

SHIYU FENG

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RESEARCH INTERESTS & SUMMARY

- Research topics: Vision-based Navigation, Collision Avoidance, Robot Safety, Perception, Planning, Controls.
- Created real-time hierarchical navigation systems through C++ and Python in ROS/Gazebo simulation and real robots.
- Proficient experience with real-time stereo and depth cameras, multiple robotic platforms, and autonomous driving cars.

EDUCATION

Ph.D. Candidate in Mechanical Engineering, focused on Robotics

August 2016 – Expected May 2024

Georgia Institute of Technology, Atlanta, GA, USA

- The George W. Woodruff School of Mechanical Engineering GPA: 4.00/4.00
- Advisor: Dr. Patricio A. Vela (ECE Department); Co-advisor: Dr. Jun Ueda (ME Department)

Master of Engineering in Mechanical Engineering

August 2015 – May 2016

University of California at Berkeley, Berkeley, CA, USA

- Department of Mechanical Engineering, Controls GPA: 3.43/4.00

Bachelor of Science in Mechanical Engineering

September 2011 – July 2015

Chongqing University (CQU), Chongqing, China

- Department of Mechanical Engineering GPA: 3.73/4.00 (Ranked in the top 1%)
- Graduated as an Outstanding College Graduate

PUBLICATIONS

- [1] S. Feng, Z. Zhou, J. S. Smith, M. Asselmeier, Y. Zhao, and P. A. Vela. "GPF-BG: A Hierarchical Vision-Based Planning Framework for Safe Quadrupedal Navigation." IEEE International Conference on Robotics and Automation (ICRA). 2023.
- [2] S. Feng, A. Abuaish, and P. A. Vela. "Safer Gap: A Gap-based Local Planner for Safe Navigation with Nonholonomic Mobile Robots." arXiv preprint arXiv:2303.08243 (2023).
- [3] S. Feng, Z. Wu, Y. Zhao, and P. A. Vela, "Image-Based Trajectory Tracking Through Unknown Environments Without Absolute Positioning," in IEEE/ASME TMECH, vol. 27, no. 4, pp. 2098-2106, Aug. 2022.
- [4] S. Feng, F. Lyu, J. Ha Hwang, and P. A. Vela, "Ego-centric Stereo Navigation Using Stixel World," 2021 IEEE International Conference on Robotics and Automation (ICRA), Xi'an, China, 2021, pp. 13201-13207.
- [5] R. Xu, S. Feng, and P. A. Vela, "Potential Gap: A Gap-Informed Reactive Policy for Safe Hierarchical Navigation," in IEEE Robotics and Automation Letters, vol. 6, no. 4, pp. 8325-8332, Oct. 2021.
- [6] H. Chen, S. Feng, Y. Zhao, C. Liu, and P. A. Vela, "Safe Hierarchical Navigation in Crowded Dynamic Uncertain Environments," 2022 IEEE 61st Conference on Decision and Control (CDC), Cancun, Mexico, 2022, pp. 1174-1181.
- [7] J. S. Smith, S. Feng, F. Lyu, and P. A. Vela, Real-Time Egocentric Navigation Using 3D Sensing. Cham: Springer International Publishing, 2020, pp. 431–484.
- [8] A. H. Chang, S. Feng, Y. Zhao, J. S. Smith, and P. A. Vela. Autonomous, monocular, vision-based snake robot navigation and traversal of cluttered environments using rectilinear gait motion. arXiv preprint arXiv:1908.07101 (2019).

RESEARCH & WORK EXPERIENCE

Graduate Research Assistant

May 2017 – Present

Intelligent Vision and Automation Lab, Georgia Tech

Advisor: Dr. Patricio A. Vela

Project: Hierarchical Stereo Navigation with Sparse Representation

- Created a sparse perception space for real-time collision checking and path planning, which has better computational efficiency and scalability among different workstations and lightweight embedded devices.
- Designed safety-guaranteed path planning methods for holonomic and nonholonomic dynamics involving optimal control, potential fields, and control barrier functions.
- Built an image-based trajectory tracking method with VSLAM to reduce reliance on pose estimation accuracy.
- Implemented a hierarchical vision-based navigation framework (GPF-BG) for safe quadrupedal navigation.
- Developed multiple real-time hierarchical navigation systems containing perception, planning, and control modules for different robotic platforms: mobile robots, mobile manipulation robots, snake-like robots, and quadrupedal robots.
- Benchmarked navigation performance in ROS/Gazebo simulation and real robots (Turtlebot, LoCoBot, Stretch, Unitree A1) with stereo cameras, depth cameras, and laser scanners.
- Trained an explainable deep learning model to synthesize ego-centric collision-free trajectories from stereo images.
- Research to deploy reinforcement learning models for navigation and object searching in a mobile manipulation task.

Perception Engineer Intern

May 2018 – August 2018

ADAS Team, Seres (SF Motors), Santa Clara, CA

Supervisors: Chongyu Wang, Fan Wang

- Individually implemented C++ OpenCV algorithm to achieve stop-line and traffic light detection.
- Contributed to deep learning traffic detection and data preparation.
- Deployed classical and learning-based algorithms in autonomous driving field tests.
- Assisted in completing camera installation, sensor calibration, and real-time image acquisition.

Graduate Research Intern

September 2015 – May 2016

MPC Lab, University of California at Berkeley

Advisor: Dr. Francesco Borrelli

Project: Fault Tolerant Control in Autonomous Driving, Perception

- Built the main sensor data association algorithm in Python with an external optimization solver.
- Tested the sensor association algorithm in simulation and on a real autonomous driving car.

TEACHING & LEADERSHIP EXPERIENCE

ORS and VIP Undergraduate Research Mentor

August 2019 – Present

School of Electrical and Computer Engineering, Georgia Tech

- Supervise and organize 8+ undergraduate research projects on vision-based navigation with SLAM, perception, planning, control, deep learning, software and hardware design, etc.

Graduate Teaching Assistant

August 2016 – December 2021

School of Mechanical Engineering, Georgia Tech

ME 3017: System Dynamics; **Supervisor:** Dr. Jun Ueda

ME 2110: Creative Decisions and Design; **Supervisors:** Dr. Thomas Kurfess, Dr. Christopher Saldana

- Collaborated in developing course materials, homework, and exams.
- Provided weekly office hours and taught some lectures.
- Instructor for mechatronics and machining training. Conduct machining open labs.
- Served as a head TA for one semester to arrange TA training, open labs, and the final competition.

TECHNICAL SKILLS

Robotics Skills: perception, path planning, control, robot safety, obstacle avoidance, real-time system

Programming Languages: C/C++, Python, MATLAB, LabVIEW

SDKs: ROS, Gazebo, PyTorch, TensorFlow, OpenCV, PCL, CasADi

Hardware: Turtlebot, PyRobot/LoCoBot, Stretch, Unitree A1, Kinect Depth Camera, RealSense D435i

Tools: Linux, GitHub, Jira, Weka, Solidworks

Languages: Chinese, English