

Changhao Li

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University Town of Shenzhen, Shenzhen, Guangdong, China, 518055

EDUCATION

Harbin Institute of Technology (Shenzhen)

Shenzhen, Guangdong, China

M.Eng. in Mechanical Engineering

Expected Apr. 2025

- **GPA:** 3.064/4

- **Core Modules:** Discrete-time Control Systems, Optimization Methods, Robotics, etc.

Huaqiao University

Xiamen, Fujian, China

B.Eng. in Mechanical Engineering and Automation

Jun. 2022

- **GPA:** 4.13/5 (top 10%)

- **Core Modules:** Fundamental of Control Engineering, Electrical and Electronic Engineering, Theory of Machines and Mechanisms, Design of Machine Elements, etc.

PUBLICATIONS

- [1] **Changhao Li**, Xin Wang, Desheng Zhang. System identification and navigation of an underactuated underwater vehicle based on LSTM. Ocean Engineering, 2024. [Under Review]
- [2] Zhenlong Xiao, **Changhao Li**, Xin Wang. SwarmRobotics: Modeling, Simulation, and Experimental Methods for Distributed Collective Decision-Making Systems. Transactions on Autonomous and Adaptive Systems, 2023. [Under Review]

RESEARCH EXPERIENCE

Underwater Vehicle System Identification and Navigation

Sep. 2023 - Present

Graduate Research Project led by Prof. Xin Wang

- Developed a fully coupled 6-DoF nonlinear model with cross-flow terms for an underactuated underwater vehicle, simplifying it with multiple assumptions.
- Introduced a model-based EKF method for identifying all hydrodynamic damping coefficients without the need for specialized equipment.
- Implemented an LSTM neural network to predict linear and angular velocities, enabling NECF navigation without localization sensors.

Loop Shaping H-infinity Robust Controller Design

Apr. 2023 - Oct. 2023

- Analyzed H-infinity controller design methods for simpler procedures and enhanced performance.
- Utilized Loop-Shaping synthesis to optimize controller design and address computational issues brought by massive weights in MIMO systems.
- Evaluated and validated the robustness and compatibility of the proposed H-infinity controller with a linearized model at various equilibrium points compared to PID in MATLAB.

FOC-aided Camera Gimbal Stabilization

Oct. 2021 – Jun. 2022

Undergraduate Program led by Associate Prof. Ruifang Ye

- Developed a simplified gimbal model and derived the transformation matrix using DMP for accurate angle, velocity, and acceleration outputs.
- Applied FOC with Park and Clarke transformations with SVPWM for precise motor control.

- Built a dual-axis gimbal with modular design, validated stabilization performance through motor encoder and MPU6050 comparisons.

WORK EXPERIENCE

Fine Automation	Shenzhen, China
Hardware Development Engineer Intern	Apr. 2024 - Jul. 2024
• Participated in the design and structural optimization of a torpedo-type underwater vehicle hull. • Responsible for sensor placement and implementation of thruster PID control.	
HITSZ	Shenzhen, China
Teaching Assistant	Sep. 2022 – Jan. 2023
• Assisted with the undergraduate course "Fundamentals of Electromechanical System Control," providing lab course Q&A support and correcting lab reports.	

EXTRACURRICULAR ACTIVITIES

• Member, HITSZ Tennis Association	2022-Present
• Minister, Science and Innovation Department, School Student Union	2022-2023
• Head, Public Relations Department, Student Union	2019-2020
• Member, Public Relations Department, Student Union	2018-2019
• Volunteered at Xiamen Chengyi Discovery Center	2019

AWARDS & HONORS

Second-class Scholarship in Harbin Institute of Technology	2022-2023, 2023-2024
Huaqiao University Scholarship	2018-2019, 2020-2021
Third Place in the 19 th National College RoboMaster University Championship	2020
Second Prize in the 27 th Challenge Cup University Competition	2020

SKILLS & INTERESTS

- **Programming:** C/C++, Python, MATLAB and Simulink, LaTeX, Markdown
- **Frameworks and tools:** TensorFlow, Keras, Git, SVN
- **Industrial software:** SolidWorks, Auto CAD, Altium Designer, ABAQUS
- **Hardware development:** STM32, Nvidia Jetson, Underwater Vehicle Control Systems
- **Languages:** Mandarin (native), English (IELTS 7.5)
- **Interests:** tennis (NTRP 2.5), running (trying LSD), and guitar (a few tunes)

REFEREES

Xin Wang , Professor School of Mech. Eng. & Auto. Harbin Institute of Technology (Shenzhen) (86) 138-2320-2646, wangxinsz@hit.edu.cn	Xian Wu , Associate Professor College of Mech. Eng. & Auto. Huaqiao University (86) 17350818284, xianwu@hqu.edu.cn
Ruifang Ye , Associate Professor College of Mech. Eng. & Auto. Huaqiao University (86) 13600907337, yrf2010@hqu.edu.cn	