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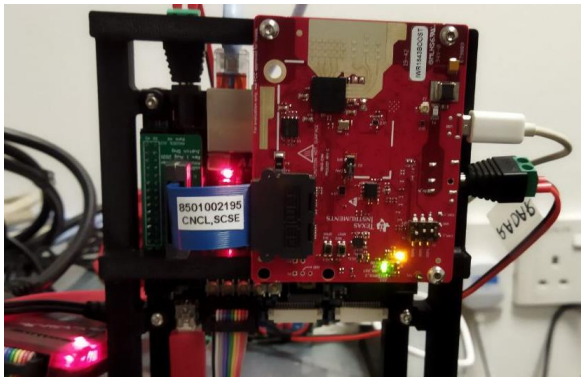
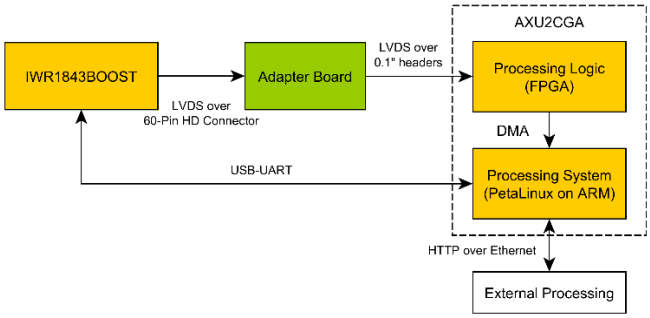
Nanyang Technological University, Singapore – Final Year Project

Aug 2021 – Mar 2022

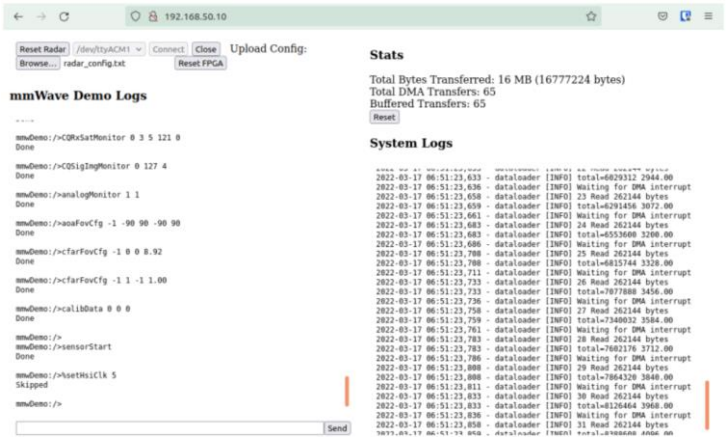
Data Capture Module for Texas Instrument's mmWave Radar Sensors



Radar (IWR1843BOOST) and FPGA (AXU2CGA) development boards mounted together



Block Diagram of System Architecture



Web Interface for Radar Control

- Designed and assembled adapter PCB with length and impedance-matched traces for 300MHz LVDS lines to connect Samtec Coax Cable Assembly to 0.1" headers on FPGA board
- Implemented LVDS deserialization and frame alignment on FPGA with SystemVerilog
- Converted frame data into AXI-Stream format for use with AXI DMA Core to stream to a Linux system for transmission to off-board processing over Ethernet
- https://dr.ntu.edu.sg/handle/10356/157253

Art Installations (Freelance Work)

I have been working with artists to bring their visions to life, moving past the common prototyping-grade techniques to using modern hardware and sensors for improved interactivity and reliability of installations.

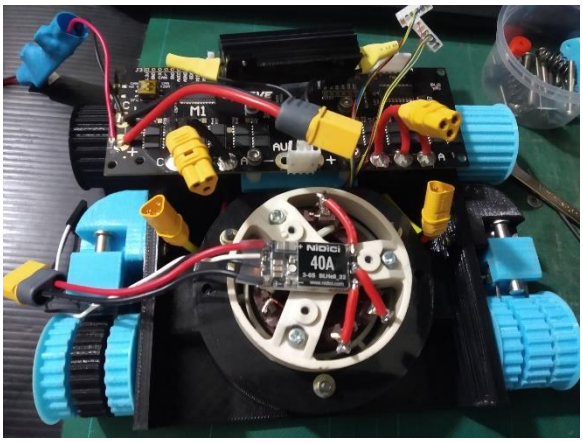
These works have also served as testbeds for a variety of small but impactful experiments, ranging from hardware more tolerant to mistakes in the field like miswiring, configuring behaviour through web-based interfaces, and eventually, the ability to rapidly build and deploy networks of modules with centralised control and logging.

- Times, 2023 (Singapore Art Week 2023)
    - An array of VL53L5CX Time-of-Flight multi-zone sensors networked through RS485 trigger bells based on human proximity to them
    - https://jus.tin.sg/times/
- LUMBA, 2022 (Singapore Art Week 2022)
    - Outdoor light installation with proximity-triggered colour changes
    - https://github.com/JustinOng/LUMBA
- Wave 2.0, 2022 (Singapore Art Week 2022)
    - Light-sensitive haptic modules mounted on gloves and vests allow one to “touch” light
    - https://jus.tin.sg/wave-2-0/
- MARCS, 2022 (Arts X Tech Lab in partnership with National Arts Council)
    - Developed electronics and firmware for proof-of-concept of a modular control system for controlling large kinetic sculptures
    - Designed flexible software interface to control hardware through different avenues like Python, Scratch or integrated with existing tools like TouchDesigner

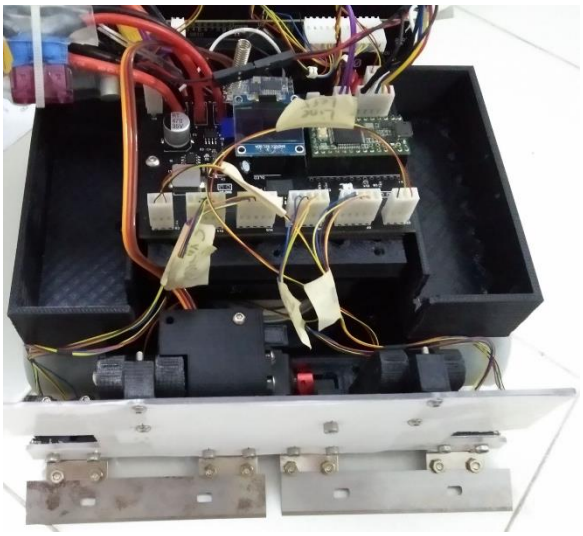
MARCS exhibition

Singapore Robotic Games 2020

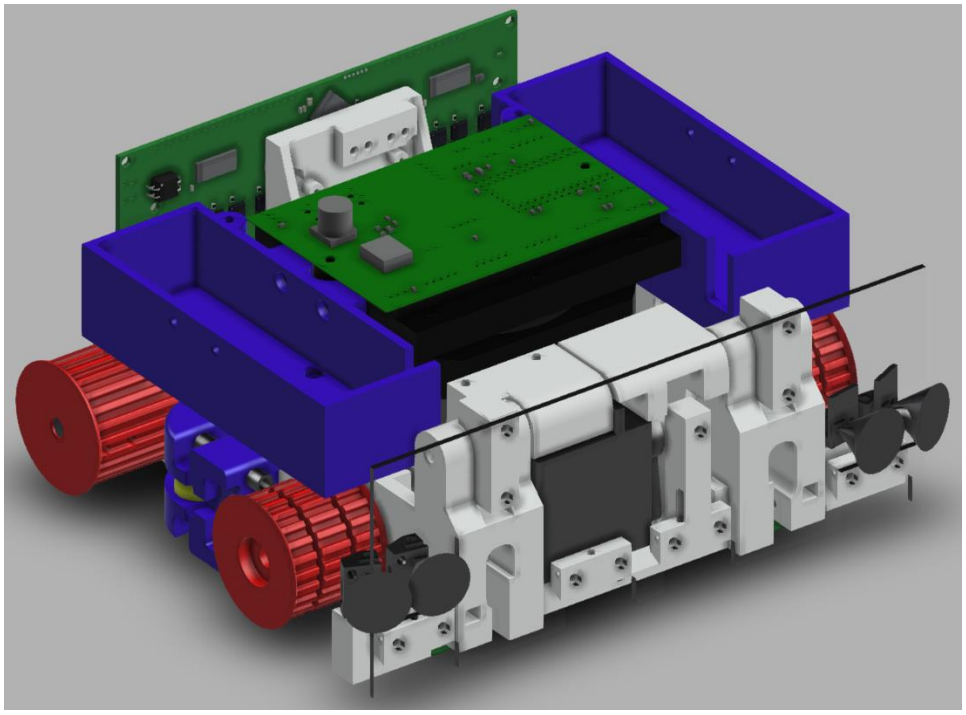
Sumo Robot Competition



Chassis with vacuum mounted



Overall robot



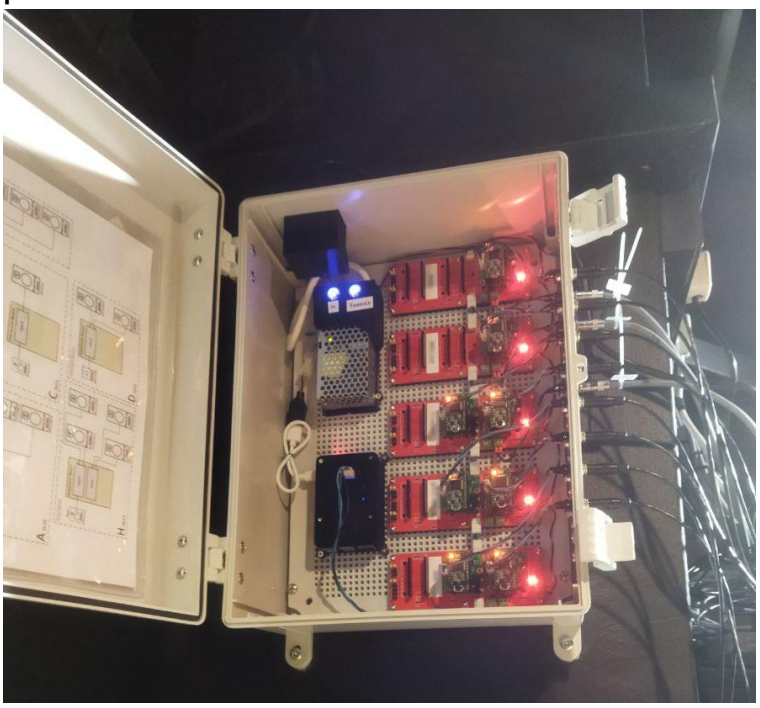
CAD model of robot

- Design and built a sumo robot powered by two brushless motors and an ODrive 3.6
- Mounted vacuum cleaner into robot to increase traction
- https://jus.tin.sg/singapore-robotic-games-2020/

Ngee Ann Polytechnic, Singapore – Final Year Project

Aug 2016 – May 2017

Audio Control System Replacement



Final Installation in August 2021

- Audio Control System for Dialogue in the Dark Singapore @ Ngee Ann Polytechnic
- First version built as part of project in 2016, then scaled down in 2021
- Developed firmware for multiple Teensy 3.2s and Audio Shields, and higher level web interface running on a Raspberry Pi to control microcontrollers over I2C
    - Raspberry Pi running web interface (Node.js), allowing configuration of sequences of audio players and actuators
    - Configuration defined in JavaScript, then translated into bitstream that is saved into microcontrollers for execution, allowing for local control without presence of Raspberry Pi