

BOWEN SHEN

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Gender: male, Age: 25

EDUCATION

Southern University of Science and Technology (SUSTech) 2021.08 - Present
Master of School of System Design and Intelligent Manufacturing, Intelligent Manufacturing and Robotics

- **GPA:** B+
- **Relevant Coursework:** Academic Writing and Presentation (A+), Advanced Numerical Methods (A), Advanced Robotics Control (A-), Advanced Artificial Intelligence (A-), ...

Southern University of Science and Technology (SUSTech) 2017.08 - 2021.06
Bachelor of Department of Mechanical and Energy Engineering, Robotics Engineering

- **GPA:** 3.77 (5/43)
- **Relevant Coursework:** Machine Learning (100), Modern Control and Estimation (98), Analog Circuits (98), Awareness Practice of Manufacturing Engineering (96), Embedded System and Robotics (95), Signals and Systems (94), CAD and Engineering Drawing (94), Calculus II A (93), Fundamentals of Control Engineering (92), Robot Modeling and Control (91), Linear Algebra I-B (91), Engineering Mechanics I-Statics and Dynamics (91), Calculus I A (90), ...

SKILLS

Languages:	Chinese, English (TOEFL 91)
Programming:	C++, Python, Java, Matlab
Software & Tools:	ROS, Gazebo, RViz, Isaac Gym, LaTeX, Arduino

PUBLICATIONS

- **S²MAT:** Simultaneous and Self-Reinforced Mapping and Tracking in Dynamic Urban Scenarios
Tingxiang Fan*, Bowen Shen*, Yinqiang Zhang*, Chuye Zhang, Lei Yang, Hua Chen, Wei Zhang, Jia Pan
Submitted to the Journal of Field Robotics, 2024.
- **DynamicFilter:** an Online Dynamic Objects Removal Framework for Highly Dynamic Environments
Tingxiang Fan*, Bowen Shen*, Hua Chen, Wei Zhang, Jia Pan
International Conference on Robotics and Automation (ICRA), 2022.

RESEARCH EXPERIENCE

Master at CLEAR Lab, SUSTech, China 2021.08 - Present

- **General Robotic Manipulation with VLMs and VGMs** 2024.04 - Present
 - Decomposed daily manipulation tasks into two phases: task-oriented object grasping and task-aware motion control. Introduced vision-language models (VLMs) and video generation models (VGMs) in these phases, respectively, to enhance task execution generalization and accuracy.
 - Implemented task-oriented object grasping by integrating the vision-language model GPT-4v with the grasping model GraspNet. Employed GPT-4v to analyze the operation scene based on task instructions and select the optimal grasping pose from the candidates generated by GraspNet.

- Currently developing a task-aware motion control method that incorporates a pre-trained video generation model, utilizing it as a high-level planner to generate future subgoals for the low-level control policy based on current observations and task instructions.

• **Locomotion Policy Guided Traversability Estimation for Quadruped Robots** 2024.01 - 2024.03

- Developed a traversability estimation approach tailored for quadruped robots that use reinforcement learning-based locomotion policies. This method simplified the traversability estimation model by leveraging terrain setups from policy training to characterize the robot's motion capabilities.
- Created a simulation environment with diverse terrains and validated the method by comparing traversability estimation results with the robot's motion command tracking performance on corresponding terrains.

• **Simultaneous Mapping and Moving Object Tracking in Dynamic Urban Scenarios** 2022.02 - 2023.11

- In collaboration with Ph.D. students from the University of Hong Kong, proposed a solution called S²MAT (Simultaneous and Self-reinforced Mapping and Tracking) that integrates a front-end dynamic object detection and tracking module with a back-end static mapping module. The proposed solution gradually improves the performance of the front-end and back-end through a self-reinforcing mechanism.
- Primarily focused on optimizing dynamic object detection at the front-end by harnessing static maps generated at the back-end. Based on Bayesian estimation, developed a background subtraction algorithm to identify potential dynamic points within the current scan using the static map. Additionally, employed a multi-object tracking approach to enhance the accuracy of the extraction results.
- Validated the proposed solution using diverse public datasets collected from vehicles and social robots. Conducted a detailed ablation study in dynamic simulation environments to further investigate the solution. Assisted collaborators in extensive long-range robotic navigation in real-world urban scenarios to further evaluate the effectiveness of the solution.

• **Online Dynamic Object Removal for Highly Dynamic Environments** 2021.08 - 2021.10

- In collaboration with a Ph.D. student from the University of Hong Kong, proposed an online dynamic object removal framework for highly dynamic urban environments. The framework consists of a scan-to-map front-end and a map-to-map back-end, both of which integrate visibility-based and map-based approaches to enhance efficiency and performance.
- Proposed a time-critical front-end employing sliding windows, leveraging the efficiency of visibility-based approaches for the instant removal of dynamic points within each Lidar scan. Introduced a map-based reverting algorithm to mitigate issues arising from the removal process based on visibility.
- Collaboratively presented *visibility check* in the back-end, which utilizes a visibility-based approach to approximate the ray-tracing process and accelerate the occupancy computation.
- Conducted validation of the proposed framework through testing in highly dynamic simulation scenarios and real-world datasets.

Undergraduate at CLEAR Lab, SUSTech, China 2019.05 - 2021.06

• **Active Drone Tracking and Aerial Photography** 2021.02 - 2021.06

- Integrated PID-based GPS tracking with DJI's visual tracking algorithm to achieve stable tracking of high-speed moving persons by the drone.
- Developed an interactive APP that allows users to engage the tracking controller to track and film target persons.

• **Flight Mode Conversion for Tailsitter Drones** 2020.07 - 2020.10

- Assisted in developing a mode-switching controller for tailsitter drones, which utilizes optimal control to plan the transition trajectory from vertical takeoff to horizontal flight.
- Designed and assembled a tailsitter drone with an onboard computer. Tuned PID parameters of the flight control, ensuring the drone can maintain a stable hover under remote control.

COURSE PROJECT EXPERIENCE

Master at Southern University of Science and Technology 2021.08 - Present

- **Text-Independent Speaker Identification** 2022.12 - 2023.01
Advanced Artificial Intelligence

- Constructed a simple convolutional neural network consisting of four convolutional layers and a fully connected layer, achieving comparable performance to ResNet-18 on a small audio dataset provided by the professor.
- Implemented data padding and cutting techniques to standardize audio of varying lengths to a uniform size. Employed data augmentation to enhance the robustness of the trained network.

Undergraduate at Southern University of Science and Technology 2017.08 - 2021.06

- **Modeling and Simulation of a Bipedal Robot Climbing Stairs** 2019.04 - 2019.06
Walking Robot

- Collaborated with course teammates to construct an 8-degree-of-freedom bipedal robot in the Webots simulation environment. Implemented stair-climbing controls when the robot's relative position to the stairs is known and the mass of the robot's legs negligible.
- Planned the center of gravity trajectory for the robot and employed inverse kinematics to calculate the rotation angles of waist joints based on the determined center of gravity trajectory.

TEACHING EXPERIENCE

Southern University of Science and Technology

- **Teaching Assistant of Modern Control and Estimation** 2021.09 - 2022.01
- Homework correction, standard answers crafting, demonstration code development.

AWARD

2023	Third Prize 2023 World Robot Contest Championships – Beijing
2022	Excellent Teaching Assistant SUSTech
2021	Outstanding Graduate, Department of Mechanical and Energy Engineering SUSTech
2020	Second Prize SUSTech Merit Student Scholarship
2019	Second Prize SUSTech Merit Student Scholarship
2019	Second Prize 12 th International Underwater Robot Competition
2018	Second Prize SUSTech Merit Student Scholarship
2018	Advanced Individual of "Winter Vacation Alma Mater" Social Practice Activity SUSTech
2017	Third Prize SUSTech Freshman Scholarship

EXTRACURRICULAR EXPERIENCE

Student Union of Shuli College, SUSTech 2017.10 - 2019.03

- **Member of Activity Department** 2017.10 - 2018.03
- Love letter plank road, new year party.
- **Undersecretary of Activity Department** 2018.03 - 2019.03
- Girl's Day, welcome party.

Shuli College Football Team, SUSTech 2017.10 - 2019.03

- **Linebacker of the Team** 2017.10 - 2019.03
- 4th place in the SUSTech College Cup