Shaoli (Shelley) Hu

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EDUCATION

Shanghai Jiao Tong University 09/2023 – present
M.S. Control Science and Engineering

- GPA: 88/100
- **Coursework:** Robotics, Distributed Machine Learning Systems

Northeastern University 09/2019 – 06/2023
B.S. Robotics Engineering

- GPA: 88/100 (Rank: 3/66)
- **Coursework:** Artificial intelligence foundation, Robotics Foundations, Artificial Intelligence and Robots

Osaka University 05/2021 – 08/2021
Lecture Program, Humanities and Social Sciences (cross-disciplinary learning)

PAPERS

Conflict-Based Search and Prioritized Planning for Multi-Agent Path Finding Among Movable Obstacles 07/2025

Shaoli Hu, Shizhe Zhao, Zhongqiang Ren

Poster paper of the Multi-Robot & Multi-Agent Systems (MRS) conference

Review of Fault Diagnosis based Protection Mechanisms for Battery Energy Storage Systems 06/2024

Solomon N. Adasah, Ziqi Wang,**Shaoli Hu**, Skieler Capezza, Junya Shao, Mo-Yuen Chow

DOI: 10.1109/ISIE54533.2024.10595828

UAV Formation Obstacle Avoidance Based on Improved Consistency Algorithm 10/2022

Shaoli Hu, Jiankai Tang, Chen Chen, Hongli Xu, Shuai Wang

DOI: 10.1109/ICCASIT55263.2022.9986809

Sub-pixel Underwater Object Size Measurement Algorithm Based on Improved Otsu Binarization and Edge Curvature Filtering 05/2022

Chen Chen, Hangbin Cao, Jun Liu, **Shaoli Hu**, Jingyu Ru, Hongli Xu

DOI: 10.1109/IDITR54676.2022.9796503

RESEARCH EXPERIENCE

Multi-Agent Path Finding Among Movable Obstacles 03/2025 - present

- Developed novel algorithms to address the ”curse of dimensionality” in classical MAPF:
  - PP-PAMO*: This is a ”first-come, first-served” planning method. It assigns a fixed priority order to all agents and plans paths for higher-priority agents first. When planning for lower-priority agents, the algorithm ensures they never push any box onto a location that would block the already-planned path of a higher-priority agent.
  - CBS-MOH/CBS-MOL: These are two variants of Conflict-Based Search (CBS) adapted for movable obstacles. They introduce new types of conflicts (agent-agent, agent-box, box-box) and resolve them at the high level. CBS-MOH ignores boxes during the low-level path planning for individual agents, relying solely on high-level constraints to manage interactions. In contrast, CBS-MOL modifies the low-level planner to explicitly consider the positions of all boxes during each agent's path search, enabling more direct and informed planning.
- Validated all algorithms in simulation, achieving over 90% success rates in partial instances with low computational overhead.

- I independently designed and established a motion capture system integrated with a multi-agent robotic environment, and successfully conducted real-world experiments for multi-agent motion control and box-pushing tasks.
- PBS-PAMO*: A planned extension aimed at significantly improving scalability by finding fast, near-optimal solutions for large-scale problems with many agents.
- Under Development
  - Extended M*: An ongoing development adapting single-agent M* to multi-agent settings via subdimensional expansion, minimizing joint state-space search while ensuring completeness.

Early Warning and Diagnosis of Battery System (Collaboration with Siemens) 11/2023 - 03/2025

- Conduct targeted research across industry practices and academic literature to map common battery failure modes and current safety detection approaches. This dual-track insight directly shapes the early warning system's design to meet real-world operational needs.
- Innovation: Developed a fuzzy system to dynamically link ambient temperature with battery parameters (electrolyte conductivity, diffusion coefficient) in the P2D model, enabling accurate prediction of SEI growth under variable conditions.
- Validation: Leveraged COMSOL to generate simulation datasets, achieving $R^2 > 0.97$ across degradation scenarios to verify model accuracy.
- Outcomes: Delivered a high-precision early warning system for internal short circuits and capacity fade, complemented by a literature review and a physical battery sandbox model for practical demonstration.

Undergraduate Experience – Ocean Heart Robotics Laboratory 09/2020 – 7/2023

- Research on Autonomous Target Recognition Method of Underwater Vehicle Based on Deep Learning Algorithm (Student National Innovation Project)
  - This research developed a deep learning-based target recognition system using YOLOv5, RCNN, and SiamRPN++ for improved single-object tracking accuracy in complex underwater environments.
- UAV Formation Obstacle Avoidance Based on Improved Consistency Algorithm
  - An improved consensus algorithm was proposed for UAV formations, introducing virtual agents to maintain formation integrity while enabling individual agents to autonomously avoid obstacles.
- Sub-pixel Underwater Object Size Measurement Algorithm Based on Improved Otsu Binarization and Edge Curvature Filtering
  - A sub-pixel accuracy size measurement method was developed using refined Otsu binarization and edge curvature filtering, combined with triangle similarity, to precisely estimate object dimensions underwater.
- Physical robot: Garbage Recycling Robot
  - A prototype robot was designed for autonomous underwater garbage collection, integrating distance sensors and an enhanced YOLOv5 model to detect, locate, and retrieve floating debris.

ADDITIONAL EXPERIENCE

Co-Founder and Technical Lead, Holographic Interaction Startup 02/2023 – 05/2024

- Co-founded a startup at XbotPark Innovation Camp and MiraclePlus, focusing on integrating AIGC with holographic projection for human-computer interaction.
- Conducted market analysis and research to identify key opportunities in digital-physical interaction, informing product design and development strategy.
- Designed and analyzed the hardware structure to enable seamless integration of virtual avatars with physical projection systems.
- Developed a gesture recognition system that allows users to interact with virtual avatars in real-time, enhancing user experience and immersion.

Clinical Engineer Assistant, Ronovo Surgical 12/2024 – 03/2025

- Designed path planning algorithms for the UR16e robotic arm to achieve precise motion control in surgical environments.
- Utilized force sensors to calibrate and optimize the combined force output, achieving an accuracy rate of over 90%.
- Developed experimental protocols to enable the robotic arm to replace human hands in moving surgical instruments, ensuring accurate force measurement during movement.

Extracurricular Activities & Volunteerism

- Completed 50km Charity Walk (2 times), fostering perseverance while contributing to social causes
- Achieved third place in the university badminton competition, where collaborative training helped build teamwork and sportsmanship, alongside consistent physical activity.
- Volunteered at the city library, assisting with book organization and reader services.
- Served as class representative, facilitating communication between students and faculty to help address needs and coordinate activities.

HONOURS & AWARDS

Competitions and Awards

International Level

Second Prize, Mathematical Contest in Modeling (MCM)	2021, 2022
Second Prize, Dimensional Cup International Competition	2020

National Level

Third Prize, China Robot Competition	2022
Third Prize, Twelfth National College Students' Mathematics Competition	2020

Regional Level

First Prize, Eighth National Youth Science Popularization Innovation Experiment	2022
Second Prize, Computer Design Competition	2022
Second Prize, Mechanical Innovation Design Competition	2022
Second Prize, National College Students' Mathematical Modeling Competition	2021
Second Prize, Twelfth National College Students' Mathematics Competition	2020
Third Prize, Network Technology Challenge Competition	2023

Honors and Titles

Merit Student of Shanghai Jiao Tong University (top 3%)	2024, 2025
Outstanding Graduate of Northeastern University (top 4%)	2023
Outstanding Participant, NingBo XbotPark	2023
HKCRC Campus Ambassador, Hong Kong Center for Construction Robotics	2023
Outstanding Student Model (top 1.3%)	2020, 2021

Scholarships

Shanghai Jiao Tong University Graduate Academic Scholarship	2023, 2024, 2025
First-Class Scholarship for Outstanding Students (top 3%)	2020, 2021, 2022, 2023

SKILLS & INTERESTS

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

Software & Tools: ROS2, ROS1, Mujoco, COMSOL, SolidWorks, LabVIEW, SPSS, Origin, Latex, Office

Languages: Chinese(Native), English(Fluent)

Interests: Running, Badminton, Tennis, Photography