SHIYU FENG

85 5th St NW, Atlanta, GA 30308 ● Phone: 510 229 8611 ● shiyufeng@gatech.edu

RESEARCH INTERESTS & SUMMARY

- A Ph.D. candidate in Mechanical Engineering and Robotics at Georgia Tech.
- Research topics: Vision-based Navigation, Perception, Planning, Controls, Collision Avoidance and Robot Safety.
- Using C++, Python, MATLAB, and ROS/Gazebo through research and prototyping.

EDUCATION

Ph.D. Candidate in Mechanical Engineering August 2016 – Present

Georgia Institute of Technology, Atlanta, GA, USA

- The George W. Woodruff School of Mechanical Engineering GPA: 4.00/4.00
- Advisor: Dr. Patricio 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

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

SELECTED 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 (Equal Contribution), 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 (Equal Contribution), 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 (Equal Contribution), 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)

Project: Hierarchical Stereo Navigation with Sparse Representation; **Advisor**: Dr. Patricio Vela

- Created an egocentric perception space by combining stixel and sparse features estimated from the stereo camera. The perception propagates to maintain temporal information for perception space collision checking (PiPS).
- Designed a Potential Gap local planning that formulates potential fields from sparse gaps to generate safe trajectories. The gaps are detected within any laser scan-like egocentric perception.
- Proposed a trajectory servoing method to track Cartesian trajectories within image space composed of sparse feature points. It reduces the reliance on the accuracy of pose estimation.
- Implemented a hierarchical vision-based planning framework (GPF-BG) integrating our previous Global Path Follower (GPF) navigation system and a gap-based local planner using Bézier curves (BG) for safe quadrupedal navigation.
- Extended the Potential Gap navigation technique by guaranteeing safety for nonholonomic robots in all tiers of hierarchy. Nonlinear MPC with a keyhole-shaped zeroing barrier function is applied to track local trajectories and ensure safety.

ORS Undergraduate Research Mentor August 2019 – May 2023

School of Electrical and Computer Engineering (Georgia Tech)

- Lead undergraduate research on vision-based navigation including image processing, obstacle avoidance, path planning, control, deep learning and so on.

Perception Engineer Intern May 2018 – August 2018

ADAS Team, SF Motors, Santa Clara, CA; **Supervisor**: Chongyu Wang & Fan Wang

- Implemented C++ OpenCV algorithm to achieve stop-line and traffic light detection using image processing approaches.
- Deployed the algorithm on a real testing car in ROS environment, and accomplished field test.
- Contributed to deep learning detection model training and image annotation.
- Assisted in completing camera installation, calibration, and image acquisition.

Graduate Teaching Assistant August 2016 – August 2019

ME 2110: Creative Decisions and Design (Georgia Tech); **Supervisor**: Dr. Thomas Kurfess, Dr. Christopher Saldana

- Instructor for mechatronics and machining training.
- Responsible for tutoring and assessing students.
- Conduct open lab and troubleshoot student questions.

Graduate Research Intern September 2015 – May 2016

MPC Lab (University of California, Berkeley)

Project: Fault Tolerant Control in Autonomous Driving, Perception; **Advisor**: Dr. Francesco Borrelli

- Built the main sensor data association algorithm in Python and connected ECOS solver with the algorithm.
- Tested the sensor association algorithm in simulation and on a real car.

TECHNICAL SKILLS

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

SDKs: OpenCV, ROS, CasADi, PCL, Linux, GIT, Jira, PyTorch, TensorFlow

Tools: Weka, Solidwords, ProE, AutoDesk, ANSYS