Zhihao Ruan
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EDUCATION

University of Pennsylvania
Philadelphia, PA

- *Master of Science in Engineering in Robotics* *May 2022*
  General Robotics, Automation, Sensing & Perception (GRASP) Laboratory
  - **Selected Coursework:** Introduction to Optimization, Advanced Topics in Machine Perception, Interactive Computer Graphics

University of Michigan
Ann Arbor, MI

- *Bachelor of Science in Computer Science Engineering,* ***GPA: 3.9/4.0*** *Sept 2018 – May 2020*
  College of Engineering
  - **Selected Coursework:** Embedded Systems Design (grader), Machine Learning (grader), Computer Vision, Autonomous Robotics, GPU Programming & Architecture, Operating Systems

Shanghai Jiao Tong University
Shanghai, China

- *Bachelor of Science in Electrical and Computer Engineering,* ***GPA: 3.6/4.0*** *Sept 2016 – Aug 2020*
  University of Michigan-Shanghai Jiao Tong University Joint Institute (UM-SJTU Joint Institute)
  - **Selected Coursework:** Electromagnetics, Signals and Systems, Analog Circuits, Semiconductor Devices

RESEARCH EXPERIENCE

Interactive Sensing and Computing (ISC) Lab
Ann Arbor, MI

Research Assistant of Prof. Alanson Sample, Synthetic Health Sensor *Jan 2019 – Dec 2019*

- Built an embedded system in **C & MATLAB** with **STM32** microprocessor and Panasonic's GridEye® 8×8 IR sensor through **I²C & UART** that can collect, detect and visualize heat distribution in the room.
- Constructed **a complete C API** for Panasonic's GridEye® 8×8 IR sensor for **STM32** microprocessor from scratch.
- Implemented **Direct Digital Synthesis (DDS) in C** of a frequency-sweep ultrasonic sine wave from 39kHz to 41kHz with STM32 microprocessor and ultrasonic transducers.
- Implemented two different ultrasound distance measurement algorithms in **Python** including **FMCW (Frequency-Modulated Continuous Wave) algorithm** and **phase-based ranging algorithm** with STM32 microprocessor.

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 in **Python** which detects human tracffic flow, automatically analyzes & detects entrances on **Raspberry Pi 4B**, stores data on a server, visualizes analyzed data on a self-designed front-end website **in real time** ($\sim$ 15 FPS with Google Coral Edge TPU USB accelerator).
- Achieved **20 FPS and 90% accuracy** object tracking & people counting with **self-designed Kalman filter tracker**, automatic entrance detection with density-based clustering algorithm — **DBSCAN** in Python.

Linux Infrastructure Implementation on x86 PCs
Ann Arbor, MI

EECS 482: Introduction to Operating Systems *Jan 2020 – Apr 2020*

- Implemented mutex, conditional variables & thread class using context switching API in **Linux kernel library** with multiprocessor support provided using **interrupt handling** and **CPU guard** in C++.
- Built Unix pager with swap-backed & file-backed pages with **page fault handing** and **process switching & forking** support in C++.
- Emulated Unix-style file system using inode and directory entry structures with client request handling using **Berkeley sockets** and safe concurrency using **C++ Boost library**.

MXNet Optimization with GPU
Ann Arbor, MI

EECS 498: GPU Programming & Architecture *Nov 2019 – Dec 2019*

- Implemented GPU parallelization of forward kernel of MXNet incubator 1.3.x with **tiled matrix multiplication** and **GPU shared memory**; boosted inference speed **from 30s to** $<$ **3s** on fashion-mnist dataset and Nvidia TITAN Xp graphics card.

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

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

- Implemented a **GPU-accelerated motion planning algorithm** originally proposed by Chonhyon Park, et al. in **ROS C++ & CUDA** with Nvidia GPU parallel programming & optimization.
- Built a controller and trajectory follower in **ROS C++** for Dynamixel motors on robot arm from scratch and achieved **30 Hz signal transmission**.

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.