Qiayuan **Liao**

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"Design, build, and control cool robot optimally!"

Skills

Able to design, build and control a complex robot system except for the circuit independently; manage and work with dozens of people (35 Formal and 45 preparatory team members typically); handle more than ten robotics projects whose development cycle is about one year at the same time.

Control	Experience using Trajectory Optimization, NMPC, MPC, TVLQR, LQR, PID on real robots.
Mechanic	Design robot prototypes rapidly using Fusion 360, Solidworks. Manufacture using CNC and 3D print.
Framework & Tools	Frequent use of ROS1 with ros-control, Gazebo, LaTeX and Linux.
Programming	C++, Python, OpenCV.
Languages	Chinese (Native), English (Fluent).

Experience

Undergraduate Research, UC Berkeley Hybrid Robotics (Prof. Koushil Sreenath)

Remote

Research Intern — *June 2022 –*

- Development of cheetah_ros, a Nonlinear MPC and WBC framework for legged robot based on OCS2 and ros-controls.
- Working on add the DCBF duality constraints to a NMPC controller for quadruped robot locomotion.
- **Research results submitted to ICRA2023 (under review)**
  Title: **Walking in Narrow Spaces: Safety-critical Locomotion Control for Quadrupedal Robots with Duality-based Optimization**
  Author List: Qiayuan Liao, Zhongyu Li, Akshay Thirugnanam, Jun Zeng, and Koushil Sreenath

Undergraduate Research, SUSTech CLEAR Lab (Prof. Wei Zhang)

Online & Shenzhen, China

Research Intern — *Nov 2021 – March 2022*

- Development of cheetah_ros, a hardware and simulation interface of quadruped robot (Unitree's Aliengo) based on ros-control, and Cheetah-Software.
- Working on control the quadruped robot bumps the ball in the air to the desired position using trajectory optimization and MPC.
- **Research results submitted to ICRA2023 (under review)**
  Title: **Real-time Trajectory Optimization and Control for Ball Bumping with Quadruped Robots**
  Author List: Qiayuan Liao, Hua Chen, Wei Zhang

Full-Stack Developing and Management, GDUT DynamicX Robot Team

Guanzhou, China

Captain & Founder — *Oct 2019 - Oct 2021*

- Found and led a team of up to 45 people building and controlling seven different robots in participating the RoboMaster University Championship. More than 400 universities around the world participated, and 8000 young engineers competed on the RoboMaster stage.
- Designed and manufactured the mechanical structure of Mecanum and Swerve Drive chassis, 2-axis gimbal, ball shooter, and 5-axis robot arm. Supervised all the designs before manufacturing.
- Developed rm-controls, an control and simulation framework for RoboMaster competition robot based on ROS. Implemented the PID, LQR, and some kinematics algorithms and programs of the robots mentioned above.
- Developed a ROS driver of the high-speed camera and IMU timestamp synchronization, and a targe detecting and tracking program using OpenCV.

Intern (RoboMaster High-School Students Vacation Camp), DJI Technology Co., Ltd.

Shenzhen, China

Embebed Developer — *2018 summer, 2019 winter & summer*

- Use PID to control BLDC motor by CAN interface on STM32 and DJI Jetson TX2.
- Control Mecanum wheel chassis's velocity and position of 3-axis robot arm's end-effector using kinematics.
- Localization accounting AprilTag and IMU, navigate using navigation ROS package.

Full Stack Developing, High & Middle schools

Chaozhou, China

Individual Developer — *2015 - 2018*

- Reproduced several open-source FDM 3D printers (kossel) in middle school.
- Developed a novel desktop Selective-Laser-Sintering 3D printer in high school.

Education

GDUT (Guangdong University of Technology)

Guangdong, China

B.S. in Electromechanical Engineering — *Sept 2019 - Expected June 2023*

Honors & Awards

International

2021 **Top 32 Team, Second Prize**, RoboMaster University Championship *Shenzhen, China*

2018 **First Place**, Denmark Young Scientists Fair and Contest *Copenhagen, Denmark*

Domestic

2020 **Third Prize**, RoboMaster University Championship *Online*

2019 **Champion**, RoboMater Winter Camp for High School Students *Shenzhen, China*

2017 **First Prize**, Guangdong Youth Science and Technology Innovation Competition *Guanzhou, China*