Boyang Zhang

CONTACT INFORMATION
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EDUCATION

Ph.D., Civil and Environmental Engineering — Aug 2023 (expected)
M.S., Electrical and Computer Engineering
***Duke University**, Durham, United States*

- Dissertation topic: Synthesis of a novel nonlinear feedback control via constraints
- Advisor: Henri P. Gavin, Ph.D
- Certificate in College Teaching
- Certificate of Accomplishment in Teaching Writing in the Disciplines

M.Eng., Ocean and Naval Architectural Engineering — Oct 2017
***Memorial University (MUN)**, St. John's, Canada*

- GPA: 4.0/4.0
- Thesis: Improving time-domain prediction of vortex-induced vibration for marine risers
- Advisor: Wei Qiu, Ph.D

B.Eng., Ocean and Naval Engineering — July 2013
***Tianjin University (TJU)**, Tianjin, China*

RESEARCH EXPERIENCE

Research Assistant — June 2018 – Present
Duke University, Durham, United States

- Developed centralized and decentralized frameworks for the navigation and control of hundreds of double integrators based on extensions of Gauss's principle of least constraint (GPLC).
- Resolved the deadlocks naturally among double integrators by a constraint reformulation.
- Developed computationally simple, centralized and decentralized control methods for single/multiple nonholonomic wheeled mobile robots based on extensions of GPLC.
- Developed computationally simple, centralized and decentralized control methods for single/multiple nonlinear quadrotors based on generalizations of GPLC.
- Derived the input-output stability of nonlinear dynamical systems based on conic sectors.

Research Assistant — June 2014 – June 2017
Memorial University, St. John's, Canada

- Improved a time-domain model to predict vortex-induced vibration (VIV).
- Re-developed an in-house finite-element program in Fortran for mooring line analysis.
- Designed a model test of two cylinders under VIV interaction at high Reynolds numbers.

Undergraduate Research Student — Mar 2012 – June 2013
Tianjin University, Tianjin, China

- Analyzed extreme loading scenarios for an offshore jack-up platform in ANSYS.
- Assisted in coupling the hull heave-moonpool fluid motion for a SPAR platform.
- Conducted ship resistance/propulsion tests at Tianjin University Towing Tank.

JOURNAL PUBLICATIONS

1. **Zhang, B.** and Gavin, H.P. Gauss's Principle with Inequality Constraints for Multi-agent Navigation and Control. *IEEE Transactions on Automatic Control*, vol. 67, no. 2, pp. 810-823, 2022, doi: 10.1109/TAC.2021.3059677.
(impact factor: 5.792 (2020), 6.549 (2021))

2. **Zhang, B.** and Gavin, H.P. Decentralized Control of Multiagent Navigation Systems. *IEEE/CAA Journal of Automatica Sinica (JAS)*, vol. 9, no. 5, pp. 922-925, 2022, doi: 10.1109/JAS.2022.105569.
(impact factor: 6.171 (2020), 7.847 (2021))

3. **Zhang, B.** and Qiu, W. Improving Time-Domain Prediction of Vortex-Induced Vibration for Marine Risers. *Marine Systems & Ocean Technology*, vol. 13, no. 1, pp. 13-25, 2018, doi: 10.1007/s40868-017-0041-3.

Peer-Reviewed Conference Publications

1. **Zhang, B.** and Gavin, H.P. Decentralized Unified Position-Attitude Control of Nonlinear UAVs. *Proceedings of the 61st IEEE Conference on Decision and Control (CDC)*, 2022, accepted.

2. **Zhang, B.** and Gavin, H.P. Unified Position-Attitude Control of A Nonlinear Quadrotor Swarm. *Proceedings of the 2022 American Control Conference (ACC)*, pp. 4030-4035, 2022, doi: 10.23919/ACC53348.2022.9867205.

3. **Zhang, B.** and Gavin, H.P. Natural Deadlock Resolution for Multi-agent Multi-swarm Navigation. *Proceedings of the 60th IEEE Conference on Decision and Control (CDC)*, pp. 5958-5963, 2021, doi: 10.1109/CDC45484.2021.9683102.

4. **Zhang, B.** and Gavin, H.P. Unified Position and Attitude Control of a Fully Nonlinear Quadrotor. *Proceedings of the 2021 American Control Conference (ACC)*, pp. 1064-1069, 2021, doi: 10.23919/ACC50511.2021.9483358.

Academic Presentations

- 2022 American Control Conference, Atlanta, GA — June 2021
- IEEE/CAA JAS Symposium Series 1 (virtual) — Feb 2022
- 60th IEEE Conference on Decision and Control, Austin, TX — Dec 2021
- Southeast Control Conference 2021, Blacksburg, VA — Oct 2021
- 2021 American Control Conference, New Orleans, LA — May 2021

Teaching and Professional Experience

Instructor of Robust Control (ME592) — Spring 2018
Duke University, Durham, United States
- Prepared lecture materials.
- Gave lectures to 7 students.

Teaching Assistant — Aug 2021 – Present
Duke University, Durham, United States
- Gave three tutorial labs to 51 students.
- Held office hours.
- Graded the assignments and lab reports.

Mechanics of Solids (EGR201L) — Fall 2021
Undergraduate course, 54 students.

Risk and Resilience in Engineering (CEE690.06) — Fall 2021
Graduate course, 15 students.

Teaching Assistant — Jan 2014 – Dec 2015
Memorial University, St. John's, Canada
- Gave tutorial lectures and labs to 344 students.
- Generated the solutions to assignments and exams.
- Graded the assignments and lab reports.

Mechanical Vibrations (EN6933) Fall 2014/2015
Undergraduate course, 106/105 students.

Fluid Mechanics (EN4961) Spring 2015
Undergraduate course, 91 students.

Dynamics and Maneuvering of Ocean Vehicles (EN7035) Spring 2014
Undergraduate course, 20 students.

Marine Propulsion (EN5020) Winter 2014
Undergraduate course, 22 students.

Technology Intern Jan 2015 – May 2015
American Bureau of Shipping, Houston, United States

- Researched the rules and regulations from seven classification societies: ABS, DNV-GL, LR, BV, NK, CCS, and KR.
- Upgraded the ABS notation comparison database with 371 modifications.

Grants, Awards, and Honors

Provincial/Conference Level:

- 2022 CDC Student Travel Award and Workshop Support ($758) Sept 2022
  61st IEEE Conference on Decision and Control (CDC)
- 2022 ACC Student Travel Grant ($445) Apr 2022
  2022 American Control Conference (ACC)
- Selected student oral presenter Oct 2021
  Southeast Control Conference 2021
- 60th IEEE CDC Student Travel Support ($125) Sept 2021
  60th IEEE Conference on Decision and Control (CDC)
- 2021 ACC Student Registration Grant ($100) Apr 2021
- Short-Term Innovative Research Grant ($60,000) Sept 2019
  U.S. Army Research Office
- Mitacs Accelerate Award ($10,000) Jan 2015
  Mitacs Canada
- NSERC CREATE Offshore Technology Research Fellowship ($42,000) Sept 2013/14
  Natural Sciences and Engineering Research Council of Canada (NSERC)
- Excellent Volunteer Sept 2012
  World Economic Forum (Tianjin Summer Davos)
- Triple-A Student Mar 2009
  Department of Education, Hebei Province, China

University Level:

- Preparing Future Faculty Fellowship July 2022
- Duke Graduate School Conference Travel Award ($750) May 2022
- Summer Research Fellowship ($12,561) Jan 2022
- Bass Instructional Fellowship ($29,770) Dec 2021
- Selected Auburn Preparing Future Faculty Fellow (200 out of 800+) Sept 2021
- Senol Utku Award with Highest Distinction (1st place) ($350) Apr 2021
- The only student participant & speaker at Duke Libraries fundraising event Apr 2019
- Fellow of the MUN School of Graduate Studies Nov 2017
- Duke Graduate School Fellowship ($85,479) Aug 2017
- McGill Engineering Doctoral Award ($96,000) Mar 2017
- MUN Outstanding Teaching Assistant Award Nominee May 2016
- MUN School of Graduate Studies Scholarship ($2,000) Sept 2013/14
- TJU Excellent Student Leadership Scholarship Dec 2011/12
- TJU Advanced Student in Volunteer Service Dec 2011/12

Certifications

- Offshore Systems for Oil & Gas Production and Renewable Energy — Mar 2016
  University of Maine, Orono, United States
- Arctic/Subarctic Offshore Engineering — May 2015
  American Society of Mechanical Engineers (ASME)
- Fundamentals of Riser & Flexible Pipe Engineering — May 2015
  American Society of Mechanical Engineers (ASME)
- The Fundamentals of Project Management — May 2015
  Memorial University, St. John's, Canada
- Design and Analysis of Floating Platforms — Oct 2014
  John Halkyard Associates, Houston, United States

Reviewership

IEEE/CAA Journal of Automatica Sinica
IEEE Control Systems Letters
IEEE Conference on Decision and Control
American Control Conference

Professional Societies

Student Member of IEEE
Student Member of IEEE Control Systems Society

Languages and Skills

Computer:

- LaTeX, MATLAB, Fortran, Linux, SolidWorks, Gnuplot, AutoCAD, ANSYS

Language:

- Proficient in English and Chinese (Simplified and Traditional), basic in Spanish.

Volunteer Service

ASME International Conference on Ocean, Offshore and Arctic Engineering — June 2015
The Fall Career Fairs at Memorial University — Sept 2013/2014
Led a group of city volunteers for the World Economic Forum. — Sept 2012
Mentored high school students on Mathematics and Physics. — Jan 2011

References

Dr. Henri P. Gavin
Professor, W.H. Gardner, Jr. Department Chair — Phone: 919-660-5201
Civil and Environmental Engineering — henri.gavin@duke.edu
Duke University

Dr. Jerome P. Lynch
Professor, Vinik Dean of Engineering — Phone: 919-660-5386
Civil and Environmental Engineering — jerome.lynch@duke.edu
Duke University

Dr. Earl H. Dowell
William Holland Hall Distinguished Professor — Phone: 919-660-5321
Mechanical Engineering and Materials Science — earl.dowell@duke.edu
Duke University

Dr. Michael Zavlanos
Yoh Family Professor — Phone: 919-660-5528
Mechanical Engineering and Materials Science — michael.zavlanos@duke.edu
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