Honghao Zhu
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Education

Carnegie Mellon University 09/2022 – 05/2024
Master of Science in Mechanical Engineering-Research | GPA: 3.98/4.0 Pittsburgh, PA
- Selected Courses: Robot Dynamics and Analysis, Robot Localization and Mapping, Computer Vision, Optimal Control, Engineering Computation (C++)

Georgia Institute of Technology, College of Engineering 08/2018 – 08/2022
Bachelor of Science in Mechanical Engineering, Minor in Computer Science | GPA: 3.67/4.0 (Highest Honor) Atlanta, GA

Research Projects

Risk-aware Off-Road Driving Adaptation, Robomechanics Lab, Pittsburgh, PA 06/2023 – 09/2023
- Proposed a novel transformer and LSTM-based model for autonomous four-wheel robot driving in diverse field environments
- Enhanced pipeline adaptability by 41% by integrating real-time state-action sequence feedback into LSTM model
- Optimized framework pipeline, achieving efficient communication between three modules at a 10 Hz path planning rate
- **Publication**: Accepted to **ICRA 2024 arXiv | Video**

SuperLoc: Robust Localization through Predicting Alignment Risk, Airlab, Pittsburgh, PA 03/2024 – Present
- Designed and integrated a localization module for analyzing trajectory results and providing a ground truth point cloud map
- Conducted predict alignment risk and observability estimation to enable early LiDAR degeneracy detection
- Active sensor fusion based on predict alignment risk for robust performance and numerical stability
- Result in 49.7% performance increase compared to other SOTA LiDAR-Inertial odometry method
- **Publication**: Under review, **ICRA 2025 arXiv | Website**

Lightweight LiDAR-Inertial Odometry with Scene Graph Representation, Airlab, Pittsburgh, PA 03/2024 – Present
- Implemented support for Livox-Mid360 in SuperOdometry
- Implement RGB colorization support to enable realistic 3D map construction
- Generated scene graph from semantic representation using colorization 3D map

Inertial Navigation Learning for Shaky Perception, Robomechanics Lab/Airlab, Pittsburgh, PA 09/2022 – Present
- Designed and trained CNN and GRU networks for IMU measurement correction and motion prediction
- Developed dataset loader for raw IMU data to facilitate network training
- Implemented Pose Graph Optimization using PyPose library for IMU and motion network trajectory fusion

Robotic Arm Graffiti Painting, BorgLab, Atlanta, GA 08/2021 – 08/2022
- Simulated painting and paint-dipping actions using a Franka Emika Panda robotic arm with ROS MoveIt and Gazebo
- Created demo video showcasing robotic arm painting capabilities Demo Video

Work Experience

Midea Intelligence and Innovation Center, Shanghai, China 04/2021 – 08/2021
Architect intern
- Designed and implemented test standard sheets for evaluating sensors, including LiDAR and RGB-D units from various manufacturers; optimized sensor budget by 40% through cost-effective selection based on testing outcomes
- Developed a prototype for elderly fall detection using TI IWR6843ISK mmWave sensors
- Established a ROS environment for evaluating the myCobot Pro robotic arm; wrote Python scripts to capture RGB and depth images, generating point clouds for 3D perception learning models

Academic Projects

Receding Horizon State Estimator, Pittsburgh, PA 02/2024 – 05/2024
- Implemented receding horizon state estimator in Julia for SpaceX Dragon1 docking simulation
- Achieved smoother trajectory compared to Extended Kalman Filter (EKF) results

Automated Wheel System Design Project, Atlanta, GA 08/2021 – 12/2021
- Designed and developed an autonomous wheel system controlled by Arduino, encompassing design, 3D modeling, fabrication, and 3D printing.
- Integrated a scissor lift capable of raising objects up to 100 inches
- Developed mechanism to launch and place RC cars into designated center area