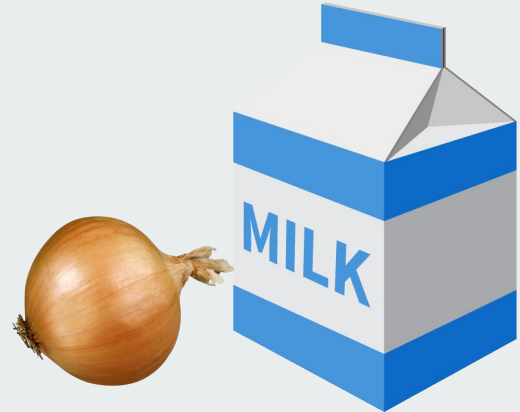# Image Recognition Expiration Date Tracker
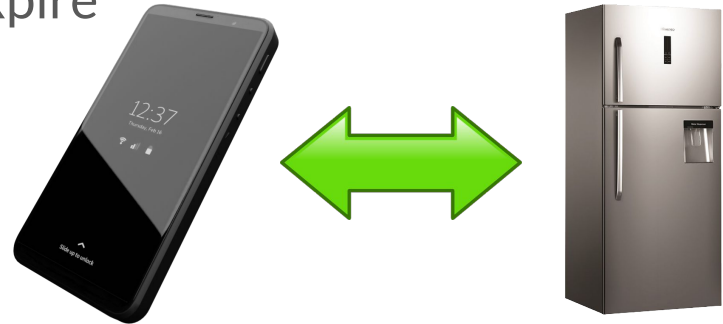
Team 66: Jonathan Jacobson, Kevin Choi, Vaibhav Makar

Our Objective

- Create an Easy-to-Use system
- Decrease wasted food and save money
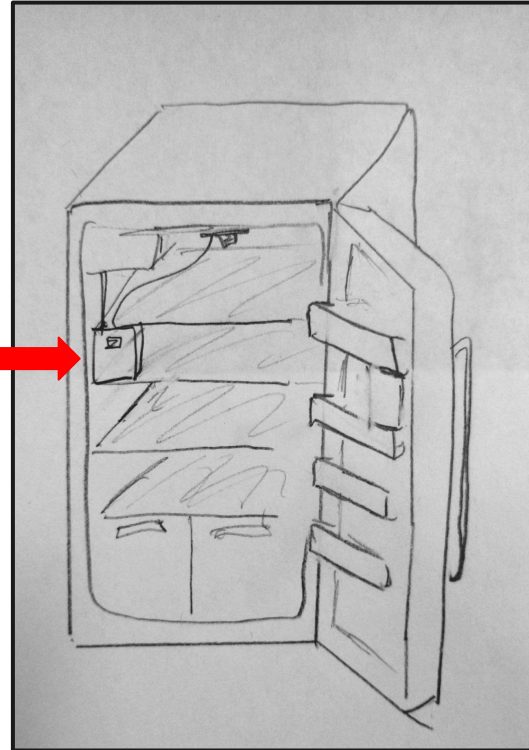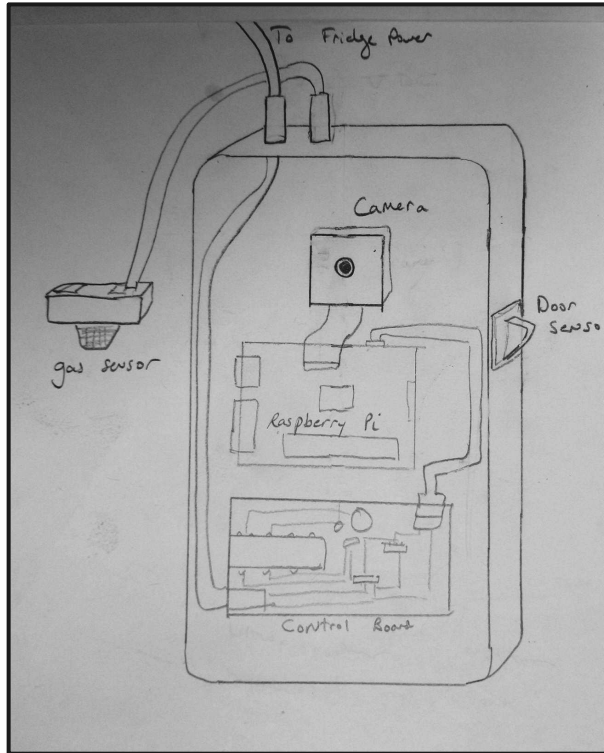- Keep people from eating expired food
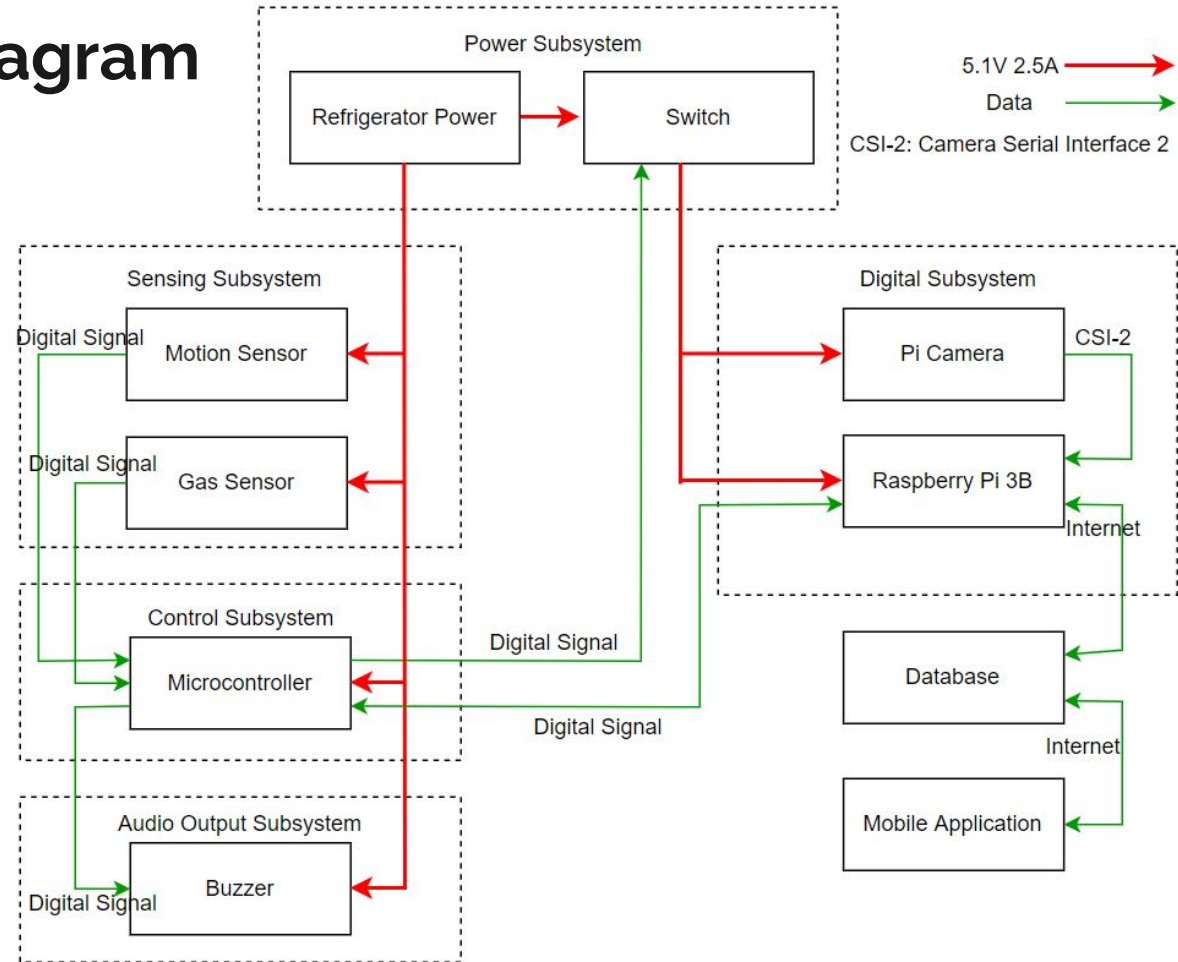
Our Project

- Scan food using computer vision
- Create a spreadsheet of foods in the fridge
- Assign timers to these foods
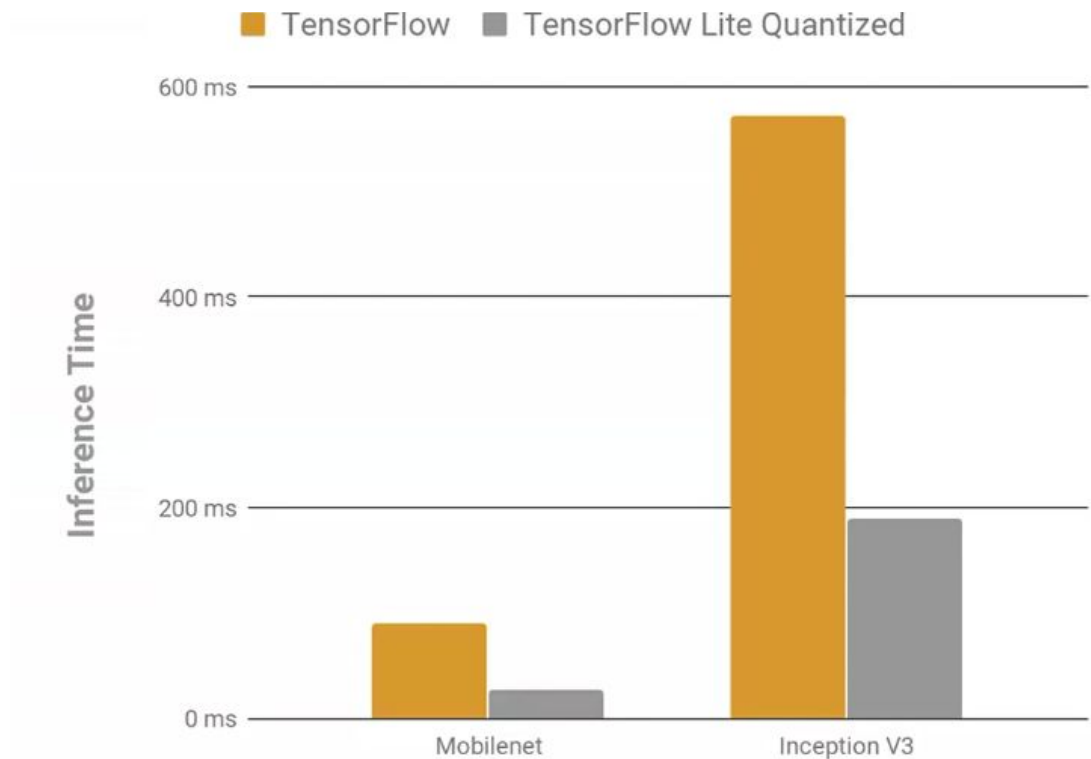- Alert the user when these timers expire

Our Design

Block Diagram

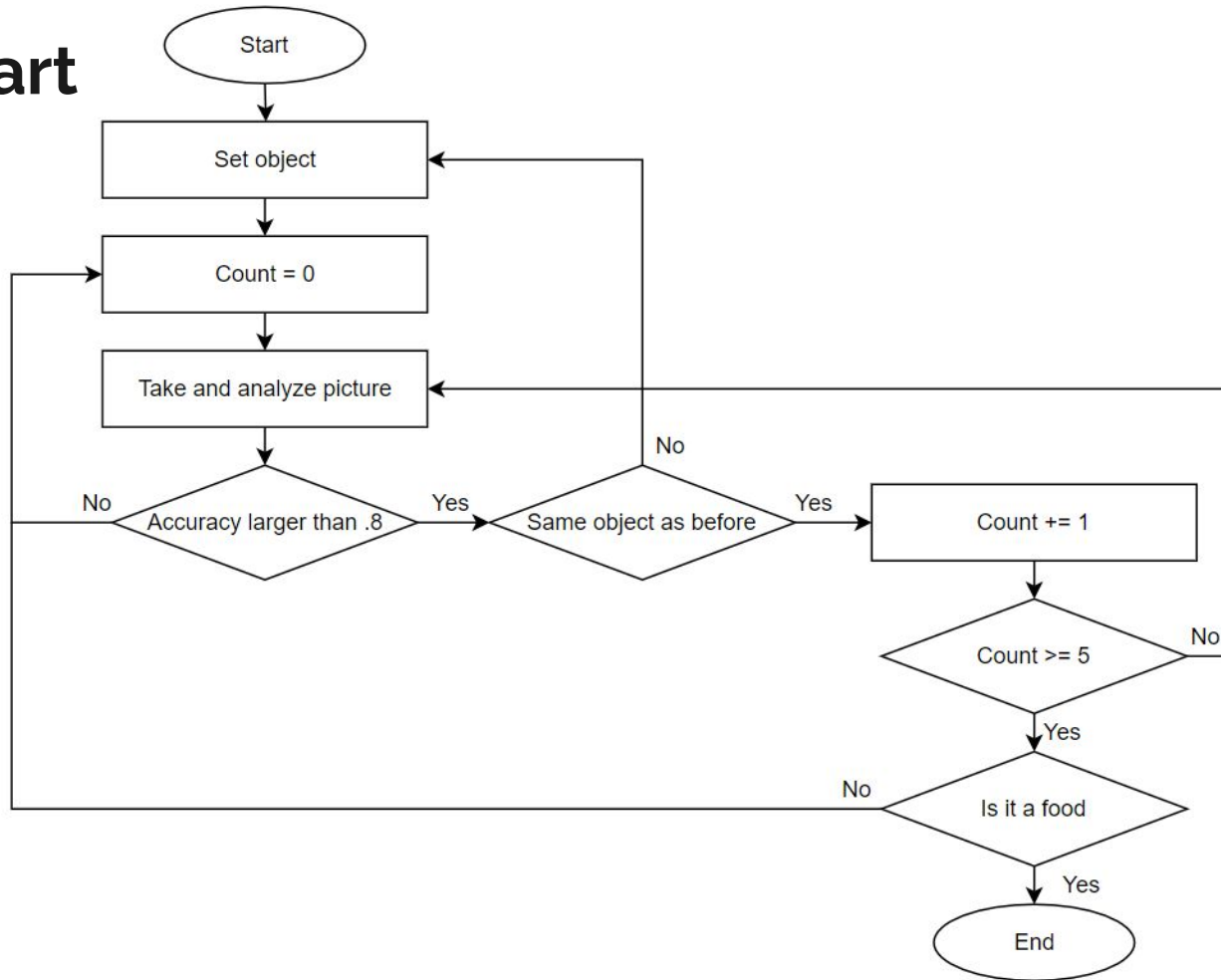# Camera + Computer Vision

- Raspberry Pi takes a picture of the object every 0.2 seconds

    - Image port instead of video port to get a higher quality picture

    - Picture size = model's training data size

- Pre-trained Tensorflow Lite model for image classification

Image Classification Module

<From Google I/O 2018 Presentation on TensorFlow Lite>

Flowchart

Example


```
banana 0.90625
banana 0.9296875
banana 0.9375
banana 0.95703125
banana 0.9375
banana is successfully scanned at 2021-05-04 12:36:47
```
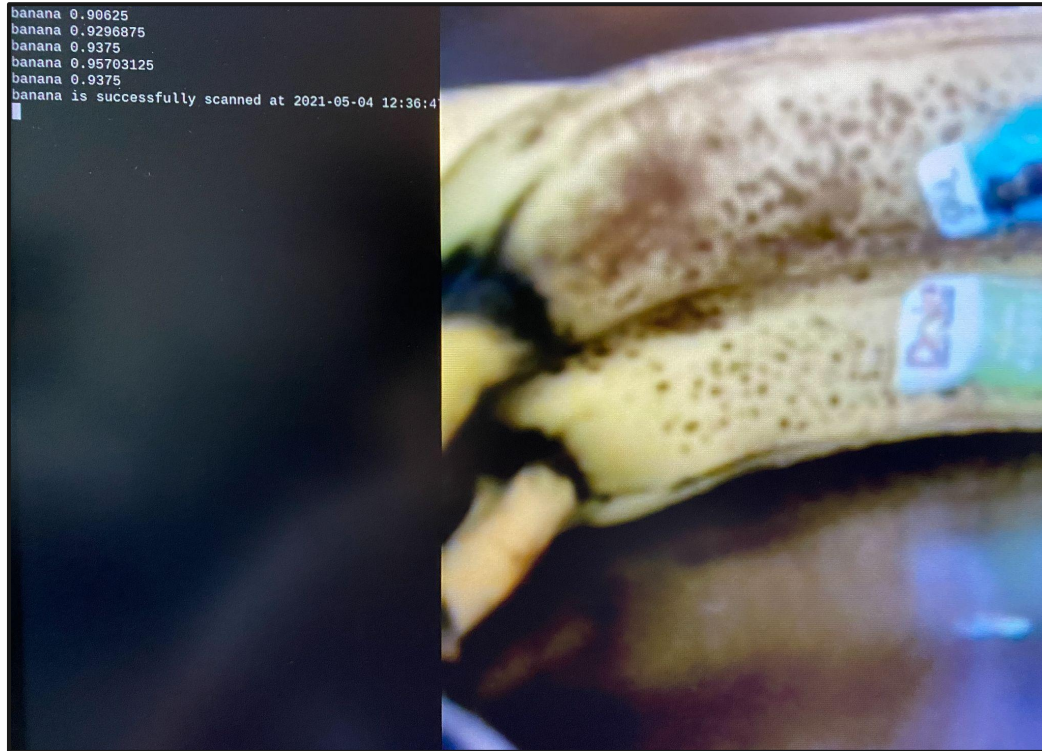
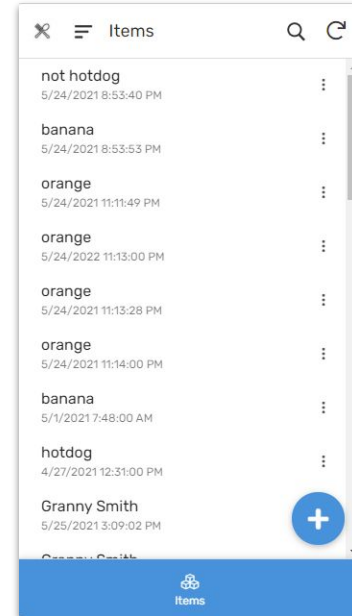| 2021-04-27 15:40:26 | tomato soup | 2021-04-30 15:40:00 |
| 2021-05-04 12:36:47 | banana | 2021-05-06 12:36:47 |

Classification Output Process

- Entry updated at database

  - [current time, food type, current time + expiration date]

  - Signal buzzer for scanning completion

- Later used to alert user for expired food

  - Check if previous time + expiration date < current time

  - Update the entry (change the font color)

  - Signal buzzer to warn the user

Creation date	Item Category	Expiration date
2021-04-26 20:53:40	not hotdog	2021-05-24 20:53:40
2021-04-26 20:53:53	banana	2021-05-24 20:53:53
2021-04-26 23:11:49	orange	2021-05-24 23:11:49
2021-04-26 23:13:16	orange	2022-05-24 23:13:00
2021-04-26 23:13:28	orange	2021-05-24 23:13:28
2021-04-26 23:14:00	orange	2021-05-24 23:14:00
2021-04-27 7:48:37	banana	2021-05-01 7:48:00
2021-04-27 12:29:49	hotdog	2021-04-27 12:31:00
2021-04-27 15:09:02	Granny Smith	2021-05-25 15:09:02
2021-04-27 15:16:24	Granny Smith	2021-05-25 15:16:24
2021-04-27 15:16:38	Granny Smith	2021-05-25 15:16:38
2021-04-27 15:16:48	Granny Smith	2021-05-25 15:16:48
2021-04-27 15:16:58	Granny Smith	2021-05-25 15:16:58
2021-04-27 15:17:08	Granny Smith	2021-05-25 15:17:08
2021-04-27 15:17:18	Granny Smith	2021-05-25 15:17:18
2021-04-27 15:17:28	Granny Smith	2021-05-25 15:17:28
2021-04-27 15:17:42	Granny Smith	2021-05-25 15:17:42
2021-04-27 15:17:54	Granny Smith	2021-05-25 15:17:54
2021-04-27 15:19:51	Granny Smith	2021-05-25 15:19:51
2021-04-27 15:29:29	orange	2021-05-25 15:29:29

Spreadsheet + App Design

- Android app allows user to view and modify items in database
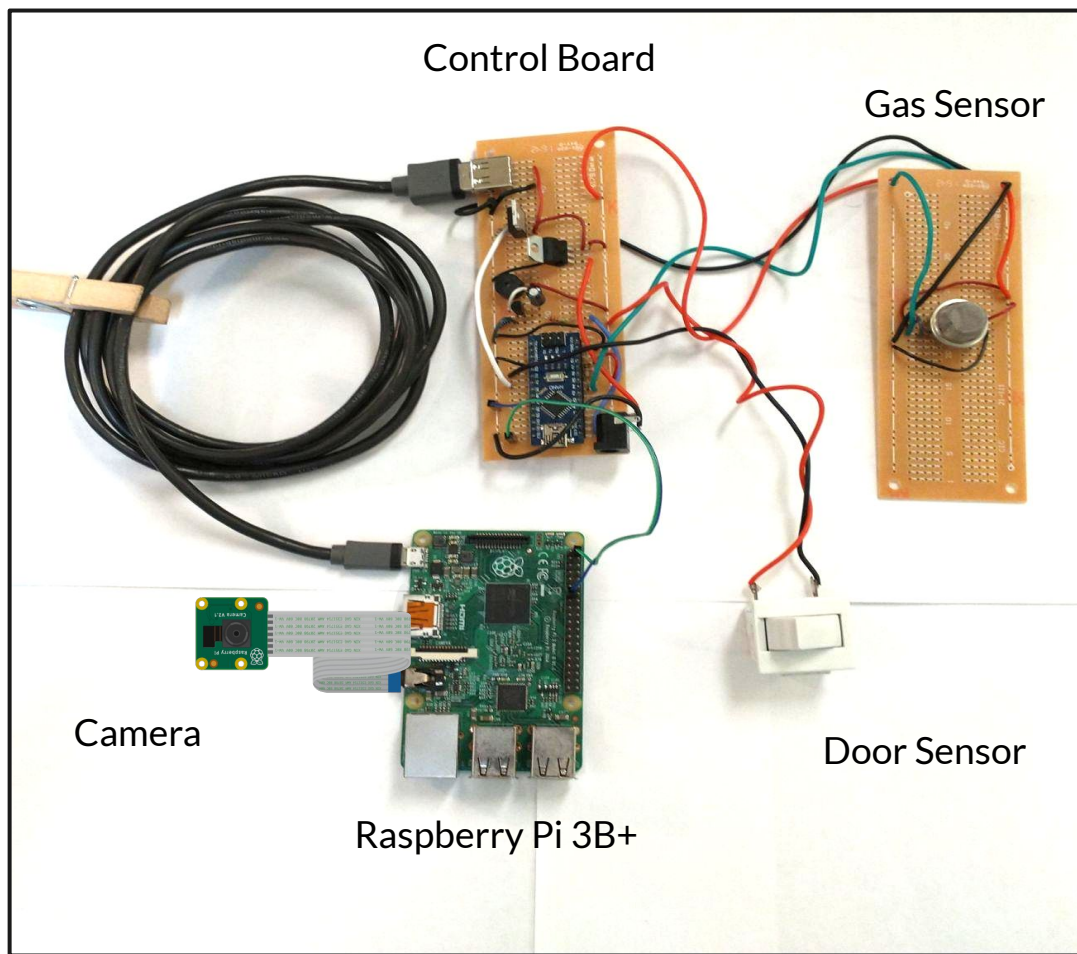
- Google sheets as an online database

Putting it all together

- Microcontroller on PCB connects Raspberry Pi to sensors
- Microcontroller decides when the Raspberry Pi should be powered on

This means that the power-hungry Raspberry Pi does not need to be always-on.

Control Board

Gas Sensor

Camera

Door Sensor

Raspberry Pi 3B+

Control Board Details

Subsystems:

- **Board Power** - Voltage regulator steps 7-35V source down to 5V
- **Buzzer** - Digital signal sent to buzzer circuit
- **USB Power** - Microcontroller sends digital signal to Power circuit, allowing a 5V line to connect to USB
- **Gas Sensor** - Connected to analog port of microcontroller.
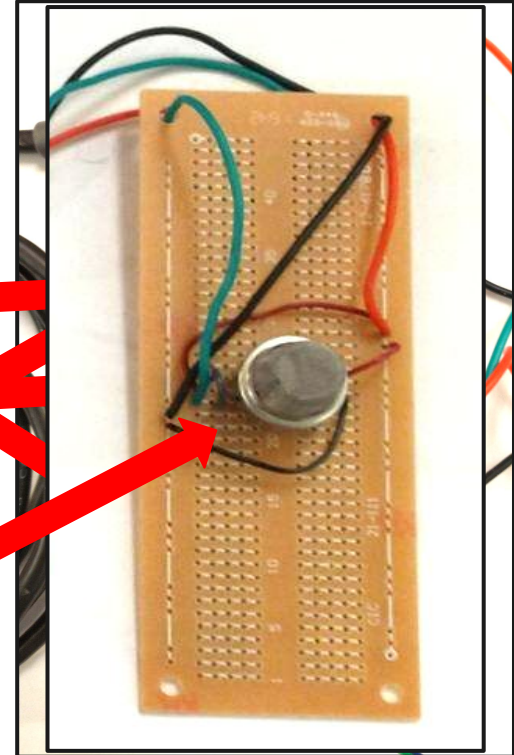
RV Table Details

1. Sensing Subsystem

The system detects when the door is opened and closed again.
The device will be able to sense the presence of gasses related to the expiration of food.

2. Classification Subsystem

The device can classify food items and create corresponding timers.
The device can set a custom expiration timer based on the user input.

3. Power Subsystem

The switch will be able to supply and decline power to Raspberry Pi.

Verification and Results

- Successfully was able to scan food items and add them to our spreadsheet
- Microcontroller board was able to control power to the Raspberry Pi safely
- Spreadsheet successfully connects to mobile app

  Overall, our project was successful

Issues

- Gas Sensor was not appropriate for our design
- Required several hours to warm up to operating temperature.

Winsen MQ-137

Next Steps / Possible Improvements

Improvements:

- Possibly changing the design to be a countertop device instead of a fridge device
  - This would allow users to track food anywhere in the kitchen

- Better sensors to supplement the detection of expired foods

Thank you!

Questions?