Anlun Huang

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RESEARCH & WORK AREA

Robot Learning, Neural Motion Planning; **Soft Robotics**, Learning Based Continuum Robot Modeling

EDUCATION

University of California San Diego (UCSD)   La Jolla, USA   *Sept. 2023 – Jun. 2025*
Department of Electrical and Computer Engineering   Master of Science in Intelligent Systems, Robotics & Control
Southern University of Science and Technology (SUSTech)   Shenzhen, China   *Sept. 2019 – Jun. 2023*
Department of Mechanical and Energy Engineering   Bachelor in Robotics Engineering

RESEARCH EXPERIENCE

Graduate Student Researcher   *Nov. 2023 – present*
Prof. Michael Yip, Advanced Robotics and Controls Laboratory, UCSD Contextual Robotics Institute   *La Jolla, USA*

- Introduced **Test-time Informed Sampling (TIS)**, a general test-time approach to **enhance neural planners' performance in unfamiliar environments**, reducing failures in real-world deployment. Designed an efficient constraint projection method with a learned differentiable collision checker (DiffCo) to mitigate invalid samples during inference. [1]
- Evaluated TIS with **neural motion planners (VQ-MPT, MPNet, MπNet)** trained on **simplistic synthetic datasets**. Achieved a 15% improvement in success rate, 50% reduction in planning time, and 80% fewer invalid samples in challenging **real-world out-of-distribution (OOD) environments**. [1]

Undergraduate Student Researcher   *Dec. 2020 – Aug. 2023*
Prof. Zheng Wang, Bionic Robotics and Control Laboratory, SUSTech Institute of Robotics   *Shenzhen, China*

- Introduced a novel **foam-embedded soft robotic joint design (Fe-Joint)** that effectively **reduces undesired oscillations** in soft robot motion. Integrated the Fe-Joint into the new **continuum soft robotic arm (Fe-Arm)** and defined four key performance metrics to optimize the design further. [2]   (Demo Video)
- Proposed an **iterative self-improving learning strategy (ISL)** with the **LSTM architecture for end-to-end inverse kinematic modeling** of the Fe-Arm. Achieved a modeling error of less than 10% relative to the maximum horizontal radius of motion, even with limited data availability and human intervention. [2]   (Code)

Undergraduate Student Researcher   *Dec. 2021 - Sept. 2022*
Prof. Hongqiang Wang, Advanced Actuators and Robotics Lab, SUSTech Institute of Robotics   *Shenzhen, China*

- Designed the **SR-Tank**, a revolutionary soft robot utilizing **origami twisting soft pneumatic actuators (OT-SPAs)** in conjunction with bellows, enabling **multidirectional movement on complex terrains and adjustable width**. Formulated the kinematic model for OT-SPAs. Developed the pneumatic control and vision system of the robot, facilitating **motor-like mobility** for the SR-Tank.
- **The champion of "The IEEE RoboSoft Competition 2022 Locomotion Scenario".**

INTERNSHIP EXPERIENCE

Mechanical Engineering Intern   *Jun. 2021 – Jul. 2021*
Research and Development Department, MileBot Robotics Co., Ltd.   *Shenzhen, China*

- Designed a specialized **unilateral lower extremity exoskeleton robot** for bed rest patients, integrating a worm gear actuation method and a four-bar linkage mechanical structure. Developed a control system tailored to meet the specific rehabilitation requirements of patients, particularly those recovering from stroke.

Research Intern   *Aug. 2021*
FlexoLink Technology Co., Ltd.   *Shenzhen, China*

- Developed a **robot manipulator force-feedback system** based on **electromyography signal**. Employed neural networks for real-time recognition of human hand gestures and grip force, enabling manipulation tasks. Integrated pressure sensor data from the manipulator to provide feedback through a force feedback device worn by the user.

PUBLICATIONS

[1]   Zhi, Y., **Huang, A.**, & Yip, M. (2025). TIS: Test-time Informed Sampling with Differentiable Collision Checking for Out-of-Distribution Neural Motion Planning. **2025 International Conference on Machine Learning (ICML). (Submitted)**

[2]   **Huang, A.**, Cao, Y., Guo, J., Fang, Z., Su, Y., Liu, S., ... & Wang, Z. (2024). Foam-Embedded Soft Robotic Joint with Inverse Kinematic Modeling by Iterative Self-Improving Learning. **IEEE Robotics and Automation Letters (R-AL) and 2024 International Conference on Intelligent Robots and Systems (IROS).**

[3]   Fang, Z., Huang, C., Wang, Y., Xu, J., Tan, J., Li, B., ... **Huang, A.**, ... & Wang, Z. (2022). Multi-Dimensional Proprioception and Stiffness Tuning for Soft Robotic Joints. **2022 International Conference on Robotics and Automation (ICRA).**