

Drew (Andrew P.) Sabelhaus

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EDUCATION

UNIVERSITY OF CALIFORNIA, BERKELEY

PH.D. MECHANICAL ENGINEERING, CONTROLS
Expected May 2018

MS. MECHANICAL ENGINEERING, CONTROLS
Dec. 2014 | GPA: 3.85

UNIVERSITY OF MARYLAND
B.S. MECHANICAL ENGINEERING, MINOR IN COMPUTER SCIENCE
May 2012 | College Park, MD
GPA: 3.7

SKILLS

PROGRAMMING

Over 2000 lines:

C • C++ • Linux Shell
MATLAB • Java • \LaTeX

Over 500 lines:

Python • Ruby • Assembly: ia32, MIPS
Visual Basic • nesC, TinyOS

Familiar:

OCaml • Julia • Android • Javascript
JSON • HTML • XML

ENGINEERING FABRICATION

Surface-Mount PCB Layout and Assembly
Digital and Analog Circuit Design
Control System Design and Testing
Soldering • Machine Shop • Tolerancing

HONORS, AWARDS

NASA Space Tech. Research Fellow, '15
NSF Graduate Research Fellowship, '12
Markowski-Leach Scholarship, '13-14
U.Md. Engineering Leadership Award, '12
U.Md. Presidential Scholarship, '08-12
L-3 Communications Scholarship, '11-12
U.Md. LGBT Equity Office Scholarship, '11
Thales Communications Scholarship, '10
Terex Corporation Scholarship, '09

PUBLICATIONS

- **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.; To be published at the 2015 ASME International Design Engineering Technical Conferences / 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.
- **Topics in Queer Student Leadership: Assessment, Transitions, and Goal-Driven Planning.** 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 structural 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 cm² 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 simplified 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 INCORPORATED

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