Drew (Andrew P.) Sabelhaus

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EDUCATION

UNIVERSITY OF CALIFORNIA, BERKELEY

PhD. Mechanical Engineering, Controls
Expected May 2018
MS. Mechanical Engineering, Controls
Dec. 2014

UNIVERSITY OF MARYLAND, COLLEGE PARK

B.S. Mechanical Engineering, Minor in Comp. Sci.
May 2012

PUBLICATIONS

- **DNA-Structured Linear Actuators.** Zampaglione, K.; Sabelhaus, A.P.; Chen, L.; Agogino, A.M.; Agogino, A.K.; 2016 ASME International Design Engineering Technical Conferences (IDETC) / 40th Mechanisms and Robotics Conference.
- **Mechanism Design and Simulation of the ULTRA Spine, a Tensegrity Robot.** Sabelhaus, A.P.; Ji, H.; Hylton, P.; Madaan, Y.; Yang, C.; Friesen, J.; SunSpiral, V.; Agogino, A.M.; 2015 ASME International Design Engineering Technical Conferences (IDETC) / 39th Mechanisms and Robotics Conference.
- **System Design and Locomotion of SUPERball, an Untethered Tensegrity Robot.** Sabelhaus, A.P.; Bruce, J.; Caluwaerts, K.; Manovi, P.; Fallah Firoozi, R.; Dobi, S.; Agogino, A.M.; SunSpiral, V.; IEEE International Conference on Robotics and Automation (ICRA), 2015
- **Design and Control of Compliant Tensegrity Robots through Simulation and Hardware Validation.** Caluwaerts, K.; Despraz, J.; Iscen, A.; Sabelhaus, A.P.; Bruce, J.; Schrauwen, B.; SunSpiral, V.; J. of the Royal Society Interface, Sept. 2014
- **Hardware Design and Testing of SUPERball, a Modular Tensegrity Robot.** Sabelhaus, A.P.; Bruce, J.; Caluwaerts, K.; Chen, Y.; Lu, D.; Liu, Y.; Agogino, A.K.; SunSpiral, V.; Agogino, A.M.; The 6th World Conference on Structural Control and Monitoring (6WCSM), July 2014
- **SUPERball: Exploring Tensegrities for Planetary Probes.** Bruce, J.; Sabelhaus, A.P.; Chen, Y.; Lu, D.; Morse, K.; Milam, S.; Caluwaerts, K.; Agogino, A.M.; SunSpiral, V.; 12th International Symposium on Artificial Intelligence, Robotics, and Automation in Space (i-SAIRAS), June 2014
- **Design and Evolution of a Modular Tensegrity Robot Platform.** Bruce, J.; Caluwaerts, K.; Iscen, A.; Sabelhaus, A.P.; SunSpiral, V.; IEEE International Conference on Robotics and Automation (ICRA), May 2014
- **TinyTeRP: A Tiny Terrestrial Robotic Platform with Modular Sensing.** Sabelhaus, A.P.; Mirsky, D.; Hill, L.M.; Bergbreiter, S.; IEEE International Conference on Robotics and Automation (ICRA), May 2013

PRESENTATIONS, WORKSHOPS, POSTERS

- **Robotics, Mechatronics, and Intelligent Systems.** Osher Lifelong Learning Institute, Feb 2014. Invited Talk.
- **Fabulous Facilitation Frameworks for LGBTQ College Students.** Out in Science, Technology, Engineering, and Mathematics Incorporated (oSTEM) National Conference, Nov 2013. Workshop.
- **Mechatronic Design of Tensegrity Robotic Systems for Dynamic Locomotion.** NASA Ames Research Center Autonomous Systems Lab Intern Poster Symposium, Aug 2013. Poster Session.
- **TinyTeRP: A Tiny Terrestrial Robotic Platform with Modular Sensing.** International Conf. on Robotics and Automation (ICRA), May 2013. Presentation.
- **Topics in Queer Student Leadership: Assessment, Transitions, and Goal-Driven Planning.** Midwest Bisexual, Gay, Lesbian, Transgender, and Allies College Conference, Feb 2013. Workshop. Also presented at National Gay and Lesbian Task Force Creating Change Conference, Jan 2013. Workshop.
- **TinyTeRP: A Tiny Terrestrial Robotic Platform.** International Symposium on Distributed Autonomous Robotic Systems (DARS), Nov 2012. Poster Session.

RESEARCH EXPERIENCE

BERKELEY EMERGENT SPACE TECHNOLOGIES LAB (BEST) | Graduate Research Fellow
Sept 2012 - Present | Berkeley, CA

- Led team of 5 master's students in designing and testing stuctural robotics components for a robot at NASA
- Created new research program (the "Tensegrity Spine Hardware Project"), recruited 5 master's students, led team on design and controls research
- Recruited and mentored 2 undergraduate researchers

NASA AMES RESEARCH CENTER, INTELLIGENT ROBOTICS GROUP | Graduate Student Intern
Feb 2013 - Present | Moffett Field, CA

- Mechanical design of SUPERball, an autonomous tensegrity robot: cable driving system, actuation system, active compliance spring system
- Sensor design for SUPERball: designed, tested, calibrated, and assembled custom force gauges
- Assisted in electronics design for SUPERball and programming in ROS (Robotic Operating System)
- Wrote and maintained pieces of the NASA Tensegrity Robotics Toolkit in C++
- Simulated different motions of SUPERball in NTRT, tested potential controls

MARYLAND MICROROBOTICS LAB | Undergraduate Researcher
Feb 2011 – Aug 2012 | College Park, MD

- Designed circuit and PCB layout for 1.2 cm^2 mobile robot
- Wrote data collection software and control algorithm for robot
- Led team of 3 undergraduates and 1 REU student to a successful paper submission

U.S. ARMY CORPS OF ENGINEERS RESEARCH CENTER | Mechanical Engineering Research Intern
Summer 2011 | Alexandria, VA

- Researched and tested long-range wireless sensor network system
- Wrote data collection software and management software for network nodes

OTHER ENGINEERING DESIGN EXPERIENCE

SOFT CLASSIFICATION FOR HYBRID SYSTEMS USING GAUSSIAN PROCESS MODELS
Spring 2014 | Hybrid Systems Identification and Control Course, UC Berkeley

- Researched Gaussian Process Models for Machine Learning, implemented software in MATLAB for regression over GPs
- Developed innovative (to-be-published) algorithm for probabilistically classifying systems with online regression
- Evaluated algorithm on simulated system (data from SUPERball simulation in NTRT)

OPTIMIZATION-BASED CONTROL FOR AN UNDERACTUATED MAGNETIC LEVITATION SYSTEM
Fall 2013 | Advanced Robotics Course, UC Berkeley

- Designed a trajectory-tracking controller for a simplied model of an underactuated magnetic levitation system
- Developed input-output linearized model for optimization initialization
- Simulated and evaluated trajectory tracking performance for multiple disturbance modes

NEARZERO DESIGN PROJECT | Controls Group Lead
Spring 2013 | Advanced Design and Automation Course, UC Berkeley

- Designed sensing and actuation system for magnetically-levitated flywheel energy storage system
- Formulated a Linear Quadratic Regulator controller, performed stability analysis of control system
- Designed circuit and layout for 3 printed circuit boards for analog sensors, digital control, and electromagnet drivers

LEADERSHIP, OUTREACH, AND ORGANIZATIONAL WORK

EQUITY, DIVERSITY, AND INCLUSION INITIATIVE | Graduate Peer Advisor
Aug 2014 - Present | Berkeley, CA

- One of two graduate students spearheading diversity programs in the Mechanical Engineering Department at UC Berkeley
- Held office hours, advised students on matters of inclusion, identity, research, and professional relationships
- Organized lab tours for two high school groups from Santa Cruz, CA
- Organized fellowship application draft reading team for under-represented students in the department
- Currently planning and organizing large "Engineering for All" initiative for spring 2015

OUT IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS INCOPORATED
Coordinator, Chapter Leadership Programs
July 2012 - Present | Berkeley, CA

- Led data collection, programs assessment, and new programming efforts for national nonprofit organization serving LGBTQ students in STEM fields
- Organized and led the Chapter Handbook Project team
- Wrote 50+ pages of leadership instructional material for current oSTEM chapter leaders, edited other sections of the 80 page oSTEM Chapter Handbook (distributed Feb 2013)
- Created online assessment strategy for handbook among student users
- Created and presented unique skills workshops at national LGBTQ+ conferences
- Temporarily filled open position on oSTEM Incorporated Board of Directors from late 2012 until mid 2013

OUT IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS AT UC BERKELEY
Secondary Advisor
Aug 2012 - Present | Berkeley, CA

- Provided advice, training, and support to local oSTEM Chapter as a former leader
- Mentored current and upcoming student leaders, in both personal and professional capacities
- Assisted in leadership transitions and programs assessment

OUT IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS AT MARYLAND
Chapter President
Nov 2010 - April 2012 | College Park, MD

- Co-founded and led chapter of oSTEM at the University of Maryland, College Park
- Wrote budgets for conference attendance and local events
- Coordinated corporate sponsorships, totaling over $3,000
- Trained current group of student leaders for their leadership transition

QUEER COUNCIL AT THE UNIVERSITY OF MARYLAND | Founder, Facilitator
May 2011 - April 2012 | College Park, MD

- Founded organizational inter-group council for LGBTQ+ student group leaders at the University of Maryland
- Led dialogue programs and generated cross-programming between groups
- Facilitated discussions and advocated for the queer community to university staff and management