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.

Mixed-Sensitivity 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 19th National College RoboMaster University Championship 2020

Second Prize in the 27th 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
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Ruifang Ye, Associate Professor
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