Bo Fu

bofu@umich.edu https://bofu.page

EDUCATION

University of Michigan Ann Arbor, MI
Ph.D. in Robotics Sep 2019-Present
GPA: 4.00/4.00

Carnegie Mellon University Pittsburgh, PA
Master of Science in Mechanical Engineering Sep 2017-May 2019
GPA: 4.00/4.00
Courses: Computer Vision (rank 1/137), Engineering Optimization, Planning and Decision-making in Robotics, AI and Machine Learning in Engineering Design, Robot Localization and Mapping

Tongji University Shanghai, China
Bachelor of Engineering in Vehicle Engineering (Automotive Electronics) Sep 2012-Jul 2017
GPA:4.90/5.00 (rank 1/197)
Courses: Automatic Control Theory, Simulation and Design for Control Systems, Signal and System

SKILLS

Engineering: C/C++, Python, MATLAB/Simulink, LaTeX, ROS, OpenCV, Inventor**,** Autocad**,** Altium Designer
Languages: English (Fluent), German (Fluent), Mandarin (Native)

PUBLICATIONS

- **B. Fu**, T. Kathuria, D. Rizzo, M. Castanier, X. J. Yang, M. Ghaffari, and K. Barton, "Simultaneous human-robot matching and routing for multi-robot tour guiding under time uncertainty," Journal of Autonomous Vehicles and Systems, vol. 1, no. 4, p. 041005, 2021.
- M. Deng, **B. Fu**, and C. Menassa, "Room match: Achieving thermal comfort through smart space allocation and environmental control in buildings," in Proceedings of the 2021 Winter Simulation Conference. Phoenix, AZ., 2021.
- **B. Fu**, W. Smith, D. Rizzo, M. Castanier, M. Ghaffari, and K. Barton, "Robust task scheduling for heterogeneous robot teams under capability uncertainty," arXiv preprint arXiv:2106.12111, 2021. [Under review]
- **B. Fu**, W. Smith, D. Rizzo, M. Castanier, and K. Barton, "Heterogeneous vehicle routing and teaming with Gaussian distributed energy uncertainty," in *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2020, pp. 4315-4322
- **B. Fu**, K. S. Shankar, N. Michael, "Rad-VIO: Rangefinder-aided downward visual-inertial odometry," in *2019 International Conference on Robotics and Automation (ICRA)*. IEEE, 2019, pp. 1841–1847.
- J. Hao, Z. Yu, Z. Zhao, X. Zhan, **B. Fu**, and P. Shen, "Development and optimization of energy management strategy for four-wheel-drive plug-in hybrid electric vehicle," *Mechatronics Journal*, 2018, no. 8, pp.12-19, 30.
- Zhiguo Zhao, **Bo Fu**, Dongsheng Li, "A small-sized wet-membrane humidifier for automotive air-conditioner", [China Invention Patent Publication No. CN106004350B] [Date: Jan 25, 2019]

RESEARCH PROJECTS

Resilient Vehicle Teaming in Uncertain Environments (Advisor: Prof. Kira Barton) June 2019-Present
Barton Research Group, University of Michigan *Ann Arbor, MI*

- Establish probabilistic models that learns and quantifies the vehicle and task heterogeneities and environmental uncertainties across a broad range of missions.
- Develop a planning framework that optimizes user-defined objectives in the presence of uncertainties and generates robust and agile teams.
- Develop a model update and plan repair scheme to capture and adapt to environmental changes while minimizing additional repair costs.

Multirotor Downward Visual-Inertial Tracker (Advisor: Prof. Nathan Michael) Sep 2017-May 2019
Resilient Intelligent Systems Lab, Carnegie Mellon University *Pittsburgh, PA*

- Built a quadrotor state estimator based on a downward camera, laser and IMU which operates at 150 Hz and can be used for high speed closed loop control
- Developed a homography based frame to frame visual tracking algorithm that improves the accuracy and robustness compared to related previous publications
- Investigated an Extended Kalman Filter model, which is suitable for camera, laser, IMU fusion on multirotor
  Video: https://youtu.be/6LGKj8MTYQ8

Control Strategy for 4WD Plug-in Hybrid Electric Car (Advisor: Prof. Zhiguo Zhao) Aug 2016-Jun 2017
Clean Energy Automotive Engineering Center, Tongji University *Shanghai, China*

- Developed a rule-based control strategy, which achieved a 24.41% fuel consumption decrease in simulation compared to result of the original internal combustion engine vehicle
- Optimized strategy parameters based on genetic algorithm and achieved an additional 1.53% fuel consumption reduction
- Conducted hardware-in-the-loop test of hybrid control unit to prove the function, reliability, robustness

EXPERIENCE

Bosch Engineering GmbH/EPT-CN, Robert Bosch Investment (China) Ltd. Shanghai, China
Intern, Software Group *Aug-Dec 2016*

- Constructed, tested Simulink models for two hybrid electric vehicle structures, whose simulation results used for project bidding
- Built a hybrid control unit strategy of hybrid electric vehicle (including torque-limitation, torque-demand, torque-distribution blocks), which was used in a sample vehicle of a domestic automobile corporation

COURSE PROJECTS

H-infinity Control on the Cubli System (Guide: Prof. Peter Seiler) Mar-Apr 2020
University of Michigan *Ann Arbor, MI*

- Implemented H-infinity control on the Cubli system and stabilize it to the upright unstable equilibrium points
- Developed a simulation platform for the Cubli that evaluates and visualizes the performance of the control system
  Demo link: https://youtu.be/wlQBQwDsPbM

Spider Legged Robot Climbing in 3D Block World (Guide: Prof. Maxim Likhachev) Oct-Dec 2018
Carnegie Mellon University *Pittsburgh, PA*

- Developed algorithms for a simulated spider robot with sticky feet that climbs in a 3D block map with optimal global path and leg motion that avoids collision with the environment
- Implemented the global path planning with weighted A* search, footstep planning based on a list of motion primitives, leg motion planning with RRT* algorithm to achieve the functionality
  Demo link: https://youtu.be/5sN6tYRFDEo

Image Alignment Using Robust Loss Functions (Guide: Prof. Jeremy J. Michalek) Mar-May 2018
Carnegie Mellon University *Pittsburgh, PA*

- Applied sequential quadratic programming with BFGS on a homography based image alignment problem using least squares, Huber, Tukey, and a Gaussian weighted cost functions
- Demonstrated that Tukey cost function with finite difference implementation generated the most robust alignment performance on images with noise and outliers that broke the planar assumption of the homography constraint

ACTIVITIES

Electric Vehicle Racing Club, Tongji University Shanghai, China
Member, Electric Control Group *Oct 2013-Jun 2015*

- Designed motor controller packaging; designed and manufactured instrument panel and controller; attended national contests

AWARDS/HONORS

Best Student Lightning Talk Finalist at Automotive Research Center Program Review (2021)
Shanghai Outstanding Graduate (2017)
Excellent Graduation Thesis of Tongji University (2017)
China National Scholarship (2015-2016/2014-2015/2012-2013)
Excellent Student of Tongji University (2015-2016/2014-2015/2013-2014/2012-2013)
First Class of Learning Scholarship of Tongji University (2015-2016/2014-2015/2012-2013)