# Andrew P. Sabelhaus

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## EDUCATION

**PH.D. MECHANICAL ENGINEERING** — University of California, Berkeley
Dissertation title: *Tensegrity Spines for Quadruped Robots* — August 2019
Dissertation Committee: *Alice M. Agogino (Chair), Andrew Packard, Claire Tomlin, Murat Arcak*

**M.S. MECHANICAL ENGINEERING** — University of California, Berkeley
Thesis: *Mechanism and Sensor Design for SUPERball, a Cable-Driven Tensegrity Robot* — Dec. 2014
Thesis Committee: *Alice M. Agogino, Dennis Lieu*

**B.S. MECHANICAL ENGINEERING** — University of Maryland, College Park
*Minor in Computer Science* — May 2012

## APPOINTMENTS

| | |
|---|---|
| Boston University | Assistant Professor |
| Department of Mechanical Engineering | 2022 - Present |
| Division of Systems Engineering | 2022 - Present |
| Center for Information Systems and Engineering | 2022 - Present |
| Carnegie Mellon University | Postdoctoral Research Fellow |
| Deptartment of Mechanical Engineering | 2019 - 2021 |
| NASA Ames Research Center | Visiting Technologist |
| Intelligent Systems Division | 2015 - 2019 |
| University of California, Berkeley | Graduate Research Fellow |
| Department of Mechanical Engineering | 2012-2019 |

## AWARDS AND HONORS

5. NSF Faculty Early Career Development Program (CAREER) Award. National Science Foundation. Title: *Safe Autonomy for Soft Robots.* 2024-2029.
4. Intelligence Community Postdoctoral Research Fellowship. Office of the Director of National Intelligence. Title: *Rapid Deployment of Hard-to-Control Robots with Optimality Tradeoffs.* 2020-2022.
3. NASA Space Technology Research Fellowship. National Aeronautics and Space Administration. Title: *Trajectory Tracking in Nonlinear, High-Order, Underactuated Robotic Systems.* 2015-2019.
2. Markowski-Leach Foundation Award. *Awarded to individuals at San Francisco Bay Area institutions who "are likely to make a substantial contribution to society."* 2013-2014, re-awarded 2016-2018.
1. NSF Graduate Research Fellowship. National Science Foundation. 2012-2015.

## RESEARCH OUTPUT SNAPSHOT

| Peer-Reviewed Publication Count: | | | | Total Citations: | h-index: |
|---|---|---|---|---|---|
| | Conference: | Journal: | Total: | | |
| 1st-Author or PI: | 10 | 5 | 15 | 1378* (664†) | 16* (11†) |
| All: | 15 | 12 | 27 | | |

**Via Google Scholar, https://scholar.google.com/citations?user=ze69yEMAAAAJ&hl=en.*
*†Via Web of Science, https://www.webofscience.com/wos/author/record/1791313.*

# JOURNAL PUBLICATIONS

12. A.P. Sabelhaus, Z. Patterson, A. Wertz, C. Majidi, ``Safe Supervisory Control of Soft Robot Actuators,'' *Soft Robotics*, Aug. 2024. doi:10.1089/soro.2022.0131
11. A. Choi, R. Jing, A.P. Sabelhaus, M.K. Jawed, ``DisMech: A Discrete Differential Geometry-Based Physical Simulator for Soft Robots and Structures,'' *IEEE Robotics and Automation Letters*, Feb 2024. doi:10.1109/LRA.2024.3365292
10. X. Huang, Z.J. Patterson, A.P. Sabelhaus, W. Huang, K. Chin, Z. Ren, M.K. Jawed, C. Majidi, ``Design and Closed Loop Motion Planning of an Untethered Swimming Soft Robot using 2D Discrete Elastic Rods Simulations,'' *Advanced Intelligent Systems*, 2200163, 2022. doi:10.1002/aisy.202200163
9. X. Huang, A.P. Sabelhaus, M. K. Jawed, L. Jin, J. Zou, Y. Chen,``Materials, design, modeling and control of soft robotic artificial muscles,'' *Frontiers in Robotics and AI*, Vol. 30, Nov 2022. doi:10.3389/frobt.2022.1074549
8. A.P. Sabelhaus, R.K. Mehta, A. Wertz, C. Majidi, ``In-Situ Sensing and Dynamics Predictions for Electrothermally-Actuated Soft Robot Limbs,'' *Frontiers in Robotics and AI*, Vol. 9, May 2022. doi:10.3389/frobt.2022.888261
7. M. Zadan, D.K. Patel, A.P. Sabelhaus, J.Liao, A. Wertz, L. Yao, C. Majidi, ``Liquid Crystal Elastomer with Integrated Soft Thermoelectrics for Shape Memory Actuation and Energy Harvesting,'' *Advanced Materials*, April 2022. doi:10.1002/adma.202200857
6. Z.J. Patterson, A.P. Sabelhaus, C. Majidi, ``Robust Control of a Multi-Axis Shape Memory Alloy-Driven Soft Manipulator,'' *IEEE Robotics and Automatics Letters*, April 2022. doi:10.1109/LRA.2022.3143256
5. A.P. Sabelhaus, K. Zampaglione, E. Tang, L.H. Chen, A.K. Agogino, A.M. Agogino, ``Double-Helix Linear Actuators.'' *Journal of Mechanical Design (ASME)*, Vol. 143, Issue 10, Oct. 2021. doi:10.1115/1.4050739
4. Z. Ren, X. Huang, M. Zarepoor, A.P. Sabelhaus, C. Majidi, ``Shape Memory Alloy (SMA) Actuator with Embedded Liquid Metal Curvature Sensor for Closed-Loop Control.'' *Frontiers in Robotics and AI*, Vol. 8, Mar. 2021. doi:10.3389/frobt.2021.599650
3. A.P. Sabelhaus, H. Zhao, E. Zhu, A.K. Agogino, A.M. Agogino, ``Model-Predictive Control with Inverse Statics Optimization for Tensegrity Spine Robots.'' *IEEE Transactions on Control System Technology*, Vol. 29, Issue 1, Jan. 2021. doi:10.1109/TCST.2020.2975138
2. A.P. Sabelhaus, A.H. Li, K.A. Sover, J. Madden, A. Barkan, A.K. Agogino, A.M. Agogino, ``Inverse Statics Optimization for Compound Tensegrity Robots.'' *IEEE Robotics and Automation Letters*, July 2020. doi:10.1109/LRA.2020.2983699
1. K. Caluwaerts, J. Despraz, A. Iscen, A.P. Sabelhaus, J. Bruce, B. Schrauwen, V. SunSpiral, ``Design and Control of Compliant Tensegrity Robots through Simulation and Hardware Validation.'' *Journal of the Royal Society Interface*, Sept. 2014. doi:10.1098/rsif.2014.0520

# CONFERENCE PUBLICATIONS

15. A. Dickson, J.C. Pacheco Garcia, R. Jing, M.L. Anderson, A.P. Sabelhaus, ``Real-Time Trajectory Generation for Soft Robot Manipulators Using Differrential Flatness,'' *IEEE International Conference on Soft Robotics (RoboSoft)*, Accepted for Publication, 2025. doi:10.48550/arXiv.2412.08568
14. M.L. Anderson, R. Jing, J.C. Pacheco Garcia, I. Yang, S. Alizadeh-Shabdiz, C. DeLorey, A.P. Sabelhaus, ``Maximizing Consistent Force Output for Shape Memory Alloy Artificial Muscles in Soft Robots,'' *IEEE International Conference on Soft Robotics (RoboSoft)*, Accepted for Publication, 2024.
13. J.C. Pacheco Garcia, R. Jing, M.L. Anderson, M. Ianus-Valdivia, A.P. Sabelhaus, ``A Comparison of Mechanics Simplifications in Pose Estinmation for Thermally-Actuated Soft Robot Limbs.'' *ASME 2023 Conference on Smart Materials, Adaptive Structures, and Intelligent Systems (SMASIS)*, Sept. 2023. doi:10.1115/SMASIS2023-110774
12. A. Wertz*, A.P. Sabelhaus*, C. Majidi, ``Trajectory Optimization for Thermally-Actuated Soft Planar Robot Limbs,'' *IEEE International Conference on Soft Robotics (RoboSoft)*, April 2022. *Equal Contribution. doi:10.1109/RoboSoft54090.2022.9762226
11. A.P. Sabelhaus, C.Majidi, ``Gaussian Process Dynamics Models for Soft Robots with Shape Memory Actuators.'' *IEEE International Conference on Soft Robotics (RoboSoft)*, April 2021. doi:10.1109/RoboSoft51838.2021.9479294

10. Z. Patterson, A.P. Sabelhaus, K. Chin, T. Hellebrekers, C. Majidi, ``An Untethered Brittle Star Robot for Closed-Loop Underwater Locomotion.'' *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oct. 2020. doi:10.1109/IROS45743.2020.9341008
9. L.H. Chen, M.C. Daly, A.P. Sabelhaus, L.A. Janse van Vuuren, H.J. Garnier, M.I. Verdugo, E. Tang, C.U. Spangenberg, F. Ghahani, A.K. Agogino, A.M. Agogino, ``Modular Elastic Lattice Platform for Rapid Prototyping of Tensegrity Robots.'' *ASME International Design Engineering Technical Conferences (IDETC) / 41st Mechanisms and Robotics Conference*, Aug 2017. doi:10.1115/DETC2017-68264
8. A.P. Sabelhaus, A.K. Akella, Z.A. Ahmad, V. SunSpiral, ``Model-Predictive Control of a Flexible Spine Robot.'' *American Control Conference (ACC)*, IEEE, May 2017. doi:10.23919/ACC.2017.7963738
7. K. Zampaglione, A.P. Sabelhaus, L.H. Chen, A.M. Agogino, A.K. Agogino, ``DNA-Structured Linear Actuators.'' *ASME International Design Engineering Technical Conferences (IDETC) / 40th Mechanisms and Robotics Conference*, Aug 2016. doi:10.1115/DETC2016-60291
6. A.P. Sabelhaus, H. Ji, P. Hylton, Y. Madaan, C. Yang, J. Friesen, V. SunSpiral, A.M. Agogino, ``Mechanism Design and Simulation of the ULTRA Spine, a Tensegrity Robot.'' *ASME International Design Engineering Technical Conferences (IDETC) / 39th Mechanisms and Robotics Conference*, Aug 2015. doi:10.1115/DETC2015-47583
5. A.P. Sabelhaus, J. Bruce, K. Caluwaerts, P. Manovi, R.F. Firoozi, S. Dobi, A.M. Agogino, V. SunSpiral, ``System Design and Locomotion of SUPERball, an Untethered Tensegrity Robot.'' *IEEE International Conference on Robotics and Automation (ICRA)*, May 2015. doi:10.1109/ICRA.2015.7139590
4. A.P. Sabelhaus; J. Bruce, K. Caluwaerts, Y. Chen, D. Lu, Y. Liu, A.K. Agogino, V. SunSpiral, A.M. Agogino, ``Hardware Design and Testing of SUPERball, a Modular Tensegrity Robot.'' *The 6th World Conference on Structural Control and Monitoring (6WCSCM)*, July 2014.
3. J. Bruce, A.P. Sabelhaus, Y. Chen, D.Lu, K. Morse, S. Milam, K. Caluwaerts, A.M. Agogino, V. SunSpiral, ``SUPERball: Exploring Tensegrities for Planetary Probes.'' *12th International Symposium on Artificial Intelligence, Robotics, and Automation in Space (i-SAIRAS)*, June 2014.
2. J. Bruce, K. Caluwaerts, A. Iscen, A.P. Sabelhaus, V. SunSpiral, ``Design and Evolution of a Modular Tensegrity Robot Platform.'' *IEEE International Conference on Robotics and Automation (ICRA)*, May 2014. doi:10.1109/ICRA.2014.6907361
1. A.P. Sabelhaus, D. Mirsky, L.M. Hill, S. Bergbreiter, ``TinyTeRP: A Tiny Terrestrial Robotic Platform with Modular Sensing.'' *IEEE International Conference on Robotics and Automation (ICRA)*, May 2013. doi: 10.1109/ICRA.2013.6630933

## EDITORIALS

1. X. Huang, A.P. Sabelhaus, M.K. Jawed, L. Jin, J. Zou, Y. Chen. ``Editorial: Materials, design, modeling and control of soft robotic artificial muscles.'' *Frontiers in Robotics and AI*, Nov. 2021. doi:10.3389/frobt.2022.1074549

## UNDER REVIEW + PRE-PRINTS

4. M.L. Anderson, J.C. Pacheco Garcia, C. DeLorey, R. Jing, S. Alizadeh-Shabdiz, Z. Patterson, A.P. Sabelhaus, ``Safe Autonomous Environmental Contact for Soft Robots using Control Barrier Functions.'' *Under Review*, arXiv:2504.14755
3. R. Jing, C. Van Hook, I. Yang, A.P. Sabelhaus, ``Fault Detection and Response for Safe Control of Artificial Muscles in Soft Robots.'' *Under Review.*
2. R. Jing, M. Anderson, M. Ianus-Valdivia, A. Akber, C. Majidi, A.P. Sabelhaus, ``Safe Balancing Control of a Soft Legged Robot.'' *Preprint Only.* arXiv:2209.13715
1. A.P. Sabelhaus, L.A. Janse van Vuuren, A. Joshi, E. Zhu, H.J. Garnier, K.A. Sover, J. Navarro, A.K. Agogino, V. SunSpiral, A.M. Agogino, ``Design, Simulation, and Testing of a Flexible Actuated Spine for Quadruped Robots.'' *Preprint Only.* arXiv:1804.06527