Haowen Liu

✉ 12132633@mail.sustech.edu.cn , lhw448978989@gmail.com

Education

Southern University of Science and Technology (SUSTech)   Sept. 2021 - June. 2024
Master of Engineering, Electronic Science and Technology   *Shenzhen, China*
Concentration: Human-robot interaction, Cane Robot, Exoskeleton, ...

Harbin Institute of Technology (HIT)   Sept. 2017 - June. 2021
Bachelor of Engineering, Automation   *Shenzhen, China*
Concentration: Robot design and control, kinematics, dynamics, ...

Skills

- **Technical:** Programming tools (i.e., C/C++ language, Python, MATLAB), ROS, medical device development, computer-aided design (i.e., SolidWorks), proficiency in embedded system (i.e., STM32), human-robot interaction strategy, biomechanical analysis (e.g., motion capture system, gait analysis)
- **Knowledge:** Robotics, control, mechanical engineering, biomechanical engineering, electronics, system design and development, biomechanics, kinematics, dynamics.

Research Project & Contest

**Lower Limb Exoskeleton for Post-Stroke Gait Rehabilitation** |SUSTech   Sept. 2021 – May. 2022

- Updated a wearable cable-driven exoskeleton SEAExo-I to help people regain independent walking ability after stroke and improve their quality of life.
- Achieved clinical validation of SEAExo-II in eight stroke survivors. Proposed personalized assistance strategy enhanced post-stroke participants' walking performance with improvements in gait symmetry, knee flexion, and foot contact angle by **48.4%**, **60%**, and **70.1%**
- Under the guidance of Prof. Mingming Zhang

Intelligent Cane Robot for Enhancing User's Walking Performance | SUSTech   May. 2022 – Present

- Developed a new cane-type wheeled robot and proposed a novel human-following control frame with multi-camera fusion. The effectiveness of the method has been validated in outdoor experiments involving six healthy subjects. The results demonstrated that the average tracking error in the X and Y directions was less than **4.1 cm** and **4.4 cm**, respectively.
- Proposed an optimization-based multi-camera configuration to minimize the occlusions by leg during walking.
- considered occlusions of legs and established a linear regression model to compensate for the data loss caused by the occlusions
- Under the guidance of Prof. Mingming Zhang
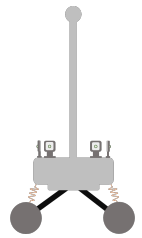
Human-Exoskeleton-Cane(HEC) Robot Integrated System | SUSTech   Jan. 2023 – Present

- Updated the cane robot with an active suspension system to enhance its ability to provide support for walking. Additionally, this update has improved its adaptability to different terrains.
- Proposed a biologically inspired human-Exoskeleton-cane interaction rules, which control Exo and cane robot base on use's gait.
- Proposed a muti-camera supervise system which can locate the position of leg, and the average error in the X direction is below **5.4 mm**, the average error in the Y direction is below **2.4 mm**, and the average angle error is below **2.1°**.
- Under the guidance of Prof. Mingming Zhang
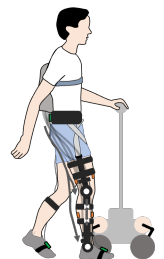
The ABU Asia-Pacific Robot Contest 2020 Suva (Robocon 2020) | HIT   Sept. 2019 - Sept. 2020

- Led the PR group of the WTR Robot Team(HIT), to develop a rugby robot capable of autonomously receiving and kicking the ball.

Publications

- Zhong B[1], Shen M[1], **Liu H**[1], Zhang M[*], et al. "A Cable-driven Exoskeleton with Personalized Assistance Improves the Gait Metrics of People in Subacute Stroke," in *IEEE Transactions on Neural Systems and Rehabilitation Engineering* (**TNSRE**), vol. 31, pp. 2560-2569, 2023.
- **Liu H**[1], Wu F[1], Zhang M[*], et al. "Close-Range Human Following Control on a Cane-Type Robot With Multi-Camera Fusion, " in *IEEE Robotics and Automation Letters* (**RAL**), vol. 8, no. 10, pp. 6443-6450, 2023.

[1]co-first author, [*]response author

Teaching Assistantship

GGC5046 SUSTech Postgraduate English   Fall, 2021
- Established healthy relationships with 24 students by actively supporting them with academic and behavioral guidance.
- Assisted in answering students' questions.
- Graded 240+ homework assignments, quizzes and tests to assist teacher.

AWARDS

- **First Prize** in The ABU Asia-Pacific Robot Contest 2020 Suva (ROBOCON 2020)   2020
- **Third Prize** in The RoboMaster University Championship   2019
- TOPBAND Progressive **Scholarships**   2019
- **Best Technology Prize** in HITsz Robot Cup   2018
- **Third prize** of summer social practice activities   2018
- **Third prize** of winter social practice activities   2018