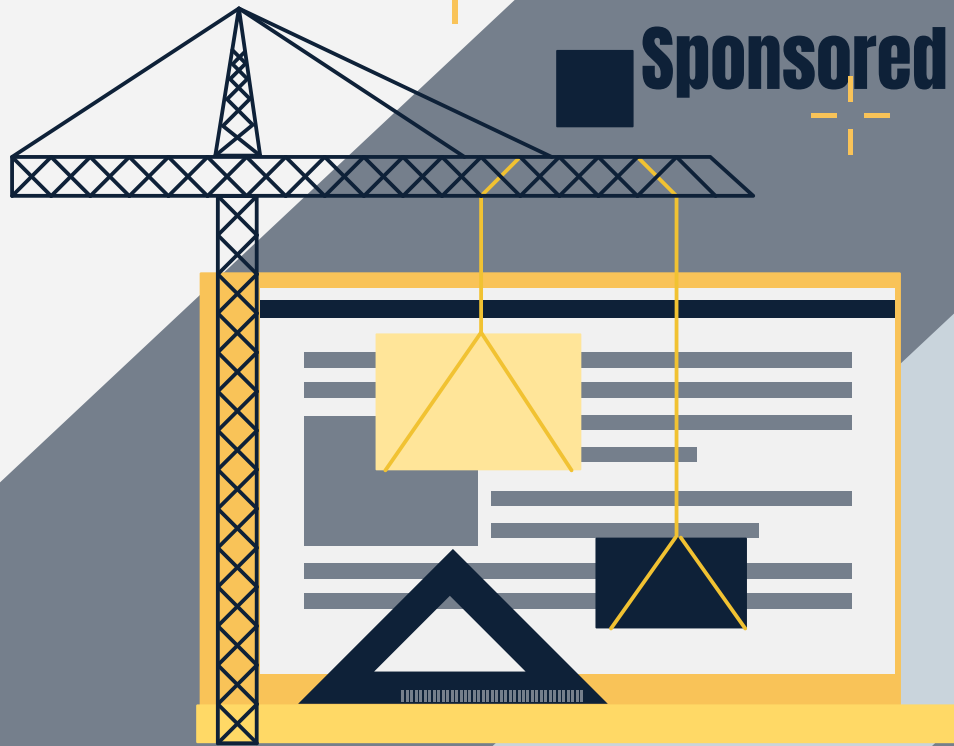# Sidewalk Monitoring Project

## Sponsored by City of Los Angeles, BOE

Audrey Stanford
Adriany Cocom
Adriana Velasco
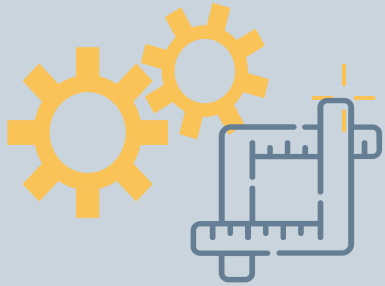Judith Cabrera
Cindy (Xue) Wu
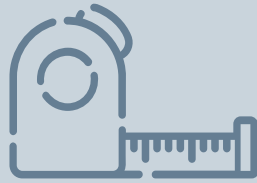Mark Dagrac

# PROJECT BACKGROUND
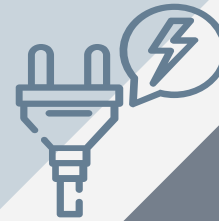
**Dimensions** – must be L X W = 24 x 24 inches.

**The height of tire** – must be at least 6 inch tall.

**Motor power** – must be able to carry over 30 pounds.

**Customizable** – must be able to add additional expansion boards

**Weight** – must be not over 15 pounds. (preferably as light as possible)

**Cost** – must be affordable (>$1000)

# Challenges of the Project

Crossing Slope

Running Slope

Vertical Displacement

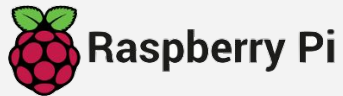Horizontal Displacement

# 02
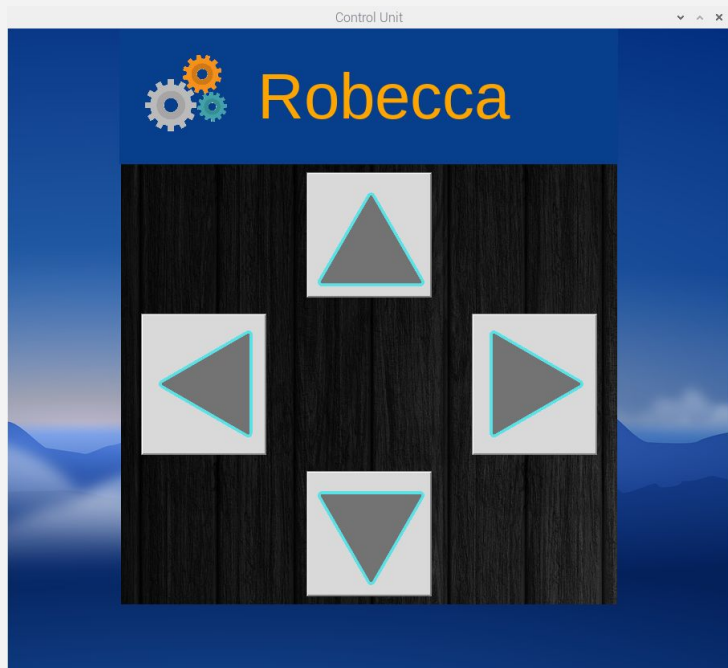# NEW TECHNOLOGIES

SOFTWARE DEVELOPMENT

# Software

- Goal of Software ⇒ GUI that allows user:
  - Controls Robecca
  - Capture, view and save sloped data

- Raspberry Pi ⇒ Raspbian
- Well integrated
- Written in python
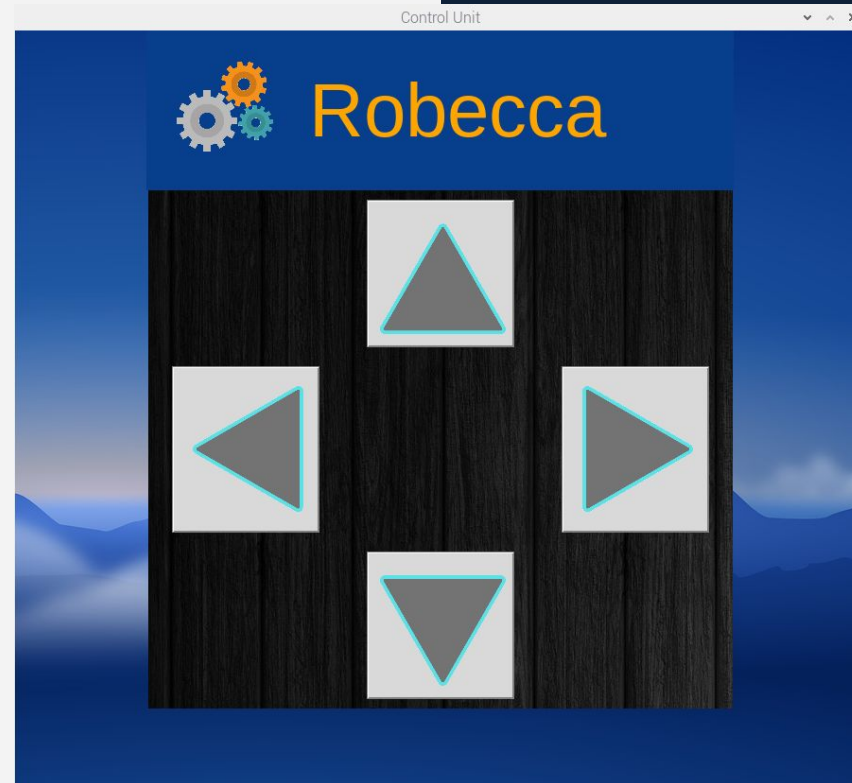  - Tkinter Library used

# Python Applications



Two Applications built to address the software's intended functionalities
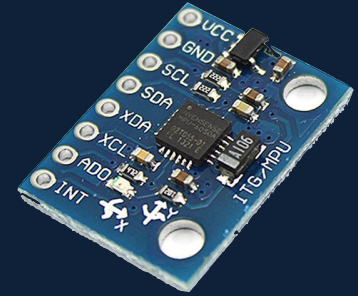
# Control Unit (Fall Semester)

- How do we control Robecca?

# Devices: Accelerometer & Digital Leveler

# 3-Axis Accelerometer





## Information Unit

| | Time | X Rot | Y Rot | Lat | Lon |
|---|---|---|---|---|---|
| 1. | 10-21-2019 20:31:34 | 38.42 | 1.3 | 33.9323 | -118.2046 |
| 2. | 10-21-2019 20:31:35 | -9.83 | 41.38 | 33.9323 | -118.2046 |
| 3. | 10-21-2019 20:31:36 | -12.28 | 39.95 | 33.9323 | -118.2046 |
| 4. | 10-21-2019 20:31:37 | -12.26 | 40.81 | 33.9323 | -118.2046 |
| 5. | 10-21-2019 20:31:38 | -5.83 | 39.55 | 33.9323 | -118.2046 |
| 6. | 10-21-2019 20:31:39 | -8.84 | 38.29 | 33.9323 | -118.2046 |
| 7. | 10-21-2019 20:31:40 | -6.17 | 37.94 | 33.9323 | -118.2046 |
| 8. | 10-21-2019 20:31:41 | -9.04 | 41.53 | 33.9323 | -118.2046 |

Freeze        Save Data

- 3-Axis Accelerometer
  - Time Stamp
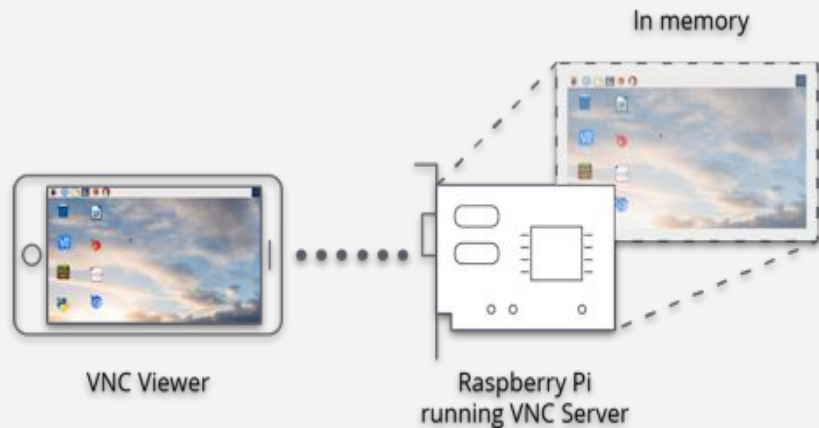  - X-Rotation
  - Y-Rotation
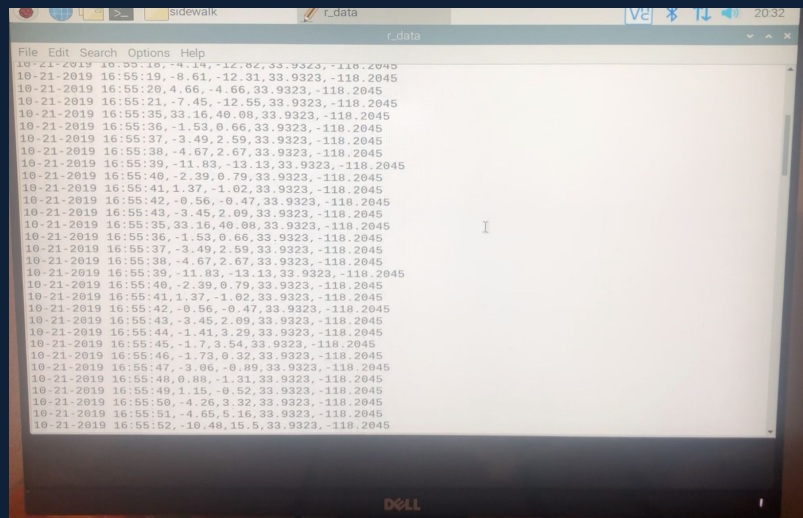- GPS
  - Latitude
  - Longitude

# DIGITAL LEVELER



## Digital Levler

| Time | XY-Volt | XY-Temp(°C) | XY-Angle | XY-Percent |
|------|---------|-------------|----------|------------|
| 1. 03-09-2020 13:57:01 | (04704.12, 05257.36) | (+19.3, +20.3) | (-00.372, +01.078) | (0.6493%, 1.8817%) |
| 2. 03-09-2020 13:57:03 | (+01.077, 04703.65) | (05257.21, +19.3) | (4.14, -00.374) | (0.2443%, 0.6528%) |
| 3. 03-09-2020 13:57:05 | (04703.63, 05257.73) | (+19.3, +21.2) | (-00.374, +01.079) | (0.6528%, 1.8834%) |

Freeze        Save Data

- Johnson Digital Leveler
- Information
  - Time Stamp
  - X-Y Voltage
  - X-Y Temperature
  - X-Y Angle
  - X-Y Percent Slope

# Software

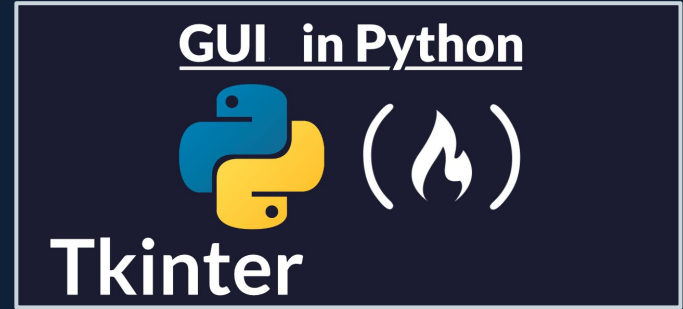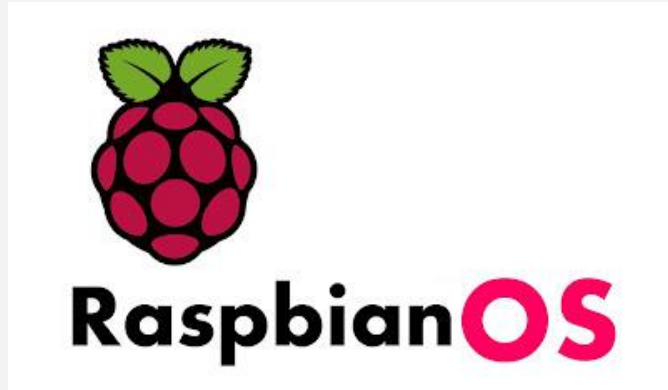- How is all this software accessed?

- **How/Where is the data saved?**
  - Saved on Robecca in .csv file

# Software Learned



Python Programming



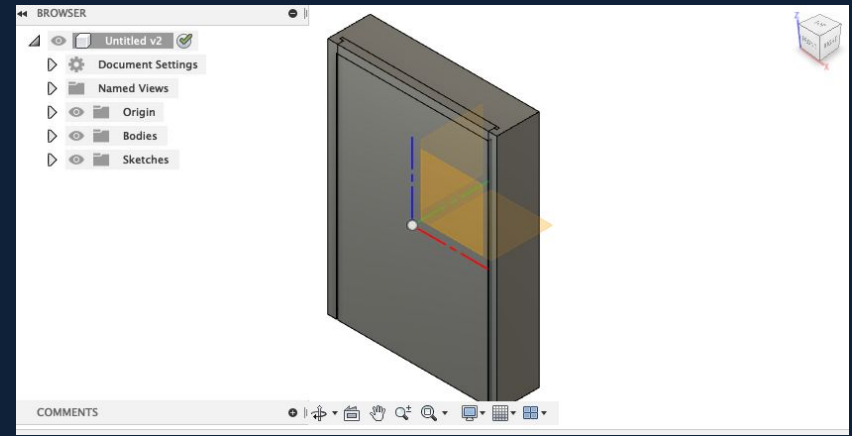RaspbianOS



GUI in Python

Tkinter
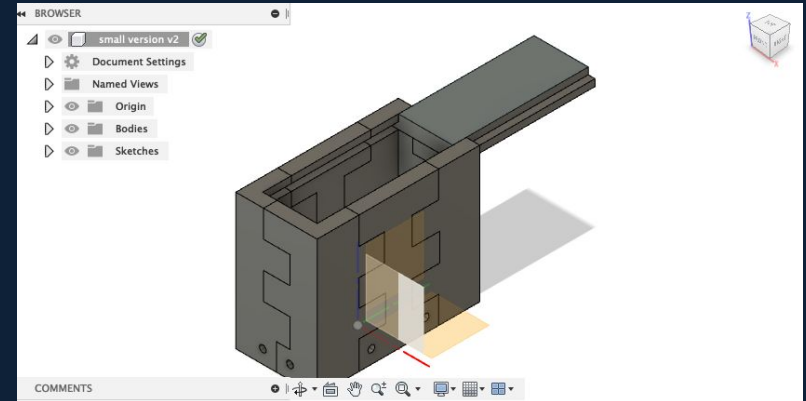


REAL VNC

# FUSION 360
## Designing a Shell

Many versions for the shell of the robot were made
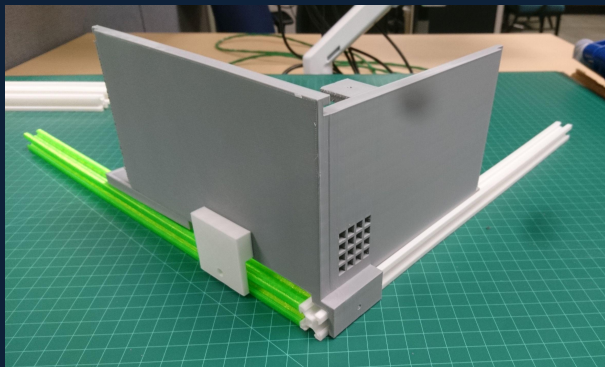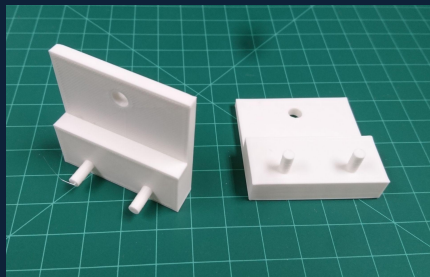
## LEARNING PROCESS

We needed a way to easily access the inside of the robot without taking the entire shell off. Sliding frame was then integrated into design



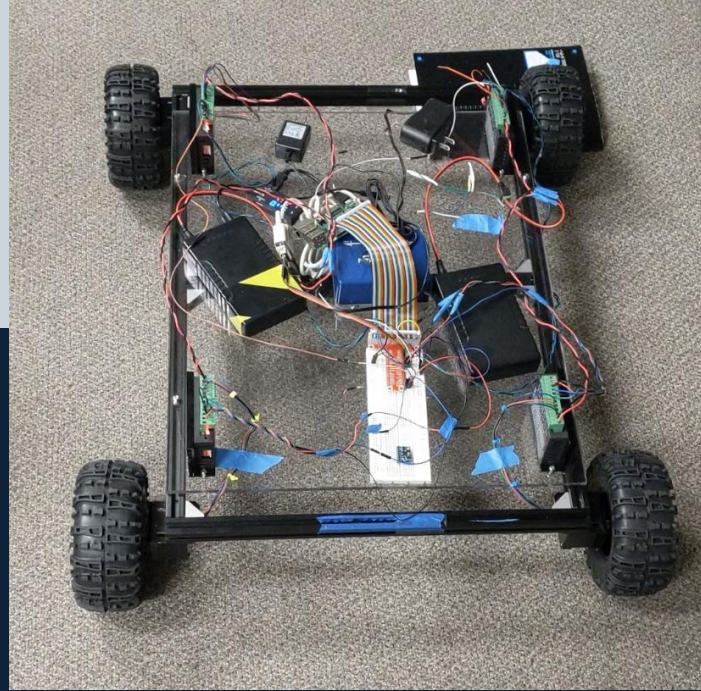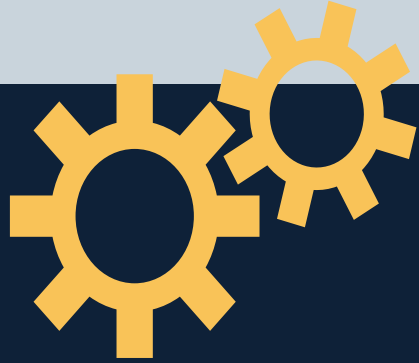Size of the shell was too big to be made inside of 3D printer. Shell had to be cut into parts
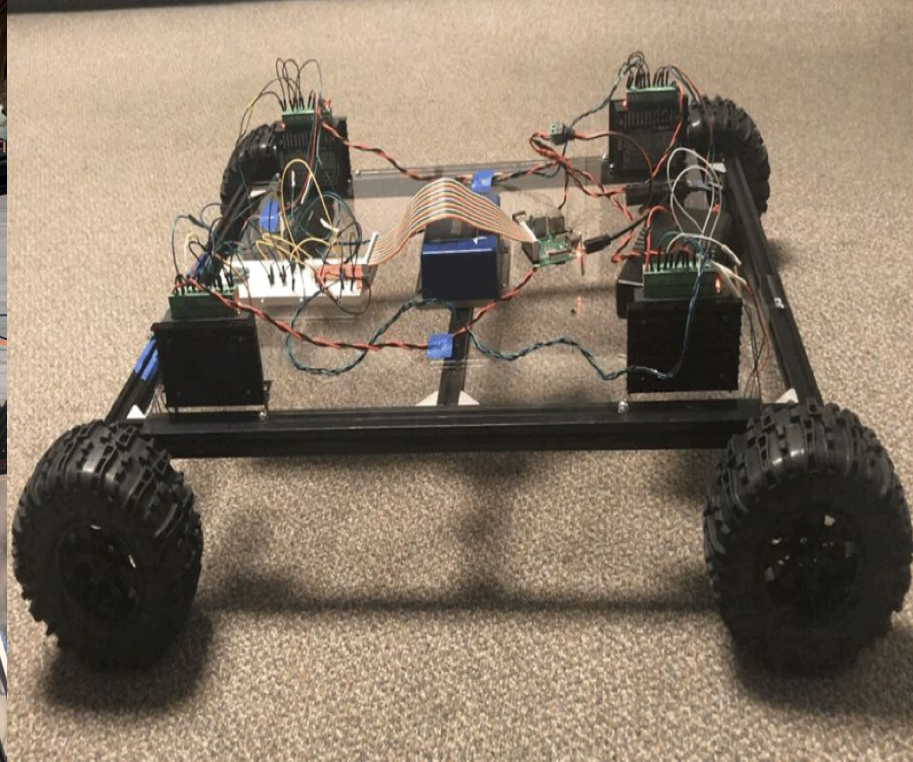
# HELP FROM JONATHAN AND KARL

CAL STATE LOS ANGELES

ROBECCA

SIDEWALK SLOPE PROJECT
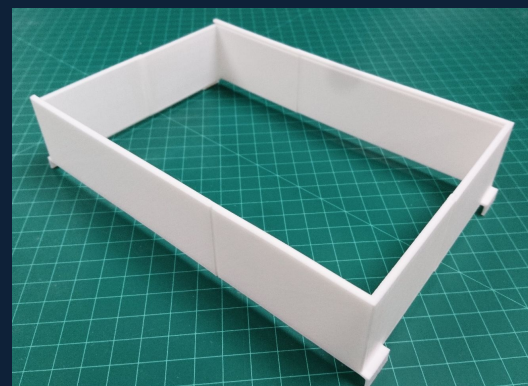
Thank you both for your contribution

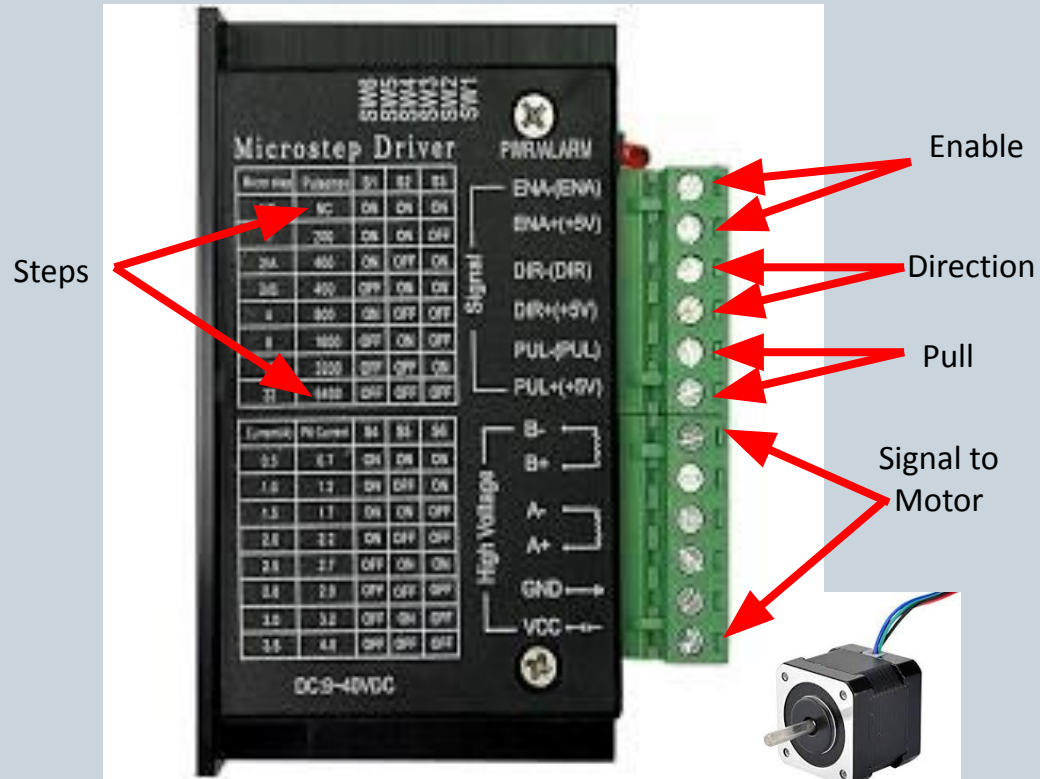# Assembling Challenges

# Directions, Dimensions, Motors, & Tires

Components

Screen Cover

Accelerometer

Raspberry Pi 3

Camera

24"

Motor Controller

26"

GPS Module

Battery

RS232-UART converter

Digital leveler
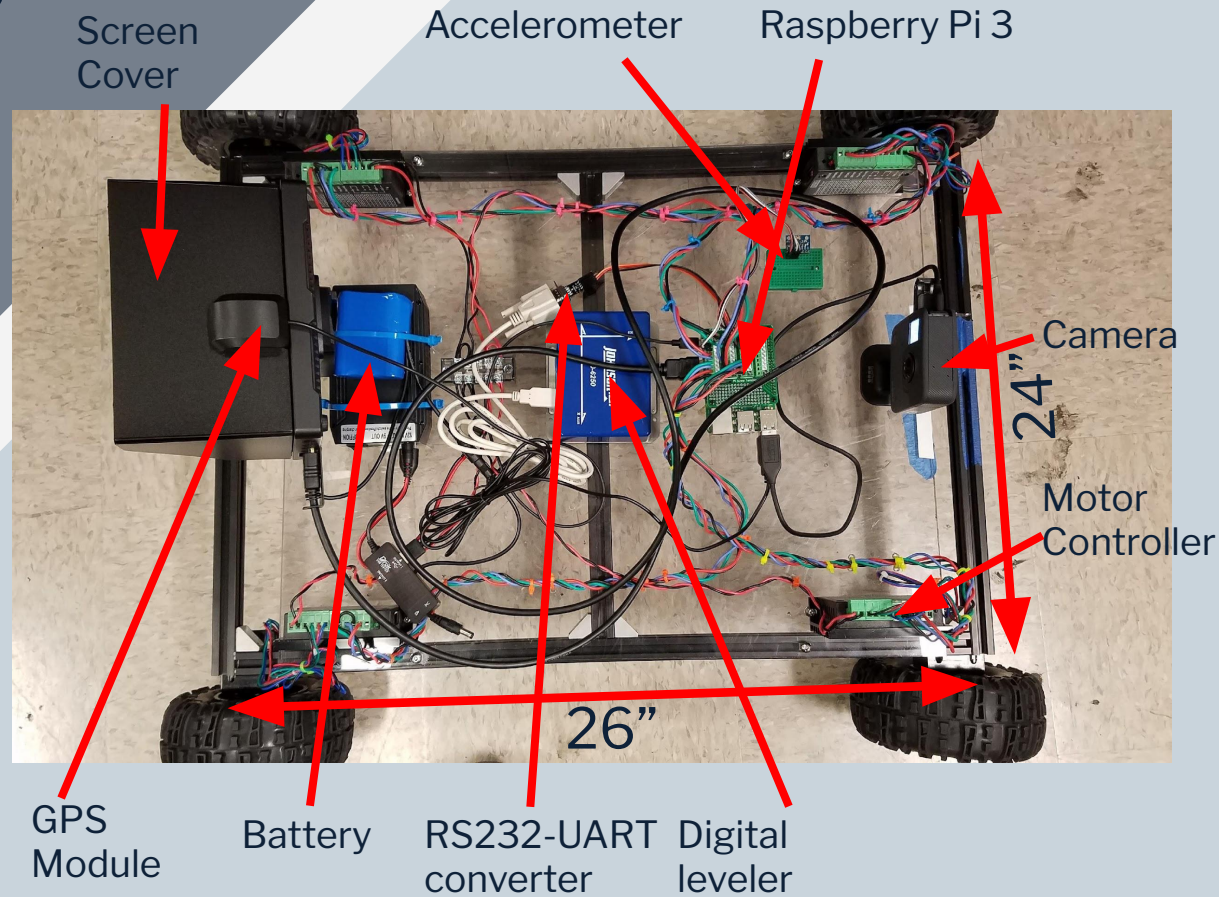
# Data Collection
# Raspberry Pi

40 GPIO-Pins

Broadcom CPU

WLAN/Bluetooth

4 x USB 2 Ports

MicroSd Card Slot

DSI Display Port

Ethernet (RJ45)

Micro USB Power Input

HDMI Output

CSI Camera Port

Audio Output Jack
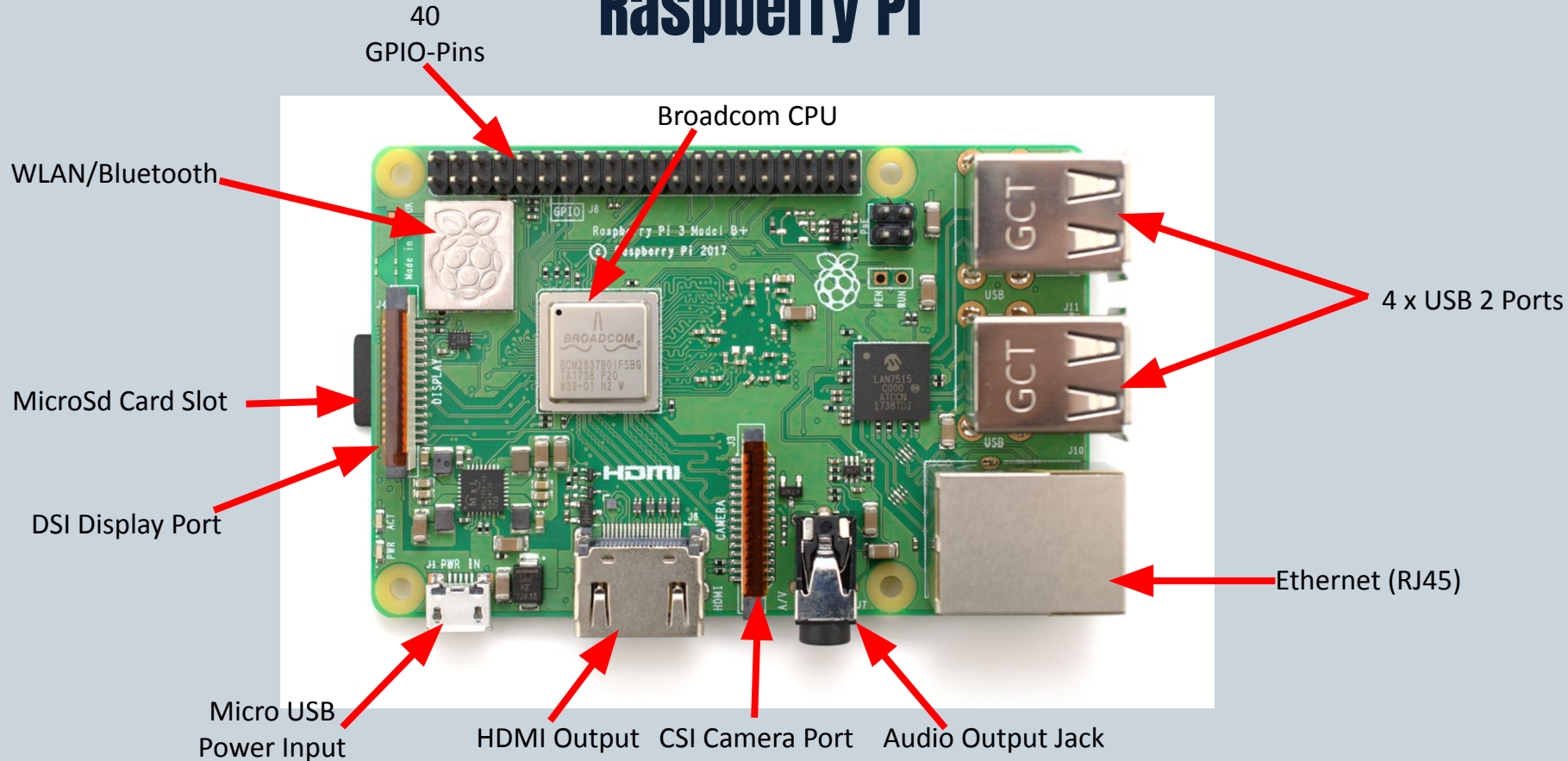
# Motor Controller & Camera



Camera Lens (Front)

Status Screen

microSd Card 1

microSd Card 2

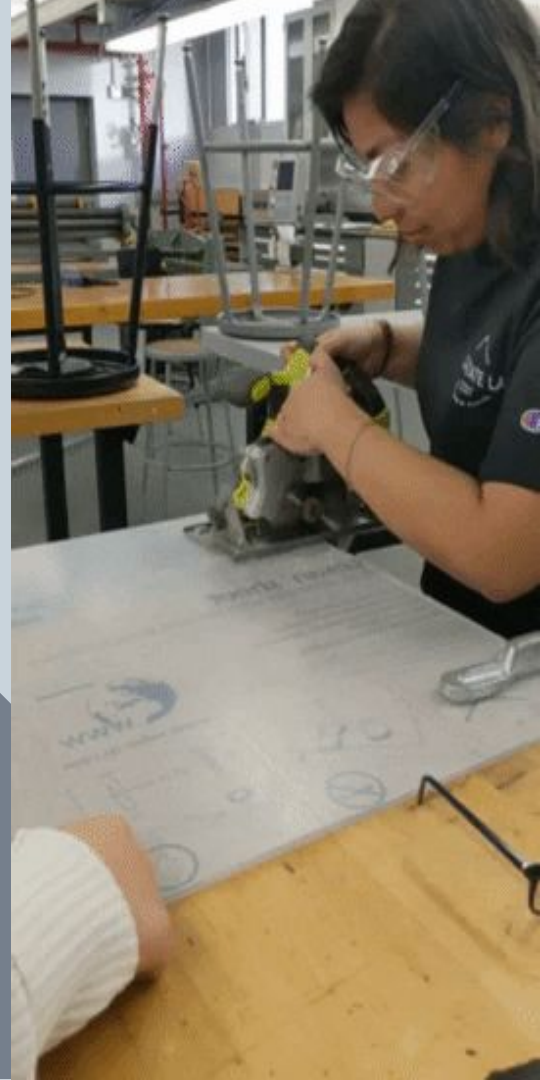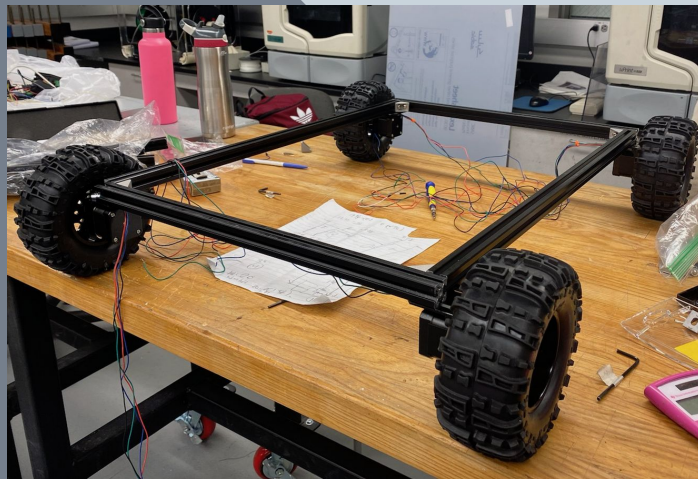Shutter Button

Front Lens

Enable

Direction

Pull

Signal to Motor

Steps

# 03

# PROGRESS

# MAKERSPACE LAB

# Accomplishments

## CHASSIS
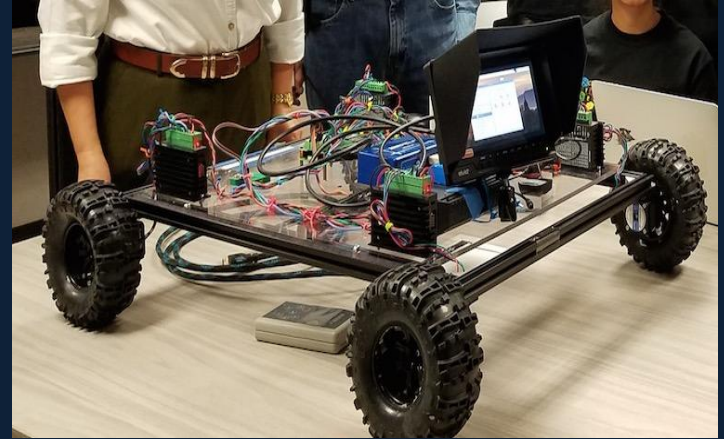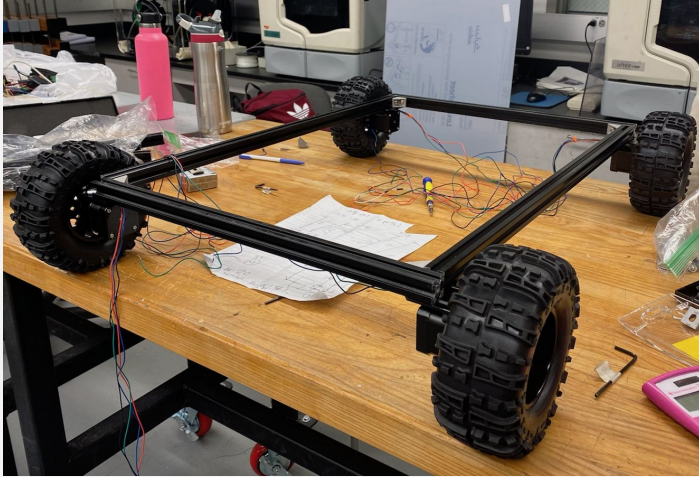
# Accomplishments



## Robecca
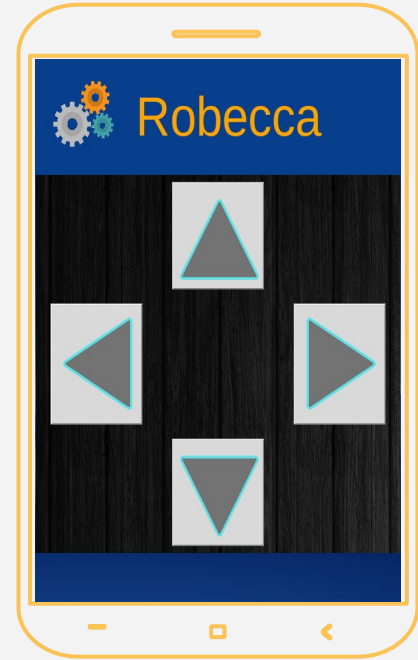
**REMOTE CONTROL**

# Accomplishments
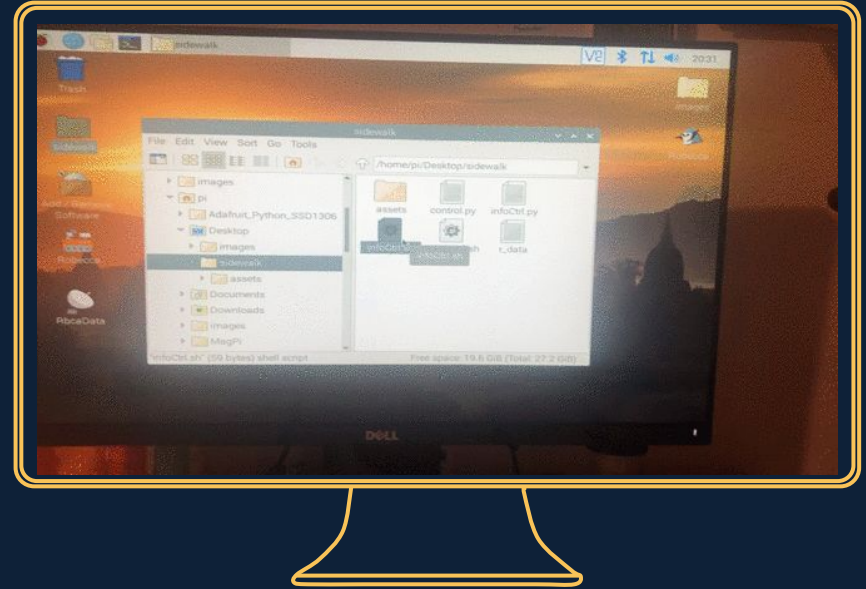
# OUR
# CONSULTANTS

## MARK
## DAGRACA

# Why was I brought in.



- Help with electrical design and consulated with choosing the right components for motor and wiring etc.
- Reviewed and advised on CAD design and help with design for 3D printing challenges.
- Knowledge of integrating hardware and software components into one cohesive unit.
- Reviewed Documentation
- Provided technical subject matter expertise

**04**

**FUTURE PLANNING**

# FUTURE PLANNING

| REQUIREMENT | | CHALLENGE |
|---|---|---|
| **MEASURE vertical and horizontal displacement** | ≫ | Sensor must be programmed to remove noise. |
| **CAPABLE of self-navigation** | ≫ | Robot must be able to avoid sabotage and self collision |
| **SELF-POSITIONING in the middle of the sidewalk** | ≫ | Must maintain location in the middle of the sidewalk |

# CHALLENGE

Sensor cannot distinguish grass from concrete

# SOLUTION

Image texture processing

# CHALLENGE

Avoid collision and sabotage

# SOLUTION

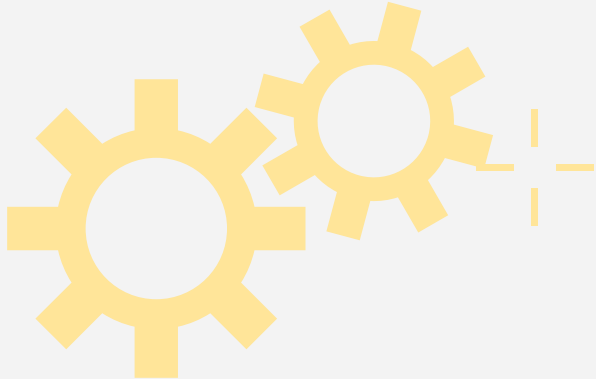LIDAR, Infrared detection, S.O.S. notification to user

# CHALLENGE

Positioning the rover in the middle of the sidewalk

# SOLUTION

Behaviour based reactive approach, model based approach exploiting various sensors

05

# CONCLUDING STATEMET

THANKS

ENGINEERING
CITY OF LOS ANGELES