Guanqi He

Curriculum Vitae

School of Information Science and Technology
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Education

Sept. 2019 - Jun. 2023

ShanghaiTech University (Double First-Class University), Shanghai, China
Bachelor of Engineering, Computer Science and Technology
Major GPA-**3.97/4.0**, Overall GPA-**3.73/4.0**, Overall Rank-**23/226**

Research Interest

Adaptive Control, Autonomous Robot, Hybrid System, Multi-agent System, Output Regulation: Designing stable and robust adaptive control schemes for complex autonomous robotics systems to handle model and environment uncertainty.

Publication

2022 **Guanqi He**, Yang Wang, Gilberto Pin, Andrea Serrani, Thomas Parisini. Switching-based Adaptive Output Regulation for Uncertain Systems Affected by a Periodic Disturbance. American Control Conference (ACC), pp. 5030-5036, 2022.

2022 **Guanqi He***, Yash Jangir*, Junyi Geng, Mohammadreza Mousaei, Dongwei Bai and Sebastian Scherer. Image-based Visual Servo Control for Aerial Manipulation Using a Fully-Actuated UAV. IEEE International Conference on Robotics and Automation (ICRA), Under Review.

Research Experience

Carnegie Mellon University, Robotics Institute, Air Lab

Sept. 2022 - Present

Research Intern
- Project: Collaborative Heterogeneous Autonomy for Multi-Domain Platforms (CHAMP).
- Developed Visual-Servoing Control strategies for Aerial Manipulators to effectively servo a fully actuated UAV for performing manipulation tasks for Autonomous Boat Maintenance.

Apr. - Aug. 2022

Robotics Institute Summer Scholar (RISS)
- Project: Aerial Manipulation with Image-based Visual Servo using a Fully-Actuated UAV.
- Designed hybrid visual servo motion and force controller for fully actuated UAV to perform active aerial manipulation in an unknown environment.
- Implemented wrench control algorithms in Gazebo simulator and hardware platform.
- Used ROS, C++, Python and OpenCV.

Advisor: **Professor Sebastian Scherer**, Associate Research Professor, Robotics Institute

ShanghaiTech University, Multi-Agent and Intelligent Control Lab

May. 2021 - Present

Undergraduate Researcher
- Project: Switching-based Adaptive Output Regulation for Uncertain Systems.
- Innovated novel switched adaptive controller to reject uncertain system's single-frequency disturbance.
- Extended scheme to cancel multi-frequency and frequency-unknown disturbances.
- Proved stability and convergence of the scheme with the Lyapunov method and switching analysis.

Advisor: **Professor Wang Yang**, Assistant Professor, School of Information Science and Technology

ShanghaiTech University, Multi-disciplinary Artificial Reality Studio (MARS)

Dec. 2020 - Mar. 2021

Undergraduate Researcher
- Project: Face Re-lighting with Neural Network
- Estimated face normal and texture map via single face picture using neural network.
- Generated and refined face mapping from single images using UNet with Pytorch.

Advisor: **Professor Yu Jingyi**, Professor, IEEE Fellow, School of Information Science and Technology

Competition and Projects

Sep. 2019 - Present **RoboMaster Competition, Team Leader**, Shezhen, China
- Lead team to out-competed +8,000 students from +300 universities. Awarded National 2nd Place.
- Coordinated team development and organized training on computer vision, control, and mechanics.
- Applied for resources and funding of 100,000 RMB for team development.
- Designed rapid target tracking algorithm and power-saving LQR controller for wheel balancing robots.

Nov. - Dec. 2021 **Convex Optimization Course Project, Individual Project**, Shanghai, China
- Designed kernel for CNN feature extraction based on Wasserstein distance.
- Derived propagation formula for the kernel by differentiating KKT condition.
- Achieve network training and validation on MINST dataset with Pytorch.

Nov. - Dec. 2020 **Control Theorem Course Project, Project Leader**, Shanghai, China
- Designed precise position control scheme with friction compensation based on LuGre friction model.
- Designed Luenberger observer to identify small deformation of friction surfaces.
- Lead team through software simulation experiments using Simulink and Matlab.

Jun. - July. 2019 **DJI Summer Program, Team Project Leader**, Shenzhen, China
- Completed advanced robotics course. Applied knowledge onto gimbal motion controls in ROS and HAL and algorithm for game decision-making using A* and Monte Carlo methods.
- Implemented April-tag and Kalman filter to obtain position and automate trajectory planning.
- Work with mechanical and algorithmic teammates to build robots and complete project tasks.

Work and Volunteer Experience

Petoi LLC

Jul. – Sep. 2021 **Developer Intern**, Shenzhen, China
- Developed 3D gesture recognition and functions and wrote code in PyTorch and OpenCV.
- Enabled robotic dogs to interact with human gestures using camera modules.

ShanghaiTech University

Nov. 2019 – Present **Student Innovation Center, Assistant Management**, Shanghai, China
- Manage equipment and lab maintenance.
- Trained students on using 3D printers, laser cutters, and CNC machines.

2021-2022 **Introduction to Control, Teaching Assistant**, Shanghai, China

Jun. – Jul. 2021 **ShanghaiTech University Social Outreach Program, Volunteer Leader**, Guyuan City, China
- Lead team to create a video course on traditional brick carving and paper cutting to preserve heritage.
- Applied motion capture technology to record and document historical brick carving processes.

2020 **Linear Algebra, Teaching Assistant**, Shanghai, China

Awards

2022 One of forty-eight worldwide students selected for Carnegie Mellon's Robotics Institute Summer Scholars Program.

2022 RoboMaster Competition A.I. Challenge, National 3rd Award.

2021 ShanghaiTech Outstanding TA Award.

2021, 2020 RoboMaster Competition, National 2nd Award.

2020 **ShanghaiTech Outstanding Student Award** (Top 10%).

2019 Midea (Global 500) Open Innovation Contest, National 3rd Award.

2018 Adolescents Sci.Tech. Invention Contest, Provincial 1st Award.

2016 RoboCup Junior Rescue, Individual Team, Global 1st Award.

Skills and Courses

Programming C++, C, Python, MATLAB, ROS, OpenCV, Pytorch, HAL/STM32, Solidworks.

Coursework Convex Optimization, Adaptive Control, Machine Learning, Artificial Intelligence, Signals and Systems, Introduction to Control, Introduction to Embedded Systems, Computer Architecture, Algorithms and Data Structures, Probability and Statistics, Introduction to Programming.

Exams GRE: 332 (Verbal 162/Quantitative 170/Writing 4.0), TOEFL: 100 (R28/L25/S24/W23).

Language English (Fluent), Chinese (Native).