

Andy Borum

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RESEARCH INTERESTS

Theoretical and applied mechanics
Geometric and optimal control theory
Robotic manipulation and path planning

EDUCATION

University of Illinois at Urbana-Champaign 2012 – present

Ph.D., Aerospace Engineering (*in progress*)

M.S., Aerospace Engineering

Advisor: Timothy Bretl

Supported by the National Science Foundation Graduate Research Fellowship

Virginia Tech 2008 – 2012

B.S., Engineering Science and Mechanics

B.S., Mathematics

HONORS AND AWARDS

University of Illinois College of Engineering Mavis Future Faculty Fellowship, Fall 2016

Finalist, Best Conference Paper Award at the IEEE International Conference on Robotics and Automation (ICRA), Spring 2014

National Science Foundation Graduate Research Fellowship, Fall 2013

University of Illinois Aerospace Engineering Stillwell Fellowship, Fall 2012

Virginia Tech Engineering Science and Mechanics Outstanding Senior, Spring 2012

Dan Pletta Award for Outstanding Senior Research Project, Spring 2012

Howard Stone Award for Outstanding Computational Senior Research Project, Spring 2012

2nd Place, Michelin Best Poster Competition at the 35th Adhesion Society Meeting, Spring 2012

Virginia Space Grant Consortium Undergraduate STEM Research Scholarship, Spring 2011

REFEREED JOURNAL PUBLICATIONS

6. A. Borum and T. Bretl, Reduction of Sufficient Conditions for Optimal Control Problems with Subgroup Symmetry, *IEEE Transactions on Automatic Control*, **conditionally accepted**.
5. A. Borum and T. Bretl, Sufficient conditions for a path-connected set of local solutions to an optimal control problem, *SIAM Journal on Applied Mathematics*, **76**:976–999, 2016.
4. R. Plaut, A. Borum, D. Holmes, and D. Dillard, Falling vertical chain of oscillators, including collisions, damping, and pretensioning, *Journal of Sound and Vibration*, **349**:195–205, 2015.

3. D. Holmes, A. Borum, B. Moore III, R. Plaut, and D. Dillard, Equilibria and instabilities of a Slinky: Discrete model, *International Journal of Nonlinear Mechanics*, **65**:236–244, 2014.
2. R. Plaut, A. Borum, and D. Dillard, Analysis of carbon nanotubes and graphene nanoribbons with folded racket shapes, *ASME Journal of Engineering Materials and Technology*, **134**(2), 021009, 2012.
1. R. Plaut, D. Dillard, and A. Borum, Collapse of heavy cantilevered elastica with frictional internal support, *ASME Journal of Applied Mechanics*, **78**(4), 041011, 2011.

REFEREED CONFERENCE PUBLICATIONS

6. A. Borum and T. Bretl, Helices, relative equilibria, and optimality on the special Euclidean group, in *IEEE Conference on Decision and Control (CDC)*, 2016.
5. A. Borum and T. Bretl, The free configuration space of a Kirchhoff elastic rod is path-connected, in *IEEE International Conference on Robotics and Automation (ICRA)*, 2015.
4. O. Roussel, A. Borum, M. Taïx, and T. Bretl, Manipulation planning with contacts for an extensible elastic rod by sampling on the submanifold of static equilibrium configurations, in *IEEE International Conference on Robotics and Automation (ICRA)*, 2015.
3. A. Borum and T. Bretl, Geometric optimal control for symmetry breaking cost functions, in *IEEE Conference on Decision and Control (CDC)*, 2014.
2. M. Mukadam, A. Borum, and T. Bretl, Quasi-static manipulation of a planar elastic rod using multiple robotic grippers, in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2014.
1. A. Borum, D. Matthews, and T. Bretl, State estimation and tracking of deforming planar elastic rods, in *IEEE International Conference on Robotics and Automation (ICRA)*, 2014. **Finalist for ICRA Best Conference Paper Award.**

NON-REFEREED CONFERENCE PUBLICATIONS AND PRESENTATIONS

4. D. Holmes, A. Borum, B. Moore III, R. Plaut, and D. Dillard, Slinky mechanics: static shapes and unstable states, *American Physical Society March Meeting*, 2014.
3. A. Borum, J. Burns, P. Wentzel, A. Andreyev, and S. Ross, Asteroid capture using a binary exchange mechanism, *Virginia Space Grant Consortium Student Research Conference*, 2012.
2. A. Borum, R. Plaut, and D. Dillard, Analysis of carbon nanotubes and graphene nanoribbons with folded racket shapes, *35th Annual Meeting of the Adhesion Society*, 2012. **2nd place in the Michelin Best Poster Competition.**
1. A. Borum, R. Plaut, and D. Dillard, Analysis of carbon nanotubes and graphene nanoribbons with folded racket shapes, *78th Annual Meeting of the Southeastern Section of the American Physical Society*, 2011.

COMMUNITY OUTREACH

Education Justice Project
 Danville Correctional Center
 Danville, Illinois

2013 – Present

Responsibilities:

- Computer Lab Coordinator
- Workshop and Reading Group Facilitator
- IT Support Group Facilitator
- Computer Lab Policy Advisory Committee Facilitator
- Mathematics and Science Tutor