Zhihao Ruan

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EDUCATION

University of Pennsylvania — Philadelphia, PA
- *General Robotics, Automation, Sensing & Perception (GRASP) Laboratory* — *May 2022*

*Master of Science in Engineering in Robotics, **projected***

University of Michigan — Ann Arbor, MI
- *College of Engineering* — *May 2020*

*Bachelor of Science in Computer Science Engineering, **GPA: 3.89/4.00***

Shanghai Jiao Tong University — Shanghai, China
- *University of Michigan-Shanghai Jiao Tong University Joint Institute (UM-SJTU Joint Institute)* — *August 2020*

*Bachelor of Science in Electrical and Computer Engineering, **GPA: 3.56/4.00***

RELATED COURSEWORK

ECE: Electromagnetics, Signals and Systems, Analog Circuits, Semiconductor Devices; **CSE:** Embedded Systems, Machine Learning, Computer Vision, Autonomous Robotics, CUDA programming, Operating Systems.

RESEARCH EXPERIENCE

Synthetic Health Sensor — Ann Arbor, MI

Interactive Sensing and Computing Lab of Prof. Alanson Sample, University of Michigan — *Jan 2019 – Dec 2019*

- Built an embedded system with STM32 microprocessor and Panasonic's GridEye® 8×8 IR sensor using I^{2}C, UART and MATLAB signal processing that can <u>collect</u>, <u>detect</u> and <u>visualize</u> heat distribution in the room.
- <u>Constructed</u> a complete API <u>from scratch</u> for Panasonic's GridEye® 8×8 IR sensor for STM32 microprocessor.
- Implemented <u>Direct Digital Synthesis (DDS)</u> of a frequency-sweep ultrasonic sine wave from 39kHz to 41kHz with STM32 microprocessor and ultrasonic transducers.
- Implemented two different ultrasound distance measurement algorithms including <u>FMCW (Frequency-Modulated Continuous Wave) algorithm</u> and <u>phase-based ranging algorithm</u> with STM32 microprocessor and Python.

PROJECT EXPERIENCE

Real-Time On-Device Flow Statistics Detection and Prediction — Shanghai, China

Undergraduate Major Design Experience, UM-SJTU Joint Institute — *June 2020 – Aug 2020*

- Built a system which <u>detects</u> human tracffic flow, automatically <u>analyzes & detects</u> entrances on Raspberry Pi 4B, <u>stores</u> data on a server, <u>visualizes</u> analyzed data on a self-designed front-end website <u>in real time</u>.
- Implemented object tracking & people counting with <u>self-designed Kalman filter tracker</u>, automatic entrance detection with <u>density-based clustering algorithm</u> — DBSCAN.

DOAPP: Dynamic Object Avoidance and Path Planning — Ann Arbor, MI

Undergraduate Major Design Experience, University of Michigan — *Oct 2019 – Dec 2019*

- Implemented a <u>GPU-accelerated motion planning algorithm</u> by Chonhyon Park, et al. on an Nvidia's GPU with CUDA parallel programming & optimization.
- Built a <u>ROS controller and trajectory follower from scratch</u> for Dynamixel motors on robot arm.

Interactive Game: *Step on White Tiles* — Ann Arbor, MI

EECS 373: Introduction to Embedded Systems Design, University of Michigan — *March 2019 – April 2019*

- <u>Visualized</u> black & white tiles flow by driving a projector <u>with FPGA</u> by programming <u>VGA protocols in Verilog</u>.
- Decoded signals from Nintendo controller in Verilog.
- Built <u>a complete menu selection user interface</u> on an LCD display with SmartFusion® microprocessor and Nintendo controller.
- Achieved stepping detection on projected tiles through <u>SPI communication</u> with Pixy® camera.
- Enabled sound effects using SmartFusion® microprocessor, Adafruit® Audio Sound Board and Dell® stereos.

WORK EXPERIENCE

Introduction to Machine Learning	Grader
Computer Vision	Grader
Introduction to Embedded Systems Design	Grader
Matrix Algebra	Grader
Academic Writing II	Teaching Assistant

SKILLS

Programming Languages: C/C++, Python, MATLAB, Verilog.

Development Tools: STM32CubeMX, OpenCV, PyTorch, Scikit-Learn, LCM (Lightweight Communications and Marshalling), ROS (Robotics Operating System), CUDA