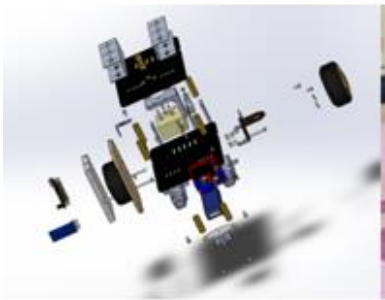
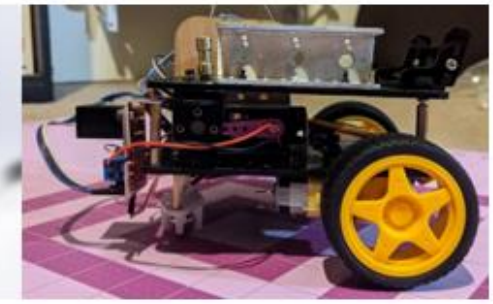
Warnakulasuriya Fernando

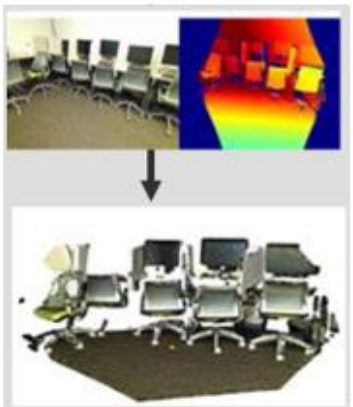
Hi, I am an undergraduate student majoring in Electrical Engineering at UCLA. Currently I work in the LEMUR robotics research lab at UCLA.

I have a deep passion for embedded systems and robotics. I love to research about different electrical systems and figure out how they work.

This portfolio contains some projects that I have worked on as well as what I have learned from these projects.







FORAY: Manual and Autonomous Blimp Robot

Objective:

- FORAY is a project at UCLA LEMUR, a research lab, that involves the programming and manufacturing of Lighter-than-Air (LTA) robots like blimp. The goal of this project, in collaboration with the government, is to discover the most efficient way to control and to solve pragmatic problems involving these LTAs by placing LTA robots in a competition where they would catch green balls and shoot them to a goal.

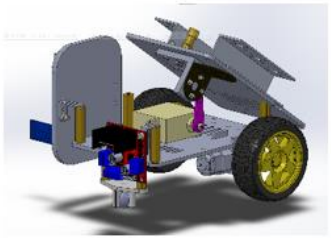
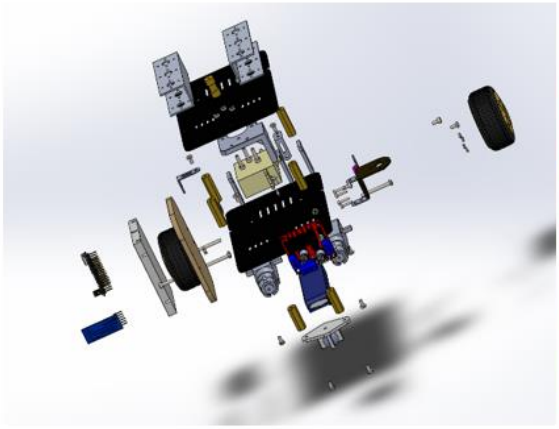
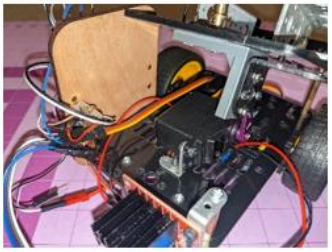
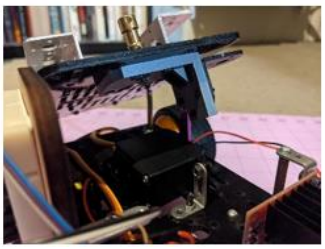
Role:

- Researching effective ways and creating algorithms to make the LTA robot hover in front of a green ball with the use of vision processing and PID control.
- Programming the LTA robots be controlled through manual and autonomous control with the help of PyGame.
- Finding the best camera that enables the blimp to hover in front of the green ball efficiently (cameras used include OpenMV, ESP32 cam, and Nicla Vision).
- Performing unit tests for the whole LTA robot system.
- Creating the project's modularized source code version for easy debugging
- Fast prototyping using Solid works to design, 3D prints to assemble mechanisms for an autonomous blimp.
- In charge of wiring and soldering hardware components.

External Links:

- **Blog Post: Capturing Mechanism and New Blimp**
- **Blimp Performance**
- **Hovering Flying Test Screen View**
- **Blog Posts Related to FORAY**

HAcK Competition: Manual and Autonomous Car

Objective:

- HAcK was a competition, for UCLA transfer students, where we had to make a car with autonomous and manual control. There were three tiers in this challenge: Control the car using Bluetooth, IR controller and fully autonomously.

Role:

- Collaborated in a team of 3 to assemble an autonomous car with unloading mechanism.
- Utilized Solid works to make replica parts and FEA analysis feature to analyze some parts of the assembly of the robot car.
- Programmed manual override, control car using Bluetooth module and Remote controller, using Python and C based coding.
- Utilize ultrasonic sensor and Reflective IR sensor to help the robot car drive through mazes autonomously
- Built team website using CSS, Java Script, and Html, showcasing project overview and delivered a design review to a panel of judges.

External Links:

- **Demo: Car Driving Through the Maze Using TV Remote (1)**
- **Demo: Car Driving Through the Maze Using TV Remote (2)**

Electrocardiogram

Objective:

- Use concepts and techniques in electrical circuit design and analysis, cardiac electrophysiology, biophysics, microcontrollers, and computer programming to design, construct, and test circuit boards capable of measuring human electrocardiograms. Capture electrocardiogram data with microcontroller, with computer analysis and display.

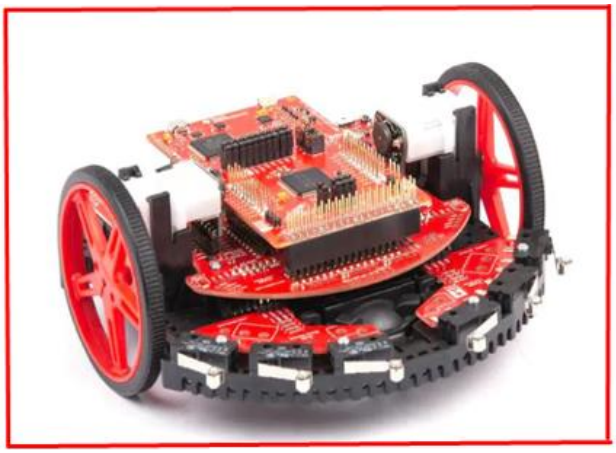
Role:

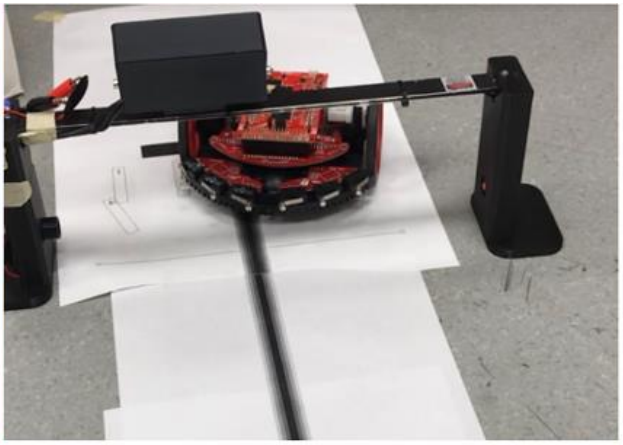
- Designed and soldered PCB to connect two LCDs, Wi-Fi module and power source to make a compact self-sufficient ECG.
- Utilized SolidWorks software to design casing for ECG and developed those designs using 3D printing and laser cutting.
- Programmed LCDs, to display heart signals, heartbeat, and battery percentage (custom characters), and Wi-Fi module to transfer data to a database.

External Links:

- **Testing Custom Characters in LCD Screen**
- **Tesing the LCD Screen by Replicating Heartbeat Pulses Using Potentiometer**

Programmable Robotic Car





Objective:

- Use concepts like PID, unit testing and hardware debugging to program the car to navigate through a track following the black center line.

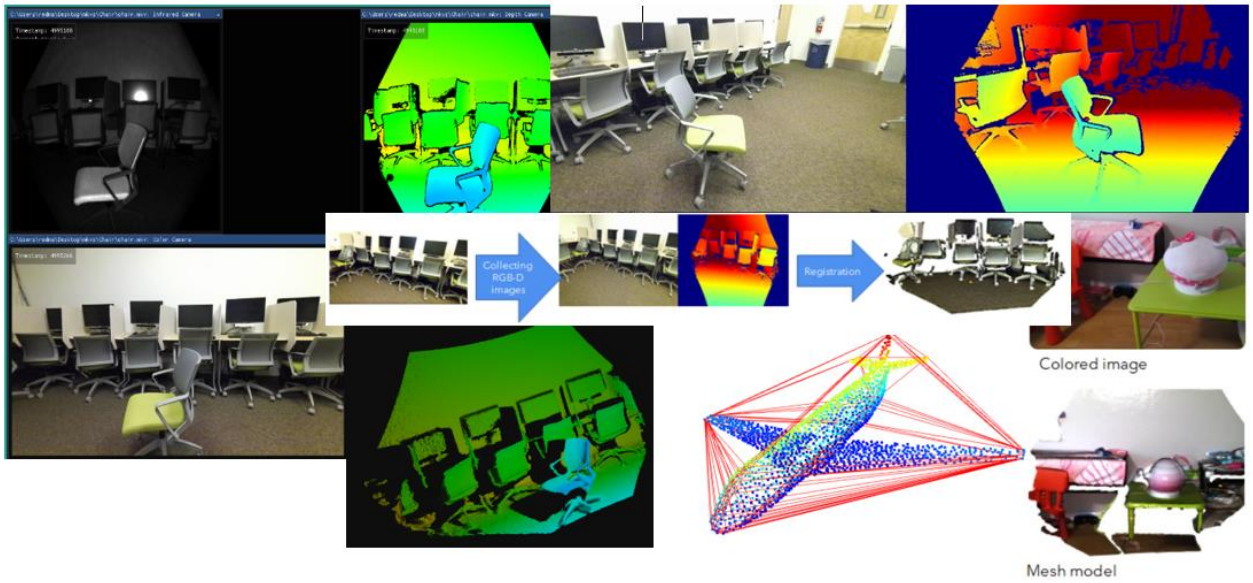
Role:

- Calibrated eight sensors and processed those sensor data values to find optimal proportional component (Kd), derivative component (Kp) and speed for better steering through the track.
- Coded the car to follow a track using C based programming.

External Links:

- **Car's Best Performance on Test Track (1)**
- **Car's Best Performance on Test Track (2)**
- **Car's Performance on Test Track**

Cost Effective 3D Modeling using Point Cloud Data from Azure Kinect SDK RGB-D Sensors



Objective:

- Create a cost-effective way to reconstruct three dimensional objects using Azure Kinetic RGB-D sensor data and Open3d library.

Role:

- Find a most effective method to reconstruct a three-dimensional scenery using RGB-D sensors, Python and Open3D Library.
- Identify and resolve existing errors in the Open 3D library and python interface.
- Experiment different approaches and functionalities existing in the Open3D library to perfect a object or scenery and reduce the processing time.

External Links:

- **Research Poster**