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: 3.9/4.0***

Shanghai Jiao Tong University — Shanghai, China
- *University of Michigan-Shanghai Jiao Tong University Joint Institute (UM-SJTU Joint Institute)* — *Aug 2020*
  Bachelor of Science in Electrical and Computer Engineering, ***GPA: 3.6/4.0***

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^2C, UART and MATLAB signal processing that can **collect**, **detect** and **visualize** heat distribution in the room.
  - **Constructed** a complete API **from scratch** for Panasonic's GridEye® 8×8 IR sensor for STM32 microprocessor.
  - Implemented **Direct Digital Synthesis (DDS)** 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 **FMCW (Frequency-Modulated Continuous Wave) algorithm** and **phase-based ranging algorithm** 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 **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**.
  - Implemented object tracking & people counting with **self-designed Kalman filter tracker**, automatic entrance detection with **density-based clustering algorithm** — DBSCAN.
- **Linux Thread Library Implementation on x86 PCs** — Ann Arbor, MI
  EECS 482: Introduction to Operating Systems — *Jan 2020 – Feb 2020*
  - Implemented mutual exclusion & conditional variables using **context switching API in Linux kernel library**.
  - Implemented yield and join functions of thread class.
  - Provided mutual exclusion on both uniprocessor and multiprocessor systems with **interrupt handling** and **CPU guard**.
- **Interactive Game:** ***Step on White Tiles*** — Ann Arbor, MI
  EECS 373: Introduction to Embedded Systems Design, University of Michigan — *Mar 2019 – Apr 2019*
  - **Visualized** black & white tiles flow by driving a projector **with FPGA** by programming **VGA protocols in Verilog**.
  - Decoded signals from Nintendo controller in Verilog.
  - Built **a complete menu selection user interface** on an LCD display with SmartFusion® microprocessor and Nintendo controller.
  - Achieved stepping detection on projected tiles through **SPI communication** 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