Joshua E. Vaughan

Assistant Professor
Dept. of Mechanical Engineering
University of Louisiana at Lafayette
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Research Interests

Mobile robotics, maritime autonomous vehicles, control of cable driven parallel manipulators, human–machine–control system interaction, command generation, input shaping, Concurrent design of commands–feedback controllers–physical systems, reinforcement learning

Teaching Interests

System dynamics and control, graduate-level controls, classical dynamics, vibrations, mechatronics, robotics, introductory mechanical design

Education

Ph.D., Mechanical Engineering, August 2008
Georgia Institute of Technology
Atlanta, Georgia
Thesis: *Dynamics and Control of Mobile Cranes*
Advisor: Dr. William Singhose
Committee: Drs. Kok-Meng Lee, Rhett Mayor, John-Paul Clarke, Patricio Vela
Concentration: System Dynamics and Control

M.S., Mechanical Engineering, May 2004
Georgia Institute of Technology
Atlanta, Georgia
Thesis: *Active and Semi-Active Control to Counter Vehicle Payload Variation*
Advisors: Dr. Nader Sadegh and Dr. William Singhose
Concentration: System Dynamics and Control

B.S., Physics with Honors, May 2002
B.S., Applied Mathematics, May 2002
Hampden-Sydney College
Hampden-Sydney, Virginia
Honors Thesis: *Trace Detection of Gaseous CS_2 with an Optoacoustic Technique*
Graduated *Magna Cum Laude*

Research Experience

8/2012 – present
Assistant Professor
Department of Mechanical Engineering – University of Louisiana at Lafayette

4/2010 – 8/2012
Postdoctoral Research Engineer
Boeing Aerospace Research Center – Georgia Institute of Technology
Procured and installed equipment in a manufacturing research facility
Developed methods for compensating for nonzero initial conditions in real-time command shaping
Investigated control and coordination of multiple material handling systems
Investigated interaction between human operators, control systems, and user interfaces
Received ≈$35,000 of support funding from Boeing

3/2009 – 3/2010
Japan Society for the Promotion of Science (JSPS) Postdoctoral Fellow
Tokyo Institute of Technology – Hirose-Fukushima Laboratory
Developed controllers for a mobile, semi-autonomous demining robot

Reduced endpoint vibration of a long-reach, robotic scanning arm
Investigated methods for landmine discrimination

9/2008 – 3/2009 Siemens Energy and Automation Postdoctoral Fellow
Georgia Institute of Technology
Led development of a mobile boom crane experimental platform
Developed input shapers to improve crane payload positioning accuracy
Designed Graphical User Interfaces to improve crane operator performance
Installed input shaping crane controller at Boeing Phantom Works in St. Louis

5/2006 – 8/2008 Siemens Energy and Automation Fellow
Georgia Institute of Technology
Developed advanced dynamic models of mobile cranes
Developed multi-input shaping techniques for vibration suppression
Investigated human operator performance in tele-operated systems
Thoroughly evaluated robust input-shaping methods and design compromises
Advised up to four undergraduate researchers per semester

11/2006 – 2/2007 NSF Doctoral Dissertation Enhancement Project (DDEP) Sponsored Researcher
Tokyo Institute of Technology – Hirose-Fukushima Laboratory
Designed and constructed a mobile base for a portable tower crane
Experimentally evaluated mobile tower crane dynamics and control methods

9/2002 – 5/2006 Graduate Researcher
Georgia Institute of Technology
Investigated changes in vehicle dynamics due to varying payloads
Developed active suspension techniques to counter the effects of vehicle payloads
Investigated active seating systems to enhance passenger safety and comfort

9/2001 – 5/2002 Undergraduate Researcher
Hampden-Sydney College

Teaching Experience

1/2018 – present *MCHE 485: Mechanical Vibrations*
1/2016 – 5/2016 Assistant Professor
8/2014 – 5/2015 University of Louisiana at Lafayette
1/2014 – 5/2014 Completed all course planning and management
8/2012 – 5/2013 Taught single and multi-degree-of-freedom vibration analysis
Developed interactive instruction modules, including Jupyter Notebooks

1/2015 – present *MCHE 201: Introduction to Mechanical Design*
Assistant Professor
University of Louisiana at Lafayette
Completed all course planning and management
Taught high-level design process (*e.g.* House of Quality, Concept evaluation)
Taught technical communication
Integrated robotics projects into course
Secured ≈$15,000 of grants and $5,000 of donations in support of class

1/2018 *Modern Approaches to System Dynamics and Control*
Visiting Lecturer
Kumoh National Institute of Technology, Gumi, Korea
Taught advanced controls to Korean undergraduate and graduate students
Developed Jupyter Notebooks in support of course

8/2017 – 12/2017 *MCHE 474: Control Systems*
Assistant Professor
University of Louisiana at Lafayette

Completed all course planning and management
Taught system dynamics and control
Integrated hands-on controls projects and modern tools into course

8/2016 – 12/2016 *MCHE 513: Intermediate Dynamics*
8/2015 – 12/2015 Assistant Professor
University of Louisiana at Lafayette
Completed all course planning and management
Taught graduate-level kinematics and dynamics
Integrated computing projects into course

2/2016 – 3/2016 *MCDDT: Mechatronics Creative Decision and Design Tools*
Visiting Lecturer
Huazhong University of Science and Technology (HUST), Wuhan, China
Taught mechanical design process and technical communication to Chinese undergraduate students

8/2016 – present *MCHE 484: Engineering Projects*
8/2013 – 5/2015 Project Advisor
1/2013 – 5/2013 University of Louisiana at Lafayette
Advised teams of up to five senior students during their capstone design project

8/2013 – 12/2013 *MCHE 470: Special Topics – Robotics*
Assistant Professor
University of Louisiana at Lafayette
Created new course at UL Lafayette
Taught broad range of robotics topics, including design, control, and sensing

8/2011 – 8/2012 *ME2110: Creative Decisions and Design*
1/2011 – 5/2011 Studio Section Instructor
8/2010 – 12/2010 Georgia Institute of Technology
Led design studio exercises for sections of twenty students
Assisted with course final project planning

2/2012 *APPH8803: Special Topics - Assistive Technology Design*
Guest Lecturer
Georgia Institute of Technology
Presented two lectures on biomechanical modeling and structural stability

11/2011 *ME6404: Advanced Control Design and Implementation*
10/2008 Guest Lecturer
11/2007 Georgia Institute of Technology
Presented two-lecture series on tele-operation control techniques
Presented a lecture on Repetitive Learning Control

1/2011 – 5/2011 *APPH8803: Special Topics - Assistive Technology Design*
Co-Lecturer
Georgia Institute of Technology
Presented lectures on biomechanical modeling and structural stability
Led laboratory and design prototyping activities

2/2011 *ME8843: Advanced Mechatronics*
Guest Lecturer
Georgia Institute of Technology
Presented lecture on motion control and command generation
Provided test question on guest lecture material

8/2010 – 12/2010 *ME6404: Advanced Control Design and Implementation*
Co-Lecturer
Georgia Institute of Technology

Taught graduate-level advanced controls design methods including optimal control, model reference control, learning control, and command shaping
Developed laboratories and tests supporting course lecture material

10/2010 *2.998: Command Shaping, Theory and Applications*
Guest Lecturer
Massachusetts Institute of Technology
Presented lecture on commands and interfaces to improve crane operator performance
Developed test items from course material

8/2010 – 12/2010 *ME4182: Capstone Design*
1/2009 – 5/2009 Project Advisor
Georgia Institute of Technology
Advised team of four senior students during their capstone design project
Assisted in procuring industry funding for Georgia Tech senior design projects

2/2009, 10/2010 *ME2110: Creative Decisions and Design*
Guest Lecturer
Georgia Institute of Technology
Presented lecture on management and planning tools
Presented design-study lecture on the GRYPHON demining robot

8/2006 – 5/2007 *ME6404: Advanced Control Design and Implementation*
Teaching Associate
Georgia Institute of Technology
Co-taught graduate level course
Developed and presented advanced controls lectures
Developed and graded exams

8/2005 – 8/2006 *ME2110: Creative Decisions and Design*
1/2004 – 5/2004 Head Graduate Teaching Assistant
Georgia Institute of Technology
Wrote course Mechatronics manual (still in use)
Assisted in procuring industry funding to support the course
Assisted with course organization and instruction
Led team of six to eight graduate teaching assistants
Graded homework, design reports, and project presentations

5/2005 – 8/2005 *ME2110: Creative Decisions and Design*
9/2002 – 12/2003 Graduate Teaching Assistant
Georgia Institute of Technology
Assisted students with implementation of design tools and techniques
Graded homework, design reports, and project presentations

5/2004 – 5/2005 Cedar Grove High School & Georgia Institute of Technology
NSF STEP Fellow
Assisted with teaching of a high school Accelerated Physics class
Planned, introduced, conducted, and evaluated classroom lab activities
Advised student Robotics Club at Cedar Grove High School

Advising Experience

8/2017 – present Mounirat Oyindamola Mahmoud, M.S. Student
Developing system for automated peeling of crawfish

8/2017 – 12/2017 Joseph Fuentes, M.S. Student
Developing models and control algorithms cable-suspended robots

1/2017 – 12/2017 Daniel Ashkebousi, M.S. Student – Graduated 12/17

Experimentally verified tracking algorithms for crane controllers

8/2016 – present Gerald Eaglin, M.S. Student
Developed optimal path-planning and tracking for cable-driven parallel manipulators
2017 NSF EAPSI Researcher at Tokyo Institute of Technology in Japan

8/2016 – present Daniel Newman, M.S. Student
Developed tracking algorithms for crane controllers
2017 NSF EAPSI Researcher at Kumoh National Institute of Technology in Korea

8/2015 – 8/2017 Forrest Montgomery, M.S. Student – Graduated 8/17
Developed models and control algorithms for nearly-horizontal cable-driven robots
Experimentally verified key results
Visiting Scholar at HiBot, Corp in Japan during summer 2016

8/2015 – 5/2017 Nicole Barry, M.S. Student – Graduated 5/17
Developed models and control algorithms for vertical cable-driven robot
Experimentally verified key results

4/2016 – 12/2016 Josh Hebert, M.S. Student – Graduated 12/16
Developed vibratory models for deep-well drill strings
Analysis of ship-induced drill-string vibration and loading
Compared models to data from live drilling operations

5/2015 – 7/2015 Atsushi Horigome, Visiting Ph.D. Student
Quantified improved jumping performance from compliant robot legs
Designed and experimentally tested flexible legs for an insectoid hexapedal robot

8/2014 – 8/2016 Yasmeen Qudsi, M.S. Student – Graduated 8/16
Quantified improved walking performance from compliant robot legs
Designed and experimentally tested flexible legs for an insectoid quadrupedal robot
Investigated changes in material properties after nanoparticle coating
Developed control of spray-based nanoparticle application

8/2014 – 8/2016 Robert Schmidt, M.S. Student – Graduated 8/16
Developed model and control algorithm for ship-mounted cranes
Designed modifications to an existing small-scale crane

1/2014 – 5/2015 Seema Mallavalli, Ph.D. Student
Developed models of flexible-legged robots
Design and control of a tube-squeezing robot

8/2013 – 5/2015 Dare Olaonipekun, M.S. Student – Graduated 5/15
Modeled and simulated a flexible parent-child robot
Designed a complete coverage algorithm for flexible robots
Finished M.S. Degree in December 2014

8/2013 – 5/2015 Mohammad Sazzad Rahman, M.S. Student – Graduated 5/15
Used machine vision to map crane workspaces
Designed obstacle avoidance algorithms for cranes

8/2013 – 12/2014 Nicholas Bergeron, M.S. Student – Graduated 12/14
Modeled and simulated an autonomous patrol boat
Implemented autonomous controller on Anaconda, an existing Swiftships boat

8/2012 – 8/2014 Ali Khayat Baheri Irani, M.S. Student – Graduated 8/14
Investigated concurrent design of commands and feedback controllers

12/2013 – 5/2014 Brett Marks, M.S. Student – Graduated 5/14

Modeled and simulated an mobile robot
Implemented Kalman-filter-based navigation algorithm

8/2012 – 12/2013 Ninad Dhundur, M.S. Student – Graduated 12/13
Modeled dynamics of cable-riding robots
Designed commands to limit oscillation on cable-riding robots

1/2017 - 2/2017 Kyung-koo Kim, Hyo-jeong Kwak, and Dong-jun Lim
Visiting Korean Undergraduate Researchers

12/2017 – present Joshua Keller, Undergraduate Researcher

12/2017 – present Jacob Irwin, Undergraduate Researcher

8/2017 – present Andrew Conlin, Undergraduate Researcher

8/2017 – present Jacob Deshotels, Undergraduate Researcher

8/2017 – 12/2017 Luke Huval, Undergraduate Researcher

8/2017 – present Michael Tonore, Undergraduate Researcher

8/2017 – present Diana Tran, Undergraduate Researcher

5/2017 – present Jacob Randall, Undergraduate Researcher

5/2017 – present Kaleb Geautreaux, Undergraduate Researcher

5/2017 – present Lane Elder, Undergraduate Researcher

5/2017 – 8/2017 Samuel Holmes, Undergraduate Researcher

1/2017 – present Juan Casas, Undergraduate Researcher

1/2017 – 5/2017 Benjamin Dantin, Undergraduate Researcher

1/2017 – 5/2017 Savannah Neill, Undergraduate Researcher

1/2017 – 5/2017 Thelen Pumford, Undergraduate Researcher

1/2017 – 5/2017 Blake Talbot, Undergraduate Researcher

8/2016 – present Jacob LaBerteaux, Undergraduate Researcher

8/2016 – present Nathan Madsen, Undergraduate Researcher

8/2016 – 12/2016 Kalin Nero, Undergraduate Researcher

8/2016 – 5/2017 Jessica Tetnowski, Undergraduate Researcher

5/2016 – 5/2017 Haley Habetz, Undergraduate Researcher

3/2016 – 5/2017 Minh Vu, Undergraduate Researcher

1/2016 – 5/2017 Angelle Bercegeay, Undergraduate Researcher

8/2015 – 5/2016 Erin Fisher, Undergraduate Researcher

8/2015 – present Kabir Qureshi, Undergraduate Researcher

8/2015 – 5/2016 Matthew Begneaud, Undergraduate Researcher

8/2015 – 8/2016 Andre Clay, Undergraduate Researcher

8/2015 – 4/2016 Bryce Teekel, Undergraduate Researcher

1/2015 – 5/2016 Gerald Eaglin, Undergraduate Researcher

5/2015 – 7/2015 Paulo Ferreira, Mauricio Murakami, Leopoldo Silva
Visiting Brazilian Undergraduate Researchers

5/2015 – 12/2015	Jarmarquis Torrence, Undergraduate Researcher
1/2015 – 5/2015	Jasmin Honneger, Undergraduate Researcher
10/2014 – 5/2015	Forrest Montgomery, Undergraduate Researcher
10/2014 – 5/2015	John Daigle, Undergraduate Researcher
8/2014 – 5/2015	Nicole Barry, Undergraduate Researcher
5/2014 – 5/2015	Beau Domingue, Undergraduate Researcher
5/2014 – 1/2015	Jordan Simon, Undergraduate Researcher
1/2014 – 11/2014	Brian Shipley, Undergraduate Researcher
8/2014 – 5/2014	Elijah Manuel, Undergraduate Researcher
8/2012 – 12/2013	Nolan Edwards, Undergraduate Researcher
8/2012 – 12/2013	James Whipple, Undergraduate Researcher
4/2013 – 6/2013	Steven Adhumeau, Undergraduate Researcher
8/2011 – 8/2012	Nathan Knight, Undergraduate Researcher
8/2011 – 6/2012	Jieun Yoo, Undergraduate Researcher
1/2012 – 5/2012	Sridatta Kompella, Undergraduate Researcher
8/2011 – 10/2011	Hyun Ju Bae, Won Kuk Han, Gu Young Jung, Gud Sem Kim, Hyun Ho Kim, Ji Ha Kim, and Jin Seon Seo Visiting Korean Undergraduate Researchers
1/2011 – 3/2011	Yoonhan Baek, Sehee Jung, Eungsoo Kim, Jongheon Kim, and Hokyun Park Visiting Korean Undergraduate Researchers
7/2010 – 9/2010	Hyoung Min Park, Yong Seok Lee, and Sun Jo Kim Visiting Korean Undergradaute Researchers
5/2010 – 8/2010	Ajeya Karajgikar, Undergraduate Researcher
1/2009 – 5/2009	Se Joong Kang, Undergraduate Researcher
8/2008 – 5/2009	Paul Jurek, Undergraduate Researcher
5/2008 – 8/2008	Anderson Smith, Undergraduate Researcher
1/2008 – 5/2008	Jason Kulpe, Undergraduate Researcher
8/2007 – 5/2008	Adrit Lath, Undergraduate Researcher
5/2007 – 5/2008	Aayush Daftari, Undergraduate Researcher
8/2006 – 12/2007	Aika Yano, Undergraduate Researcher
5/2005 – 8/2005	Nicholas Sabogal, Undergraduate Researcher
5/2004 – 5/2005	Varun Sharma, Undergraduate Researcher

Thesis Committees

Expected 2018	Jacob King, Ph.D., University of Louisiana at Lafayette
Expected 2018	Jalel Ben Hmida, Ph.D., University of Louisiana at Lafayette
May 2017	Arto Kivila, Georgia Institute of Technology Ph.D. Dissertation: *Estimation and Control of Flexible Serial Robot Arms*

May 2016	Daichi Fujioka, Georgia Institute of Technology Ph.D. Dissertation: *Input-Shaped Model Reference Control for Flexible Systems*
May 2014	Shou Wan, University of Louisiana at Lafayette M.S. Thesis: *Development of an Automated Nanoparticles Spray System for Selectively Reinforcing Polymer Composites*
October 2012	Eileen Hernandez, Georgia Institute of Technology M.S. Thesis: *Dynamic Characterization and Analysis of Aerial Lifts*

Publications

Book Chapters

Joshua Vaughan and William Singhose. *Advances in Delays and Dynamics: Delay Systems*, "The Influence of Time Delay on Crane Operator Performance", pages 329–342. Springer, 2014.

Journal Articles

[1] Daniel Newman, Seong-Wook Hong, and Joshua Vaughan. The design of input shapers which eliminate nonzero initial conditions. *Accepted: Journal of Dynamic Systems, Measurement, and Control*, 2018.

[2] Yasmeen Qudsi and Joshua Vaughan. Flexibility in insectoid robots design and control of compliant lower legs. *In Preparation for International Journal of Intelligent Robotics and Applications*, 2018.

[3] Forrest Montgomery and Joshua Vaughan. Multi-input shaping control for cable suspended parallel manipulators. *In Preparation for Journal of Dynamic Systems, Measurement, and Control*, 2018.

[4] M. Sazzad Rahman and Joshua Vaughan. Machine vision techniques for crane workspace mapping. *Under Revision*, 2017.

[5] Robert Schmidt, Matthew Begneaud, and Joshua Vaughan. Tracking of an autonomous surface vehicle with blended inputs. *Under Revision*, 2017.

[6] Ajeya Karajgikar, Joshua Vaughan, and William Singhose. Crane operator studies comparing pd-feedback control and input shaping. *Under Revision: Control Engineering Practice*, 2017.

[7] Joshua Vaughan, William Singhose, and Dooroo Kim. Dynamics of unrestrained counterweights during crawler crane tip-over accidents. *Under Revision*, 2017.

[8] Gerardo Pelaez, Joshua Vaughan, Pablo Izquierdo, Higinio Rubio, and Juan Carlos García-Prada. Dynamics and input shaping for overhead cranes transporting multibody payloads. *Under Revision: Mechanism and Machinery Theory*, 2017.

[9] Abhishek Dhanda, Joshua Vaughan, and William Singhose. Time-optimal and near time-optimal vibration reduction control for non-zero initial conditions. *Journal Dynamic Systems, Measurement, and Control*, 138(4):041006–041006, 02 2016.

[10] J. Yoon, S. Nation, W. Singhose, and J.E. Vaughan. Control of crane payloads that bounce during hoisting. *Control Systems Technology, IEEE Transactions on*, 22(3):1233–1238, May 2014.

[11] Eileen Hernandez, Ehsan Maleki, William Singhose, and Joshua Vaughan. Categorization and tip-over stability of aerial lifts. *Under Revision: Vehicle System Dynamics*, 2014.

[12] Joshua Vaughan, Paul Jurek, and William Singhose. Reducing overshoot in human-operated flexible systems. *Journal of Dynamic Systems, Measurement, and Control*, 133(1):011010, 2011.

[13] William Singhose, Joshua Vaughan, Kelvin Chen Chih Peng, Brice Pridgen, Urs Glauser, Juan de Juanes Marquez, and Seong-Wook Hong. Use of cranes in education and international collaborations. *J. of Robotics and Mechatronics*, 23(5):881–892, 2011.

[14] William Singhose and Joshua Vaughan. Reducing vibration by digital filtering and input shaping. *Control Systems Technology, IEEE Transactions on*, 19(6):1410 –1420, nov. 2011.

[15] Joshua Vaughan, Dooroo Kim, and William Singhose. Control of tower cranes with double-pendulum payload dynamics. *Control Systems Technology, IEEE Transactions on*, 18(6):1345 – 1358, 2010.

[16] Joshua Vaughan, Anderson Smith, S. J. Kang, and William Singhose. Predictive graphical user interface elements to improve crane operator performance. *Systems, Man and Cybernetics, Part A: Systems and Humans, IEEE Transactions on*, PP(99):1 –8, October 2010.

[17] Joshua Vaughan, Aika Yano, and William Singhose. Robust negative input shapers for vibration suppression. *Journal of Dynamic Systems, Measurement, and Control*, 131(3):031014, 2009.

[18] Joshua Vaughan, Aika Yano, and William Singhose. Comparison of robust input shapers. *Journal of Sound and Vibration*, 315(4-5):797 – 815, 2008.

[19] Joshua Vaughan, Joel Fortgang, William Singhose, Jeffrey Donnell, and Thomas Kurfess. Using mechatronics to teach mechanical design and technical communication. *Mechatronics*, 18(4):179–186, May 2008.

[20] Stanley Cheyne, Walter McDermott, Matt Rannals, and Joshua Vaughan. Concentration determination of binary mixture of air and carbon disulfide gas using optoacoustics. *Acoustic Research Letters Online*, 5(2):7–12, April 2004.

Conference Papers

[1] Daniel Newman, Seong-Wook Hong, and Joshua Vaughan. Eliminating nonzero initial states in flexible systems through specified insensitivity input shaping. In *Accepted to American Control Conference (ACC)*, 2018.

[2] Minh Vu and Joshua Vaughan. Designing input shapers using reinforcement learning. In *Accepted to American Control Conference (ACC)*, 2018.

[3] Daniel Newman, Seong-Wook Hong, and Joshua Vaughan. Eliminating initial oscillation in flexible systems by the pole-zero cancellation input shaping technique. In *The 7th International Conference of Asian Society for Precision Engineering and Nanotechnology (ASPEN 2017)*, Seoul, Korea, November 11–17 2017.

[4] Forrest Montgomery and Joshua Vaughan. Suppression of cable suspended parallel manipulator vibration utilizing input shaping. In *IEEE Conference on Control Technology and Applications*, Kohala Coast, Hawai'i, August 27-30 2017.

[5] Daniel Newman and Joshua Vaughan. Command shaping of a boom crane subject to nonzero initial conditions. In *IEEE Conference on Control Technology and Applications*, Kohala Coast, Hawai'i, August 27-30 2017.

[6] Gerald Eaglin and Joshua Vaughan. Reducing trajectory tracking error of flexible mobile robots using command shaping with error-limiting constraints. In *ASME 2017 Dynamic Systems and Control Conference*, Tysons Corner, VA, October 11-13 2017.

[7] Daniel Newman and Joshua Vaughan. Reduction of transient payload swing in a harmonically excited boom crane by shaping luff commands. In *ASME 2017 Dynamic Systems and Control Conference*, Tysons Corner, VA, October 11-13 2017.

[8] Youmin Hu, Dongmin Han, Ling Ling, Thomas Kurfess, William Singhose, and Joshua Vaughan. Case study: Comparison of project-based, creative engineering courses at georgia tech and huazhong university of science and technology. In *International Conference on Engineering Education & Research*, Sydney, Australia, 21 – 24 November 2016.

[9] Robert Schmidt, Matthew Begneaud, and Joshua Vaughan. Tracking of a target payload via a combination of input shaping, zero phase error tracking control, and fuzzy logic. In *Dynamic*

Systems and Control Conference, volume 2, page V002T27A005, Minneapolis, Minnesota, USA, October 12–14 2016.

[10] Forrest Montgomery and Joshua Vaughan. Modeling and control of a cable-driven robot for inspection of wide-area horizontal workspaces. In *Dynamic Systems and Control Conference*, volume 2, page V002T22A002, Minneapolis, Minnesota, USA, October 12–14 2016.

[11] Nicole Barry, Erin Fisher, and Joshua Vaughan. Modeling and control of a cable-suspended robot for inspection of vertical structures. In *International Conference on Motion and Vibration Control (MOVIC)*, Southampton, UK, July 3–6 2016.

[12] Beau Domingue and Joshua Vaughan. Crane workspace mapping via a scanning laser rangefinder. In *ASME 2015 International Mechanical Engineering Congress & Exposition (IMECE 2015)*, Houston, TX USA, November 13–19 2015. ASME.

[13] Dare Olaonipekun and Joshua Vaughan. Complete coverage path planning for flexible parent-child unit robots. In *ASME 2015 Dynamic Systems and Control Conference*, volume 3, page V003T40A004, Columbus, Ohio, USA, October 28–30 2015. ASME.

[14] M. Sazzad Rahman and Joshua Vaughan. Crane workspace mapping using qr codes. In *ASME 2015 Dynamic Systems and Control Conference*, volume 2, page V002T30A004, Columbus, Ohio, USA, October 28–30 2015. ASME.

[15] Ali Baheri and Joshua Vaughan. Concurrent design of unity-magnitude input shapers and proportional-derivative feedback controllers. In *American Control Conference (ACC)*, Chicago, IL, July 1–3 2015.

[16] Robert Schmidt, Nicole Barry, and Joshua Vaughan. Tracking of a target payload via a combination of input shaping and feedback control. In *12th IFAC Workshop on Time Delay Systems*, Ann Arbor, Michigan, June 28–30 2015.

[17] Joshua Vaughan. An initial comparison of energy use between crane control methods. In *ASME 2014 Dynamic Systems and Control Conference*, volume 3, San Antonio, Texas, October 22–24 2014.

[18] M. Sazzad Rahman and Joshua Vaughan. Simple near-realtime crane workspace mapping using machine vision. In *ASME 2014 Dynamic Systems and Control Conference*, volume 3, page V003T28A005, San Antonio, Texas, October 22–24 2014.

[19] Ali Baheri and Joshua Vaughan. Robust concurrent design of inputs and proportional-derivative feedback controllers. In *International Symposium on Flexible Automation*, Awaji-Island, Hyogo, Japan, July 14-16 2014.

[20] Joshua Vaughan, Michele Guarnieri, and Paulo Debenest. Limiting rocking oscillation of cable-riding robots subject to wind disturbances. In *International Conference on Motion and Vibration Control (MOVIC)*, Sapporo, Hokaido, Japan, August 3-7 2014.

[21] Ali Baheri and Joshua Vaughan. Concurrent command and mechanical system design to limit transient and residual vibration. In *International Conference on Motion and Vibration Control (MOVIC)*, Sapporo, Hokaido, Japan, August 3-7 2014.

[22] William Singhose, Dooroo Kim, and Joshua Vaughan. Post-ejection failure mode of post-driving machines. In *VIII International Conference "Heavy Machinery-HM 2014"*, Zlatibor, Serbia, June 25-28 2014.

[23] Joshua Vaughan. Jumping commands for flexible-legged robots. In *International Symposium on Robotics*, Seoul, Korea, Oct. 24-26 2013.

[24] Joshua Vaughan, Jieun Yoo, Nathan Knight, and William Singhose. Multi-input shaping control for multi-hoist cranes. In *2013 American Controls Conference (ACC)*, pages 3455–3460, Washington, D.C., June 17-19 2013.

[25] Joshua Vaughan. Modeling and control of rocking in cable-riding systems. In *2013 Asian Control Conference (ASCC)*, Istanbul, Turkey, June 23-26 2013.

[26] Youmin Hu, Bo Wu, Joshua Vaughan, and William Singhose. Oscillation suppression for an energy efficient bridge crane using input shaping. In *2013 Asian Control Conference (ASCC)*, Istanbul, Turkey, June 23-26 2013.

[27] Ehsan Maleki, William Singhose, Jeffrey Hawke, and Joshua Vaughan. Dynamic response of a dual-hoist bridge crane. In *ASME Dynamic Systems and Control Conference*, Palo Alto, CA, Oct. 21-23 2013.

[28] Joshua Vaughan, Kelvin Chen Chih Peng, William Singhose, and Warren Seering. Influence of remote-operation time delay on crane operator performance. In *10th IFAC Workshop on Time Delay Systems*, Boston, USA, June 22-24 2012.

[29] Joshua Vaughan, Jieun Yoo, Nathan Knight, and William Singhose. Dynamics and control of multiple cranes with a connected payload. In *19th International Congress on Sound and Vibration (ICSV19)*, Vilnius, Lithuania, July 8-12 2012.

[30] Joshua Vaughan, Jieun Yoo, and W. Singhose. Using approximate multi-crane frequencies for input shaper design. In *Control, Automation and Systems (ICCAS), 2012 12th International Conference on*, pages 639–644, Jeju Island, Korea, Oct. 17-21 2012.

[31] J. Vaughan, A. Karajgikar, and W. Singhose. A study of crane operator performance comparing pd-control and input shaping. In *American Control Conference (ACC), 2011*, pages 545 –550, 29 2011-july 1 2011.

[32] Ajeya Karajgikar, Joshua Vaughan, and William Singhose. Double-pendulum crane operator performance comparing pd-feedback control and input shaping. In *Multibody Dynamics 2011*, Brussels, Belgium, July 4-7 2011.

[33] Joshua Vaughan and William Singhose. Reducing multiple modes of vibration by digital filtering and input shaping. In *ASME Dynamic Systems and Control Conference*, Cambridge, MA, September 13-15 2010.

[34] Joshua Vaughan, Ehsan Maleki, and William Singhose. Advantages of using command shaping over feedback for crane control. In *American Control Conference*, Baltimore, MD, June 30 - July 2 2010.

[35] William Singhose, Juan de Juanes Marquez, Brice Pridgen, and Joshua Vaughan. Use of telerobotic cranes in international collaborative education. In *The 15th IASTED International Conference on Robotics and Applications*, Cambridge, MA, November 1-3 2010.

[36] Joshua Vaughan, Anderson Smith, and William Singhose. Using a predictive graphical user interface to improve tower crane performance. In *The 14th IASTED International Conference on Robotics and Applications*, Cambridge, MA, November 2-4 2009.

[37] Joshua Vaughan and William Singhose. Input shapers for reducing overshoot in human-operated flexible systems. In *Proceedings of 2009 American Control Conference*, St. Louis, MO, June 10-12 2009.

[38] Joshua Vaughan and William Singhose. Reducing vibration and providing robustness with multi-input shapers. In *Proceedings of 2009 American Control Conference*, St. Louis, MO, June 10-12 2009.

[39] William Singhose, Joshua Vaughan, and Rhett Mayor. Use of design competitions in mechatronics education. In *Proceedings of 2009 International Conference on Mechatronics*, Malaga, Spain, April 14-17 2009.

[40] Ehsan Maleki, William Singhose, and Joshua Vaughan. Initial experiments with a small-scale mobile boom crane. In *The 14th IASTED International Conference on Robotics and Applications*, Cambridge, MA, November 2-4 2009.

[41] Jisup Yoon, William Singhose, Joshua Vaughan, Gabriel Ramirez, Michael Kim, and Sujay Tawde. Dynamics and control of crane payloads that bounce and pitch during hoisting. In *ASME International Design Engineering Technical Conferences*, San Diego, CA, August 30 - September 2 2009.

[42] Abhishek Dhanda, Joshua Vaughan, and William Singhose. Optimal input shaping filters for non-zero initial states. In *Proceedings of 2009 American Control Conference*, St. Louis, MO, June 10-12 2009.

[43] Joshua Vaughan, Aayush Daftari, and William Singhose. The influence of input shaper duration on bridge crane operator performance. In *The 9th International Conference on Motion and Vibration Control*, Munich, Germany, September 15-18 2008.

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[45] Joshua Vaughan, Aika Yano, and William Singhose. Performance comparison of robust negative input shappers. In *2008 American Controls Conference*, pages 3257 – 62, Seattle, Washington, June 2008.

[46] William Singhose, Joshua Vaughan, Jon Danielson, and Jason Lawrence. Use of cranes in system dynamics and controls education. In *Proceedings of the 17th IFAC World Congress*, Seoul, Korea, July 6-11 2008.

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[48] Mingxiao Dong and Joshua Vaughan. Approximate extra insensitive methods to restrain residual vibrations of flexible manufacturing machines. In *International Symposium on Flexible Automation*, Atlanta, GA, June 23–26 2008.

[49] Jon Danielson, Joshua Vaughan, William Singhose, Lukas Wilder, and Urs Glauser. Design of a mobile boom crane for research and educational applications. In *The 9th International Conference on Motion and Vibration Control*, Munich, Germany, September 15-18 2008.

[50] Joshua Vaughan, William Singhose, Paulo Debenest, Edwardo Fukushima, and Shigeo Hirose. Initial experiements on the control of a mobile tower crane. In *ASME International Mechanical Engineering Congress and Exposition*, Seattle, Washington, 2007.

[51] Joshua Vaughan, Aika Yano, and William Singhose. Performance comparison of robust input shapers. In *The Sixth International Conference on Control and Automation*, Guangzhou, China, 2007.

[52] William Singhose, Joshua Vaughan, Jon Danielson, and Jason Lawrence. The use of tele-operated cranes for advanced controls education. In *ASME International Mechanical Engineering Congress and Exposition*, Seattle, Washington, 2007.

[53] Joshua Vaughan and William Singhose. Modeling and control of a mobile crane system. In *The Third International Conference for Advances in Mechanical Engineering and Mechanics*, Hammamet, Tunisia, 2006.

[54] Joshua Vaughan and William Singhose. ARLISS: A multidisciplinary extracurricular design project for undergraduates. In *ASEE Annual Conference and Exposition*. Chicago, Illinois, 2006.

[55] Michael Robertson, Joshua Vaughan, William Singhose, Michael Pastirik, Marion Usselman, and Donna Llewellyn. Involving high school students in a university-level mechanical engineering design competition. In *ASEE Annual Conference and Exposition*, pages 9039–9049, Portland, Oregon, June 12–15 2005.

[56] Joshua Vaughan, Nader Sadegh, and William Singhose. Examination of variable damping for payload compensation in heavy machinery. In *The Seventh International Conference on Motion and Vibration Control*, August 2004.

[57] Joshua Vaughan, William Singhose, and Nader Sadegh. A multiple model approach to payload compensation via active suspension control. In *IFAC Symposium on Advances in Automotive Control*, pages 590–595, Salerno, Italy, 2004.

[58] Samuel Klooster, Kris Kozak, Joshua Vaughan, Peter Sanders, and William Singhose. Fluid power control of a hyper-active seat for low-frequency vibration suppression. In *IFAC Symposium on Advances in Automotive Control*, Salerno, Italy, 2004.

[59] Joshua Vaughan, William Singhose, and Nader Sadegh. Use of active suspension control to counter the effects of vehicle payloads. In *IEEE Conference on Control Applications*, pages 285–289, Istanbul, Turkey, 2003.

Patents & Intellectual Property

11/14/17 "Methods for Near-realtime Workspace Mapping." U.S. Patent 9,818,198.

10/21/16 "Automated Evacuation of Pharmaceutical Tubes." U.S. Patent Application 20170113844.

3/10/15 "Methods and Systems for Improving Positioning Accuracy." U.S. Patent 8,975,853.

Funding – Approx. $913,000 Cash + $240,000 In-kind Contributions

1/2018 – 12/2021 *A Progression of Robotics Projects and Competitions for GEAR UP* – Lafayette Public School Systems – $64,970

1/2018 – 5/2018 *Input Shaping Control Research in Support of an Undergraduate Student Exchange* – Kumoh National Institute of Technology – ≈$2,650 (3,000,000 KRW)

1/2018 – 12/2020 *Automated Peeling of Louisiana Crawfish* – Louisiana Crawfish Promotion and Research Board – $201,563

11/2017 – 10/2018 *Promoting Aerospace Research and Education through ARLISS at UL Lafayette* Louisiana Space Grant Consortium (LaSPACE) – $3,948

7/2017 – 6/2018 *Improving the Core Robotics Kit in the Mechanical Engineering Curriculum* – UL Lafayette STEP Grant – $4,903

1/2017 – 12/2017 *Supporting Hands-on Robotics Projects in the Mechanical Engineering Curriculum* – UL Lafayette STEP Grant – $6,662

5/2016 – 12/2016 *Maritime RobotX at UL Lafayette* – Donation from Mr. Donald Mosing – $130,000

1/2016 – 12/2016 *Vibration-free Control of Cable-suspended Robots* – HiBot, Corp – $9,172

6/2015 – 6/2018 *Cable-Driven Robots for Inspection, Maintenance, and Rescue* – Louisiana Board of Regents ITRS (with HiBot, Corp) – $162,249 + $75,000 in-kind

6/2014 – 6/2017 *Reducing Oscillation of Ship-Mounted Cranes Used for ASV Retrieval* – Louisiana Board of Regents ITRS (with C&C Technologies, then ASV, Ltd) – $136,140 + $145,011 in-kind

6/2014 – 1/2015 *Using Robotics to Improve Efficiency of Operations at Professional Arts Pharmacy* – Professional Arts Pharmacy – $47,881

1/2014 – 1/2015 *Establishing ARLISS at the University of Louisiana at Lafayette* – Louisiana Space Grant Consortium (LaSPACE) – $12,822

10/2013 – 4/2014 *Using Hands-On Robotics Projects to Teach Mechanical Design and Technical Communication* – UL Lafayette Educational Grant – $2,157

8/2013 – 8/2014 *Making the Anaconda Autonomous – Year 1* – Swiftships Shipbuilders – $127,632 + $20,378 equipment (50% Co-PI with Dr. Arun Lakhotia)

Invited Presentations

3/2016	*An Overview of Input Shaping Control* Wuxi Institude of Huazhong University of Science and Technology, Wuxi, China
3/2016	*An Introduction to the C.R.A.W.LAB* Huazhong University of Science and Technology, Wuhan, China
3/2016	*A Brief Introduction to the University of Louisiana at Lafayette* Huazhong University of Science and Technology, Wuhan, China
11/2014	*Command Generation Strategies to Improve Flexible System Performance* Louisiana Engineering Society, Lafayette Chapter, Lafayette, LA
7/2014	*Dynamics and Control of Autonomous Surface Vehicles* Tokyo Institute of Technology, Tokyo Japan
6/2014	*Using Input Shaping to Improve Crane Performance and Safety* ISA (International Society of Automation), Lafayette Section, Lafayette, LA
10/2013	*Establishing the C.R.A.W.LAB* Shandong Jianzhu University, Jinan, Shandong Province, China
4/2013	*What Can You Do with a Physics Degree?* Hampden-Sydney College Physics and Astronomy Department, Hampden-Sydney, VA
10/2012	*Using Approximate Multi-Crane Frequencies for Input Shaper Design* 12th International Conference on Control, Automation and Systems, Jeju, Korea
5/2011	*Intelligent Command Generation* Tokyo Institute of Technology, Tokyo, Japan
10/2010	*Intelligent Command Generation to Reduce Machine Vibration* Italian Institute of Technology, Genoa, Italy
6/2010	*Why Mechanical Engineering?* Georgia Engineering Foundation – Exploring Engineer Academy Georgia Institute of Technology, Atlanta, GA
10/2009	*Use of Advanced Mechatronics for Landmine Detection* Chosun University, Gwangju, Korea
10/2009	*Challenges of Humanitarian Demining* Kumoh National Institute of Technology, Gumi, Korea
5/2008	*Limiting Input Shaper Induced Overshoot in Operator Commands* Kumoh National Institute of Technology, Gumi, Korea
1/2007	*Dynamics and Control of Mobile Cranes* Kumoh National Institute of Technology, Gumi, Korea

Conference Sessions Organized

6/2015	*Input Shaping and Vibration Control Design* (Co-organized) IFAC Workshop on Time Delay Systems, University of Michigan, Ann Arbor, USA
5/2013	*Command Generation and Filtering for Control of Flexible Systems* Asian Controls Conference, Istanbul, Turkey.
10/2012	*Command Generation for Flexible System Control* International Conference on Control, Automation, and Systems, Jeju, Korea
5/2012	*Input Shaping and Vibration Suppression* (Co-organized) IFAC Workshop on Time Delay Systems, Northeastern University, Boston, USA

Conference Sessions Chaired or Co-chaired

10/2017	Dynamic Systems and Control Conference (DSCC), Tysons Corner, VA, USA
08/2017	Conference on Control Technology and Applications (CCTA), Kohala Coast, Hawaii, USA
10/2016	Dynamic Systems and Control Conference (DSCC), Minneapolis, Minnesota, USA
10/2015	Dynamic Systems and Control Conference (DSCC), Columbus, Ohio, USA
6/2015	IFAC Workshop on Time Delay Systems, University of Michigan, Ann Arbor, USA
8/2014	International Conference on Motion and Vibration Control (MoViC), Sapporo, Japan
5/2013	Asian Controls Conference, Istanbul, Turkey
10/2012	International Conference on Control, Automation, and Systems, Jeju, Korea
5/2012	IFAC Workshop on Time Delay Systems, Northeastern University, Boston, USA
5/2006	ASEE Annual Conference and Exposition. Chicago, Illinois, USA

Consulting Experience

Fall 2016	Crane Tipover Accident Analysis Analysis of crane accident Simulation of accident conditions
Fall 2015	Garbage Truck Accident Analysis Analysis of truck accident Simulation of door opening conditions and forces
Fall 2015	Personal Transporter Accident Analysis Analysis of accident Personal Transporter design analysis
Spring 2013	Survey of Mechanical Restraint Methods Searched and categorized methods of mechanical restraint Summarized findings for support of expert witness testimony
Spring 2012	Post Driver Analysis Video analysis of post driver post ejection Analyzed the velocity of post in various modes of ejection
Fall 2011	Aerial-Lift (Cherrypicker) Stability Analysis Modeled telescoping aerial-lift Analyzed the stability of the lift within its workspace
Summer 2011	Aerial-Lift (Cherrypicker) Accident Analysis Video asnalysis of cherrypicker tip-over accident Extracted system states from video of accident
Summer 2010	Personal Transporter Market Analysis Personal transporter market review Compilation of existing personal transporter specifications Evaluation of personal transporter designs currently in market
Spring 2008	Segway Accident Analysis Processed video to determine states of Segway prior to accident Tested battery life and battery failure modes of Segway Analyzed audio levels of Segway warnings
Spring 2008	Aerial-Lift (Cherrypicker) Accident Analysis

Developed physical and mathematical models of cherrypicker in tip-over accident
Design analysis of cherrypicker in accident
Analyzed dynamics and stability of cherrypickers in various configurations

Summer 2004 Segway Accident Analysis
Reconstruction of the 1st Major Segway Accident
Segway design and safety critique
Analysis of contributing factors for accident

Professional Contributions

Int. Conf. on Ubiquitous Robots and Ambient Intelligence, Int. Program Committee
Control Engineering Practice, reviewer
IEEE Transactions on Control Systems Technology, reviewer
Transactions on Systems, Man, and Cybernetics–Part A: Systems and Humans, reviewer
International Journal of Control, Automation, and Systems, reviewer
Journal of Systems and Control Engineering, reviewer
Journal of Sound and Vibration, reviewer
Automation in Construction, reviewer
American Controls Conference, reviewer
ASME Dynamic Systems and Control Conference, reviewer
ASME IMECE, reviewer
International Conference on Intelligent Robots and Systems, reviewer

Honors

2016 – 2017 University of Louisiana at Lafayette Innovator Award Winner
2014 – 2016 University of Louisiana at Lafayette Rising Star Award Winner
2014 – 2016 University of Louisiana at Lafayette Innovator Award Winner
2015 Young Researcher of the Year – UL Lafayette College of Engineering
2013 – 2014 University of Louisiana at Lafayette Rising Star Award Winner
2012 ADVANCE at Northeastern Univ. Future Faculty Workshop Invited Participant
2009 – 2010 Trans. on Control Systems Technology Outstanding Paper Award Nominee
2009 – 2010 Japan Society for the Promotion of Science (JSPS) Postdoctoral Fellow
2008 – 2009 Siemens Energy and Automation Postdoctoral Fellow
2006 – 2008 Siemens Energy and Automation Fellow
2006 – 2007 ASME Graduate Teaching Fellow
2006 – 2007 NSF Doctoral Dissertation Enhancement Project winner
2004 – 2005 NSF STEP Fellow
Madison Scholar at Hampden-Sydney College
Phi Beta Kappa at Hampden-Sydney College (national honor fraternity)
Omicron Delta Kappa at Hampden-Sydney College (national leadership fraternity)
Pi Mu Epsilon (national mathematics honor fraternity)
Hardy Cross Award for Excellence in Physics
Two-year co-captain of baseball at Hampden-Sydney College

Memberships

2013 – present IEEE Member

2013 – present JSPS US Alumni Association