 2007

Int. Symposium on Flexible Automation, Program Committee, 2006

Advanced Intelligent Mechatronics Program Committee, member, 2005

International Conference on Motion and Vibration Control Program Committee, member, 2004

American Control Conference Program Committee, member, 2004

Japan-USA Symposium on Flexible Automation Program Committee, member, 2004

3) Standards Committees

IEEE Virtual Reality and Augmented Reality Standards Working Group, 2018-present

ASTM F15.18 - Cribs, Toddler Beds, Play Yards, Bassinets, Cradles and Changing Tables, 2018-present

ASTM D13-Textiles, D13.66 – Sewn Product Automation subcommittee member, 2017-present

ASTM F08.52, F08.67 - Pole Vault Pole Testing and Pole Vault Landing Pads subcommittee, member, 2000-2006

USA Track & Field Pole Vault Equipment Task Force, member.

4) Reviews

National Science Foundation, Division of Design Manufacturing and Industrial Innovation, proposal reviewer.

National Science Foundation, Sensors and Sensor Systems, proposal reviewer.

Milliken Summer Faculty Challenge – 2000.

AIAA Journal of Guidance, Control, and Dynamics, reviewer.

AIAA Journal of Spacecraft and Rockets, reviewer.

AIAA Guidance, Navigation, and Control Conference, reviewer.

American Control Conference, reviewer.

ASME Journal of Dynamic Systems, Measurement, and Control, reviewer.

ASME Design Engineering Technical Conferences, reviewer.

ASME Journal of Vibration and Acoustics, reviewer.

Automatica, reviewer.

Control Engineering Practice, reviewer.

Control Systems Technology, reviewer.

IEEE/ASME Transactions on Mechatronics, reviewer.

IEEE Transactions on Systems, Man, and Cybernetics, reviewer.

IEEE Conference on Control Applications, reviewer.

IEEE Int. Conference on Robotics and Automation, reviewer.

Industrial & Engineering Chemistry Research, reviewer.

Journal of the Franklin Institute, reviewer.

Journal of Sound and Vibration, reviewer.

Mechatronics, reviewer.

Mechatronics 2000, Panel reviewer.

B. Campus Contributions

Organized and supervised Georgia Tech Rescue Robot Team, 2013-present

Organized and supervised Georgia Tech CanSat Team, 2002-2012

ASME Student Group, Faculty Advisor, 2007-2012

SME Student Group, Faculty Advisor, 2001-2007

Pole vault coach for Georgia Tech track and field team (1998-2000)

Chair of 2010 Director of Design Search Committee
Chair of 2014 Zeigler Woodruff School Outstanding Educator Award Committee
Committee member: PRT (2016-2017), PPR (2017), Director of Design Search Committee (2012), HR Director Search Committee (2008), Undergraduate (1998, 2001-2003, 2006-2007, 2013-2016), Graduate (1999), Faculty Awards (2004), and Faculty Recruiting (2000).

VI. GRANTS AND CONTRACTS

A. As PI or Co-PI

Government Sources

"Input Shaping Mobile Crane Controllers", Georgia Research Alliance, October 2018, \$49,965.

"I-Corps: Reducing Oscillation of Systems Driven by Stepper Motors and On-Off Actuators", National Science Foundation, April 2016, \$50,000.

"Rocket Rescue Robot", Georgia Space Grant Consortium, August 2014, \$6,000.

"Designing a Rocket-Launched Target-Seeking Rescue Robot", Georgia Space Grant Consortium, May 2013, \$3,762.

"Hopping Rotochute Micro Satellite Design Project", Georgia Space Grant Consortium, July 2012, \$2,275.

"International DDEP: Control of Complex Tower Crane Motion Using Low-Cost Cameras", National Science Foundation, September 2011-December 2012, \$13,930.

"Input Shaping for Rotorcraft Sling Load Operation", National Rotorcraft Technology Center (NRTC), Jan. 2011 – May 2013, \$120,000. **Co-PI (Singhose: \$56,875)**

"Georgia Tech Student CanSat Team", Georgia Space Grant Consortium, Jan. 2006 - May 2010, \$19,708.

"International DDEP: Development of Aircraft Conflict Resolution Algorithms", National Science Foundation, May 2008-September 2008, \$9,950.

"Approaches to Traffic Flow Management in the Presence of Uncertainty", NASA, October 2006-September 2008, \$706,366. **Co-PI (Singhose: \$120,056)**

"International DDEP: Experimental Evaluation of a Mobile Tower Crane", National Science Foundation, November 2006-March 2007, \$10,800.

"International DDEP: Experimental and Educational Research with Remotely Operated Cranes", National Science Foundation, December 2005-March 2006, \$8,100.

"Planning Visit: Large Flexible Space Structures", National Science Foundation, December 2005, \$12,412.

"Application of Command Generation Techniques to the Control of Space Tether Systems", NASA/Marshall Space Flight Center, July 2005-July 2006, \$24,000.

"Ph.D. Dissertation Enhancement Project: Experimental Evaluation of Low-Contact-Force Machining", National Science Foundation, January 2004-May 2004, \$9,700.

Support for International Workshop on Advanced Sensors, Structural Health Monitoring, and Smart Structures, Yokohama, Japan, National Science Foundation, November 2003, \$1,334.

"Command Generation and Control of Momentum Exchange Electrodynamic Reboost Tethered Satellite", NASA/Marshall Space Flight Center, August 2003-July 2005, \$48,000.

"Georgia Tech CanSat Development", Georgia Space Grant Consortium, December 2002 - December 2005, \$20,851.

"Experimental Evaluation of Coordinated Flexible Satellite Control", National Science Foundation, November 2002, \$7,995.

"Trajectory Planning for Coordinating Satellites Using Command Generation", NASA/Goddard Space Flight Center, August 2002-July 2005, \$72,000.

Industry Sources

"Development of Novel Haptic Actuation," Google Inc., Dec. 2019, \$258,488.

"Dynamic Model and Control System Design for Cable-Driven Crane," ConcertLab, Dec. 2019, \$27,088.

"Steady Hoist for Rotocraft Operations," Atlas Devices, LLC, Dec. 2019, \$10,000.

"Mobile Vision GT Singhose SOW 5", Google Inc., Nov, 2017, \$105,650.

"Mobile Vision GT Singhose SOW 4", Google Inc., Jan, 2017, \$95,922.

"Development Kits and myRIO Controllers for Undergraduate Controls", National Instruments, October 2016, \$8,814.

"Mobile Vision GT Singhose SOW 3", Google Inc., August, 2016, \$80,193.

"Mobile Vision GT Singhose SOW 2", Google, Inc. Jan, 2016, \$112,309.

"Automated Large-Area Sanding", Boeing Research and Technology, Jan, 2016, \$50,000.

"Mobile Vision - Design and Evaluation of a Mobile Vision-Based Device for Interactive Writing", Google Inc., June, 2015, \$79,794.

"Automated Large-Area Painting", Boeing Research and Technology, May, 2015, \$50,000.

"Hardware Integration for Large-Area Sensing", Boeing Research and Technology, July, 2014, \$141,632.

"ME6404 Pneumatics project", National Fluid Power Association, November 2014, \$4,520.

"PLC Programming Curriculum for Georgia Tech", Siemens, August 2014, \$27,500.

"Use of Pneumatic Systems in Introductory Mechanical Design Projects", National Fluid Power Association, November 2013, \$4,720.

"Development of Mechatronics and Robotics Educational Platforms Using Compact Control Units", National Instruments, May 2013, \$117,000.

"Integration of Zurich University of Applied Sciences Bridge Crane into Georgia Tech Research and Educational Activities", Siemens, May 2013, \$15,920.

"Manufacturing Technologies for the 21st Century", Boeing Research and Technology, Jan. 2013, \$185,700.

"Multi-National Collaborative Design of Target-Seeking Robots", Boeing Research and Technology, Nov. 2012, \$60,864.

"Multi-National Collaborative Design Tools", Boeing Research and Technology, Nov. 2012, \$62,711.

“Input Shaping Analysis and Design Support”, Space Systems Loral, August 2012, \$47,086.

“Material Handling Dynamic Load Oscillation Suppression”, Boeing Research and Technology, Jan. 2012, \$100,000.

“Material Handling Dynamic Load Oscillation Suppression”, Boeing Research and Technology, Jan. 2011, \$100,000.

“A Balloon Hoist Experimental Setup to Evaluate National Instruments Products”, National Instruments, March 2011, \$38,665.

“Design & Development of a Pediatric Personal Transporter for Children with Disabilities”, International Diversified Products, December 2010, \$5,500. **Co-PI (Singhose: \$2,750)**

“Siemens Automation – Cherrypicker Crane Project”, Siemens Industry, August 2010, \$44,732.

“Investigation of Commercial Personal Transporters”, International Diversified Products, June 2010, \$6,000. **Co-PI (Singhose: \$3,000)**

“Material Handling Dynamic Load Oscillation Suppression”, Boeing Research and Technology, Jan. 2010, \$100,000.

“Sponsorship of Georgia Tech Curriculum Improvements”, British Petroleum, Nov. 2009, \$7,500.

“Development of a Cherrypicker Aerial Lift for Use in Local and Remote Laboratories”, Siemens Energy and Automation, Sept. 2009, \$38,000.

“Pneumatic Powered Advertisement Dispenser”, Diastone Corporation, May 2009, \$8,800.

“Material Handling Dynamic Load Oscillation Suppression”, Boeing Research and Technology, Jan. 2009, \$100,000.

“Integrating Pneumatics Into Introductory Mechanical Design”, National Fluid Power Association, May 2008, \$4,960.

“Material Handling Dynamic Load Oscillation Suppression”, Boeing Research and Technology, Jan. 2008, \$75,000.

“Expansion of Pneumatic Systems in ME2110: Creative Decisions and Design”, National Fluid Power Association, March 2006, \$4,000.

“Pneumatic Equipment and Supplies for ME2110: Creative Decisions and Design”, Festo Corporation, March. 2005, \$6,898.

“Introduction of Pneumatic Systems into ME2110: Creative Decisions and Design”, National Fluid Power Association, Nov. 2004, \$5,000.

“Feedback and Command Shaping Control of Bridge Cranes”, CAMotion, Inc. Jan. 2004 - August 2008, \$98,168.

“Prototype Controller for Elastic Spacecraft”, Northrop Grumman, January 2004 – December 2004, \$44,415.

Support for University Space System Symposium, Jet Propulsion Laboratory, November 2002-5, \$5,528.

“Control of Sloshing Liquid Demonstration Unit”, National Instruments, March 2001, \$1,500.

International Sources

“International Design and Construction of Quadrotors”, Kumoh National Institute of Technology, December 2015, \$6,000.

“International Cooperative Education in Engineering Design”, Chosun University, November 2013, \$9,000.

“Development of Educational Tasks in an Introductory Design Course”, Chosun University, November 2011, \$9,600.

“Development of a Mobile Mechatronic Device”, Chosun University, June 2011, \$9,600.

“Development of Educational Tasks in an Introductory Design Course”, Chosun University, November 2010, \$2,400.

“Research on Mobile Mechatronics Machine”, Chosun University, November 2010, \$3,600.

“Mechanical Manipulators Control, Education and Research”, Ministerio de Ciencia e Innovacion de España, Dec. 2009, 18,000 Euro (\$25,767).

“Environmentally-Friendly Automotive Parts - Human Resources Development Center”, Chosun University, Dec. 2009, \$6,000.

“Versatile Command Shaping Controllers for Industrial Cranes”, Kumoh National Institute of Technology, June 2006, \$50,829

“Development of Vibration Reduction Scheme for XY Stages Using Input Shaping”, Top Engineering Co., Center for Nano and Precision Technology, Kumi, Korea, December 2005, \$5,000.

“Command Generation for Flexible Systems”, Kumoh National Institute of Technology and Pusan National University, August 2005, 3300000 Won (\$3,210).

“Enhanced Trajectory Tracking of Flexible Systems Using Command Generation”, Japan Ministry of Education, Culture, Sports, Science and Technology (MEXT), and Tokyo Metropolitan Institute of Technology (TMIT), \$11,500 Co-PI (Singhose: \$5,750).

“Generación De Órdenes De Movimiento Que No Inducen Vibración En Maquinas Con FaltaDe Rigidez”, University of Vigo, October 2002, 900 Euros.

“Experimental Investigation of Deflection-Limiting Satellite Thruster Control for Multiple Flexible Satellites”, Japan Society for the Promotion of Science, June 2002, \$17,245.

Internal Sources

“An International Collaborative Student Space Robot Design Initiative”, Denning Global Engagement Seed Fund, 2014, \$15,000.

GTRC travel grant to Serbia, July, 2014, \$1,458.

“Interactive Tablet Computers for Introductory Mechanical Design”, Georgia Tech Technology Fee Grant, 2013, \$22,896.

“Power Analyzer for Energy-Efficient Student Design Projects”, Georgia Tech Technology Fee Grant, 2013, \$17,104.

GTRC travel grant to Turkey, July, 2013, \$1,500.

GTRC travel grant to Lithuania, July, 2012, \$750.

“Siemens Cherrypicker and Conference Paper Support” Manufacturing Research Center, July 2010, \$6,750.

GTRC travel grant to Egypt, July, 2010, \$750.

“Siemens Conference Paper Support” Manufacturing Research Center, September 2009, \$3,200.

GTRC travel grant to Spain, April, 2009, \$1,500.

“The Influence of Input Shaper Duration on Bridge Crane Operator Performance “ Aayush Daftari, President's Undergraduate Research Travel Award, August 2008, \$1,000.

“Dynamics of Orbit Boosting of an Electrodynamic Tethered Satellite with Input-Shaped Current“ Adrit Lath, President's Undergraduate Research Award, July 2008, \$1,500.

“Robustness of Negative Input Shaping“ Aika Yano, President's Undergraduate Research Travel Award, May 2008, \$1,000.

“Generator for Mobile Boom Crane”, Materials, Supplies, & Travel Grants for Undergraduate Research, April. 2008, \$1,500.

GTRC travel grant to Turkey, April, 2008, \$1,500.

“Comparison of Command Filtering Methods for Vibration Reduction in Mechanical Systems”, Anderson Smith, President's Undergraduate Research Awards, March. 2008, \$1,500.

“Development of Input Shapers for Mobile Cranes”, Adrit Lath, President's Undergraduate Research Awards, Nov. 2007, \$1,500.

“Effect of Input Shaper Duration on Crane Operator Performance”, Aayush Daftari, President's Undergraduate Research Awards, Nov. 2007, \$1,500.

“Robust Input Shaper Evaluation”, Aika Yano, President's Undergraduate Research Awards, May 2007, \$1,500.

GTRC travel grant to China, May, 2007, \$1,500.

“Conference Travel Funding: Reduction of Double Pendulum Crane Oscillations”, Dooroo Kim, President's Undergraduate Research Awards, August 2006, \$1,000.

GTRC travel grant to Serbia, October, 2006, \$1,278.

“Reduction of Double Pendulum Crane Oscillations”, Dooroo Kim, President's Undergraduate Research Awards, December 2005, \$1,500.

“Development and Testing of a Command Shaping Compensator for Nonlinear Drives”, Jon Danielson, President's Undergraduate Research Awards, December, 2005, \$1,000.

“Space Tethered Satellite Control”, Andrew Timm, President's Undergraduate Research Awards, May, 2005, \$1,500.

GTRC travel grant to IFAC (Czech Republic) & REM (France), June, 2005, \$1,500.

“Use of Fluid Power to Cancel Low Frequency Vibrations”, Varun Sharma, President's Undergraduate Research Awards, Jan. 2005, \$1,500.

“The Effects of Input Shaping on a Flexible Nonlinear Robotic Arm with Backlash”, Matthew Falkenberg, President's Undergraduate Research Awards, Jan. 2005, \$1,500.

"Study of Operator Behavior and Performance Using an Input-Shaped Bridge Crane", Attir Khalid, President's Undergraduate Research Awards, April 2004, \$1,000.

"Fluid Power Control of a Hyper-Active Seat for Low-Frequency Vibration Suppression", Earl Lewis, President's Undergraduate Research Awards, December 2003, \$960.

GTRC travel grant to IEEE CCA (Turkey) & IEEE MED (Greece), June, 2003, \$1,500.

"Vibration Reduction for High-Rise Elevators", Vlad Patrangenaru, President's Undergraduate Research Awards, April 2003, \$800.

"Experimental Verification of Input Shaping Combined with Vibration Absorbers for Oscillatory Systems", President's Undergraduate Research Awards, April 2003, \$900.

"Experimental Investigation of Input Shaping with Friction on a Solder Cell Machine", President's Undergraduate Research Awards, December 2002, \$900.

"CanSat Project", President's Undergraduate Research Awards, December 2002, \$500.

Georgia Tech Foundation Travel Grant to Spain, October 2002, \$764.

GTRC travel grant to NCOLS 2001 (Russia), April 2001, \$1,406.

"Experimental Apparatus for Input-Shaped Cam Profiles", President's Undergraduate Research Awards, July 2001, \$1,250.

GTRC travel grant for Japan lecture tour, October 2000, \$1,231.

GTRC travel grant to Advanced Motion Control 2000, February 2000, \$1,250.

Other Sources

SURE & SHARP student support (Marie Cox, April Pritchard, Nathan Mauch, Adam Vela, Dwayne Bobb, Timothy Melano, Rory Thomas, Kimberly Sheafe) May 1999 – August 2004, \$4,000.

B. As Investigator

RERC on Wheeled Mobility in Everyday Life. PI Dr. Stephen Sprigle. Funding for salary, graduate student support, materials and supplies. November 2003 - October 2008. \$134,725. Total project budget \$4,750,000.

In-Line Optical Measurement of MicroElectroMechanical Systems (MEMS) Devices During Production. PI Dr. Thomas Kurfess. Funding provided to train high school teacher for mechatronics curriculum transfer from Georgia Tech to Cedar Grove High School. June 2003-August 2003. \$6,000.

MARC Siemens - Automation and Drives. PI Dr. Steven Danyluk. Funding provided for graduate and undergraduate student support, hardware development, installation of oscillation controller on the MARC crane and development of portable bridge and tower cranes. August 2002 – August 2012, \$889,429.

HUSCO/Ramirez Laboratories for Fluid Power and Motion Control. PI Dr. Wayne Book. Funding for graduate student support, hardware development, and travel. August 2002-July 2004. \$42,775.

VII. HONORS AND AWARDS

Academic

2015 Asian Control Conference, Best Application Paper Finalist
2013 Zeigler Woodruff School Outstanding Educator Award
2009 Georgia Tech SAIC Student Paper Contest Winner, Graduate Division
2006 Georgia Tech SAIC Student Paper Contest Winner, Undergraduate Division
2004 CETL Educational Partnership Award (\$7,500 for partnership with local high school)
2003 SME Jiri Tlustý Outstanding Young Manufacturing Engineer Award
2002 Georgia Tech SAIC Student Paper Contest Winner, Undergraduate Division
2002 CETL/BP Junior Faculty Teaching Excellence Award
2002 Japan Society for the Promotion of Science Invitation Fellowship
2001 Georgia Tech SAIC Student Paper Contest Winner, Undergraduate Division
1996 Massachusetts Space Grant Fellowship
1990 Office of Naval Research Fellowship
1990 Phi Beta Kappa
1989 AAAS Mass Media Science and Engineering Fellowship
1989 Tau Beta Pi
1989 Pi Tau Sigma

Academic and Athletic

1990 The GTE Academic All-American, Collegiate Division (only one award nationally each year)
1990 NCAA Postgraduate Scholarship
1990 NACDA/Walt Disney Scholar-Athlete Award

Athletic

1989 NCAA Division III National Decathlon Champion
1990 New England Division III Athlete of the Year
1990 All New England Field Athlete of the Year
1988-1990 NCAA Division III All-American (8-Times)