

Honghao Zhu

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EDUCATION

Carnegie Mellon University

Pittsburgh, PA

Master of Science in Mechanical Engineering-Research | GPA: 4.0/4.0

May. 2023

Selected Courses: *Robot Dynamics and Analysis, Robot Localization and Mapping, Computer Vision, Linear Control Systems, Engineering Computation (C++)*

Georgia Institute of Technology, College of Engineering

Atlanta, GA

Bachelor of Science in Mechanical Engineering, Minor in Computer Science | GPA: 3.67/4.0 (Highest Honor) May 2022

RESEARCH PROJECTS

Development of robust SLAM system under high robotic motion, Pittsburgh, PA

Sep. 2022 – Present

Robomechanics Lab

- Develop a novel LiDAR-inertial SLAM using IMU pre-integration and GTSAM backend optimization that ensure high robustness when robot is under high pitch motion.
- Build a test robot in Gazebo ROS that has varied head pitch motion to simulate high robot dynamics.
- Test LiDAR-inertial SLAM in simulation and real world; Analyze absolute pose error on different pitch frequency.
- Integrate IMU measurement to conduct IMU only odometry to assist LiDAR odometry when features are sparse.
- Facilitate the development of robots capable of maintaining reliable localization and mapping in extreme outdoor environments that induce high dynamic motion for robots.

Risk aware off-Road driving adaption, Pittsburgh, PA

June. 2022 – Sep. 2022

Robomechanics Lab

- Embedded implementation using Python with the robot to ensure real-time ROS communication and optimize pipeline flow.
- Conducted extensive field experiments with a four-wheeled robot using GPS RTK.
- Resulted in 41% improvement in lap time using implemented adaptive model over non-adaptive baseline model while maintain safe driving all across.
- Submitted to *International Conference on Robotics and Automations (ICRA)* 2024, under review. [arXiv](#) | [Video](#)

Graffiti on canvas using a Franka Emika Panda robotic arm, Atlanta, GA

Aug. 2021 – Aug. 2022

BorgLab

- Simulated painting on canvas and dipping paints with a robotic arm using ROS MoveIt and Gazebo.
- Wrote Python packages, including GTDynamics and IKFastPy to solve forward and inverse dynamic and kinematic equations to control the trajectory of the robotic arm.
- Demo video of robotic arm painting [link](#)

Lower-limb exoskeleton for improving healthy and impaired human locomotion, Atlanta, GA

Aug. 2019 – Dec. 2019

GaTech Power Lab

- Collected, processed and analyzed data using Motion Capture and Vicon; recorded the movements of experimental subjects' calf muscles by ultrasonic scanning and conducted deep learning by image.
- Analyzed the collected data to determine the robotic device's availability in different age groups (18-65).

WORK EXPERIENCE

Midea Intelligence and Innovation Center, Shanghai, China

Apr. 2021 – Aug. 2021

Architect intern; built the next generation multi-functional home robot

- Created test standard sheets and tested sensors (e.g., LiDARs and RGB-Ds) from different companies; reduced company sensor budget by 40% by choosing the most cost-efficient plan based on testing results.
- Developed an early product prototype for elderly fall detection by experimenting on TI IWR6843ISK mmWave sensors.

- Built ROS environment for evaluating myCobot Pro robotic arm; wrote Python scripts to capture RGB and depth of images to generate point cloud for 3D perception learning model.

ACADEMIC AND RESEARCH PROJECT

Space Explorer Video Game, Pittsburgh, PA

Sep. 2022 – Dec. 2022

- Designed a spacecraft combat video game using C++ with OpenGL library.
- Programmed the movement of spacecraft in 3D space and mechanism of shooting missile using geometry; Loaded 3D models using shape and mesh; Added sound effect of explosion when spaceship hit the target; Completed the project in team of 4.
- Presented a demo in final presentation in front of 12 teams.

Space Capsule Capstone Project, Atlanta, GA

May. 2022 – Aug. 2022

- Designed space capsules for next generation space delivery.
- Prototyped space capsule using Solidwork and 3D printing.
- Conducted material selections for space capsule using GRANTA EduPack.
- Designed a pogo pin plate to enable communication with BUS and magnetic connection for docking mechanism; Completed the project in team of 6.
- [Video link](#)

Automated Wheel System Design Project, Atlanta, GA

Aug. 2021 – Dec. 2021

- Designed an autonomous system using fabrication and Arduino programming.
- Built an autonomous wheel system controlled by Arduino by sketching the design, 3D modeling, fabrication (e.g., laser cutting) and 3D printing with a team of four; the autonomous system includes a scissor lift that can raise an object up to 100 inches, launch and place the RC cars into the center.
- Competed in a final competition in December 2021 with ~60 other teams; placed 20/60 teams.

Machine Learning Subject Research, Atlanta, GA

Sept. 2020 – Dec. 2020

- Predicted music genres for emotion analysis with machine learning.
- Imported ~3600 lyrics databases on the Internet using Genius API, then used Python to delete punctuation and stop words; trained the analyzer using supervised algorithms such as Gaussian Naive Bayes, Linear and Lasso Regression to predict music genres.
- Designed 12 graphics to visualize the data and results using Matplotlib and Seaborn; present PPT for video performance with other 47 groups.
- GitHub repository [link](#)

Gameboy Game Project, Atlanta, GA

Mar. 2020 – Apr. 2020

- Programmed an arcade game with C language in GBA Simulator
- Designed and built game roles with different attributes such as health status, speed and positions; programmed the Gameboy's physical logic and designated order keys; downloaded pictures for game background; achieved O(1) solution to avoid image defect.

SKILLS

Programming: MATLAB, Java, Arduino, C/C++, Python, Git, ROS, Gazebo

Prototyping: SolidWork, HSMWorks, 3D Printer, Basic Fabrication

Office and Design: Word, LaTeX, Excel, PowerPoint, Adobe

Spoken language: Chinese, English, German (elementary proficiency)