Ruixiang Du

☎ 16619950660 • ✉ ruixiang.du@gmail.com • https://rdu.im

Education

Worcester Polytechnic Institute (WPI) MA, USA
Doctor of Philosophy in Mechanical Engineering, GPA: 3.93/4.0 12/2019
Master of Science in Robotics Engineering, GPA: 3.83/4.0 06/2013

North China Electric Power University (NCEPU) Hebei, China
Bachelor of Engineering in Automation, GPA: 87.9/100 07/2011

Technical Skills

Robotics: robot simulation, control and motion planning

Programming Languages: C/C++ , Matlab, Python

Software & Frameworks: ROS, V-REP, Gazebo, LCM, OMPL, Qt, Git, Linux

Embedded Development: Cortex-M3/M4, AVR, MSP430 (bare metal or with RTOS)

Internship

Maneuver Intent Inference and Motion Planning for Self-Driving Cars **nuTonomy**
Autonomous Vehicle Intern *05/2017-08/2017*

- Conducted literature review on intent inference for path planning of autonomous vehicles
- Developed an HMM-based inference model and implemented the model in C++
- Tested the implementation with real-world data collected in Boston by nuTonomy

Research

Motion Prediction and Planning for Autonomous Vehicles **WPI**
Research Assistant in Autonomy Control and Estimation Laboratory *10/2017-Present*

- Implementing a local trajectory planner for the self-driving car
- Identifying the set of surrounding vehicles that may cause collision with the self-driving car
- Performing motion prediction for identified surrounding vehicles and refine trajectory
- Finding a safe trajectory with interactive prediction and planning

Motion Planning for Small Unmanned Aerial Vehicles **WPI**
Research Assistant in Autonomy Control and Estimation Laboratory *01/2016-10/2017*

- Analyzed potential benefits of 3D path repair and studied optimal sensor pointing policy
- Implemented a 2D map using square grid and integrated Octomap to represent obstacles
- Experimented with A* and RRT* to find optimal paths online with limited global information and local onboard sensor data in a partially known environment
- Implemented the QP-based minimum-snap optimization algorithm for fast local trajectory generation and a quaternion-based motion tracking controller

DARPA Robotics Challenge Trials & Finals, Team WPI-CMU **WPI**
Research Assistant in Robotics and Intelligent Vehicles Research Laboratory *09/2013-06/2015*

- Experimented on strategies for the door task to traverse different types of doors
- Developed motion primitives and user control interface for the door task using MoveIt and Qt
- Implemented motion controllers and state machine for the wall cutting task
- Studied the whole-body manipulation controller developed by CMU and collaborated on the interfacing with task-level features

Projects

Physics-Based Robot Simulation *07/2015-09/2015*

- Constructed the simulation for the 2-link pelican robot arm, the AscTec Hummingbird quadrotor and an ackerman-steering RC car in V-REP
- Implemented code to interface with the simulator for each simulated robot using ROS, Matlab and C++ remote-API interfaces
- Integrated a C++ logger into the simulation/control code and wrote Matlab scripts to analyze log files generated by the logger

Robotics Enabled In-Home Environment Screening for Fall Risks *01/2014-05/2014*

- Worked out a robotic framework for home fall risk assessment, including setting up the software for both the Turtlebot2 platform and the Gazebo simulator, adding new sensors and developing drivers, implementing a web interface based on the "Robot Management System" to make the system accessible from a web page
- Studied the navigation of mobile robots in home environment and potential applications of robotic technologies for improving the life quality of elderly people, prepared preliminary results for proposal of further research on this topic

Intelligent Portable Aerial Surveillance System - IPASS *12/2012-05/2013*

- Developed the dynamics model of the aircraft and designed controller with Matlab simulation
- Provided support to the undergraduate team of this project for improving the mechanical design of the aircraft, based on the theoretical analysis
- Evaluated different image stitching techniques to get panoramas from cameras on the aircraft

Autonomous Flight Control of a Quadrotor *02/2012-12/2012*

- Studied the kinematics and dynamics model of the quadrotor
- Simulated the attitude and position control algorithms and visualized the results in Matlab
- Implemented and tested the controllers on the AscTec Hummingbird quadrotor

Additional Experience

Teaching Assistant (WPI)

• Real-time Embedded Systems • Embedded Computing in Engineering Design
• Introduction to ECE • Robot Control • Power Electronics

Technical Reviewer

• Mastering ROS for Robotics Programming, by Lentin Joseph, Packt Publishing
• ROS Robotics Projects, by Lentin Joseph, Packt Publishing

Professional Affiliations

Student Member, Robotics and Automation Society, IEEE 03/2013-Present
Member, Rho Beta Epsilon Robotics Honors Society, WPI 02/2013-Present

Publications

[1] **Du, Ruixiang** and Raghvendra V. Cowlagi. Interactive sensing and path-planning for a quadrotor uav in partially known environments. *Journal of Guidance, Control and Dynamics*, 2019.

[2] Christopher G Atkeson, PW Babu Benzun, Nandan Banerjee, Dmitry Berenson, Christoper P Bove, Xiongyi Cui, Mathew DeDonato, **Du, Ruixiang**, Siyuan Feng, Perry Franklin, et al. What happened at the darpa robotics challenge finals. In *The DARPA Robotics Challenge Finals: Humanoid Robots To The Rescue*, pages 667–684. Springer, Cham, 2018.

[3] Christopher G Atkeson, PW Babu Benzun, Nandan Banerjee, Dmitry Berenson, Christoper P Bove, Xiongyi Cui, Mathew DeDonato, **Du, Ruixiang**, Siyuan Feng, Perry Franklin, et al. Achieving reliable humanoid robot operations in the darpa robotics challenge: Team wpi-cmuâĂŹs approach. In *The DARPA Robotics Challenge Finals: Humanoid Robots To The Rescue*, pages 271–307. Springer, Cham, 2018.

[4] **Du, Ruixiang** and Raghvendra V Cowlagi. Interactive sensing and path-planning with incremental 3d path repair for a quadrotor uav in cluttered and partially known environments. In *2017 IEEE 56th Annual Conference on Decision and Control (CDC)*, pages 933–938. IEEE, 2017.

[5] Mathew DeDonato, Felipe Polido, Kevin Knoedler, Benzun PW Babu, Nandan Banerjee, Christoper P Bove, Xiongyi Cui, **Du, Ruixiang**, Perry Franklin, Joshua P Graff, et al. Team wpi-cmu: Achieving reliable humanoid behavior in the darpa robotics challenge. *Journal of Field Robotics*, 34(2):381–399, 2017.

[6] Christopher G Atkeson, BPW Babu, N Banerjee, D Berenson, CP Bove, X Cui, M DeDonato, **Du, R**, S Feng, P Franklin, et al. What happened at the darpa robotics challenge, and why. *submitted to the DRC Finals Special Issue of the Journal of Field Robotics*, 1, 2016.

[7] Mathew DeDonato, Velin Dimitrov, **Du, Ruixiang**, Ryan Giovacchini, Kevin Knoedler, Xianchao Long, Felipe Polido, Michael A Gennert, Taşkın Padır, Siyuan Feng, et al. Human-in-the-loop control of a humanoid robot for disaster response: A report from the darpa robotics challenge trials. *Journal of Field Robotics*, 32(2):275–292, 2015.

[8] Nandan Banerjee, Xianchao Long, **Du, Ruixiang**, Felipe Polido, Siyuan Feng, Christopher G Atkeson, Michael Gennert, and Taskin Padir. Human-supervised control of the atlas humanoid robot for traversing doors. In *2015 IEEE-RAS 15th International Conference on Humanoid Robots (Humanoids)*, pages 722–729. IEEE, 2015.

[9] Christopher G Atkeson, Benzun P Wisely Babu, Nandan Banerjee, Dmitry Berenson, Christoper P Bove, Xiongyi Cui, Mathew DeDonato, **Du, Ruixiang**, Siyuan Feng, Perry Franklin, et al. No falls, no resets: Reliable humanoid behavior in the darpa robotics challenge. In *2015 IEEE-RAS 15th International Conference on Humanoid Robots (Humanoids)*, pages 623–630. IEEE, 2015.

[10] **Du, Ruixiang** and Taskin Padir. Image stitching techniques for an intelligent portable aerial surveillance system. In *2014 IEEE International Conference on Technologies for Practical Robot Applications (TePRA)*, pages 1–6. IEEE, 2014.

[11] **Du, Ruixiang**, Vinayak Jagtap, Yanren Long, Oke Onwuka, and Taskin Padir. Robotics enabled in-home environment screening for fall risks. In *Proceedings of the 2014 workshop on Mobile augmented reality and robotic technology-based systems*, pages 9–12. ACM, 2014.