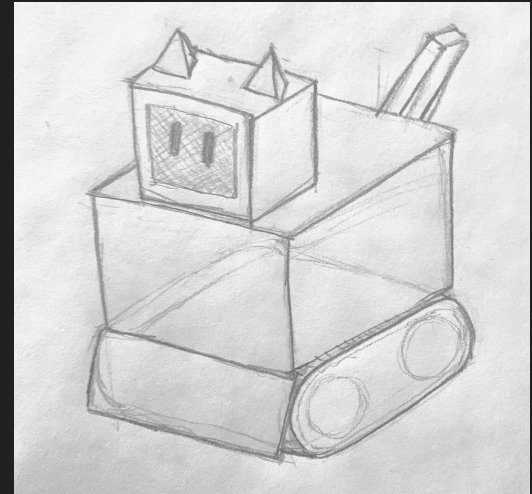Team D2

Meobot

Design Review

Olivia Xu, Maureen Zhu and Alex Shi

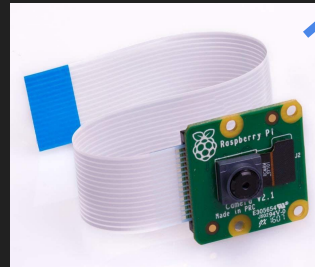# Application

A desktop robot companion pet "Meo"

- Wanders around
- "Hi Meo!"
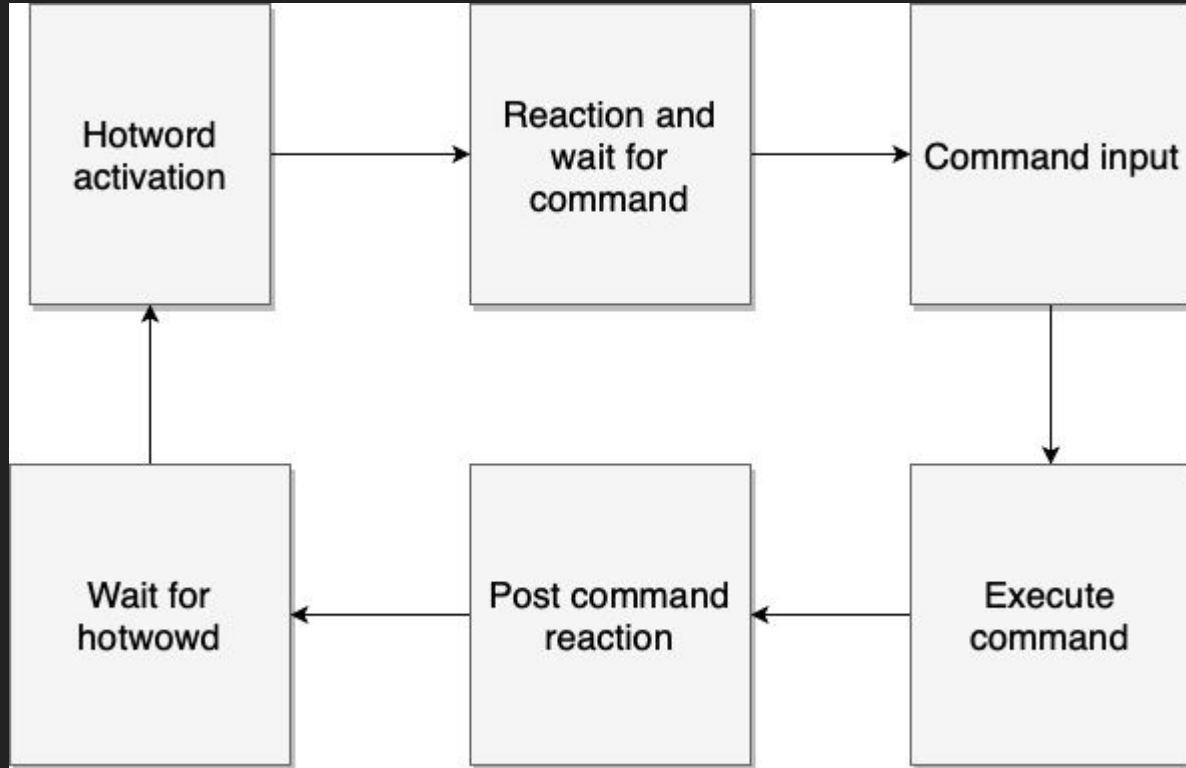- Reacts to voice command and displays information on its "face" (screen)
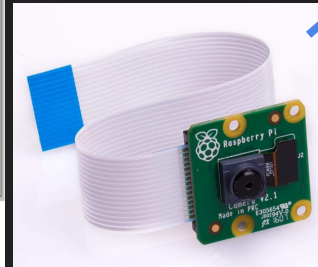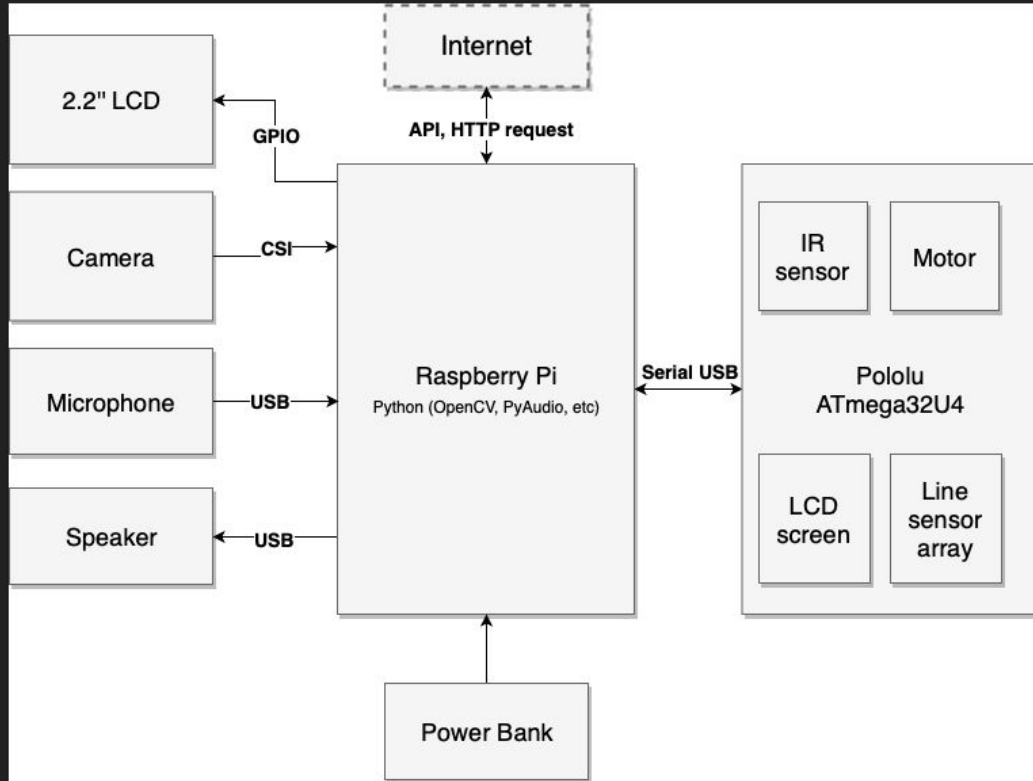
Solution Approach

- Pololu robot kit with proximity sensors
- USB serial communication between robot and RPi
- Hotword Detection
- Python for computation and Internet connection
- C++ for Pololu movement control

App Flow

Specification

2.2" LCD — GPIO

Internet — API, HTTP request

Camera — CSI

Microphone — USB

Speaker — USB

Raspberry Pi
Python (OpenCV, PyAudio, etc)

Serial USB

Pololu
ATmega32U4

IR sensor

Motor
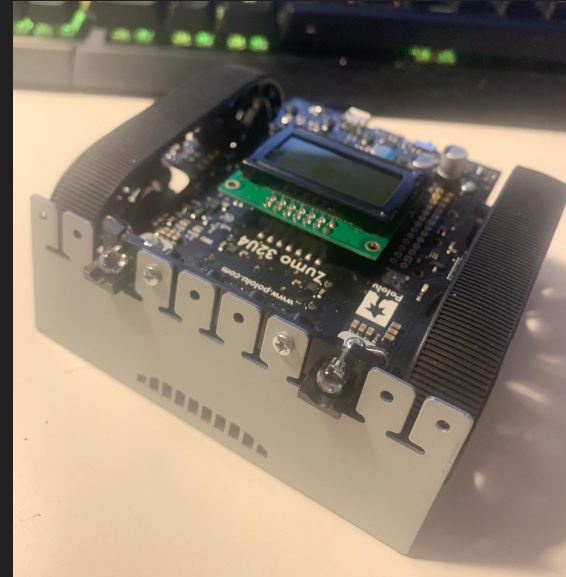
LCD screen

Line sensor array

Power Bank

Implementation Plan

Control: Raspberry Pi

Body: Zumo 32U4

- line sensor, proximity sensor, inertial sensor
- Arduino IDE

Connection: USB

Implementation Plan
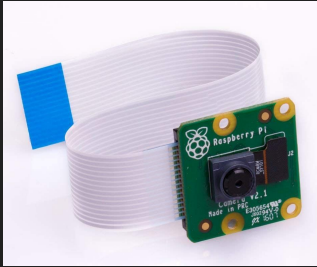
Simple Obstacle/edge avoidance:

- Two front IR proximity sensors
- Two side proximity sensors
- Three line sensor array on bottom
- Write our own algorithm

Implementation Plan

Peripherals: Camera, microphone, speaker, 2.2'' LCD display screen

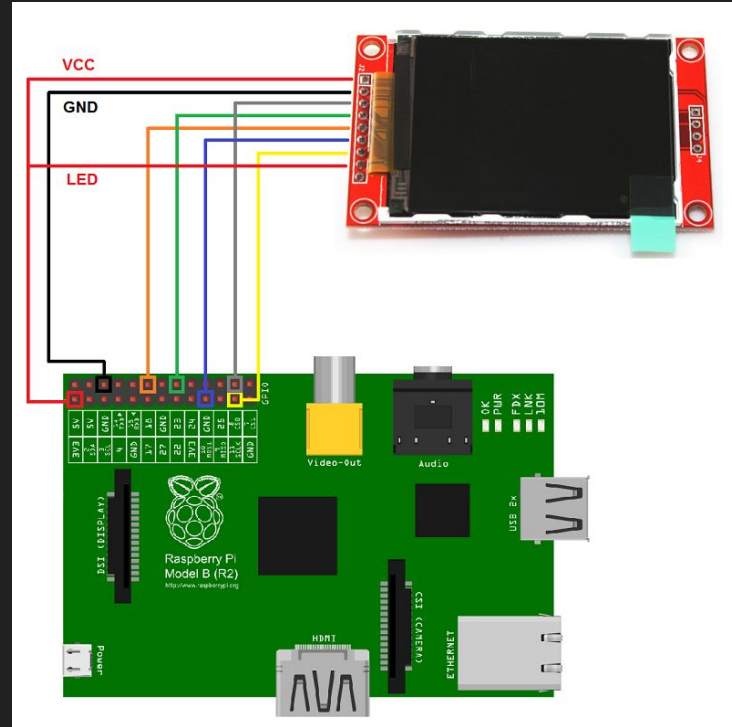Voice Recognition: Hotword Detection Toolkit

Facial recognition: OpenCV; write our own basic neural network

Implementation Plan

LCD:

- Adafruit's TFT python library
- Own code for visual display (characters, weather indication, facial expressions)

Implementation Plan

Online Resources:

- API for weather information
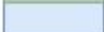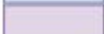- Third-party service for speech-to-text recognition

Measurement and Validation

- Voice Input
  - 80% activation rate to eliminate false positives
- Obstacle/Edge avoidance
  - 100% no falling, 80%-90% successful turn at large obstacles
- Facial recognition for team members
  - 90% success rate
- Command processing time
  - Less than 3 seconds

Project Management

Task Name	2/25	3/4	3/11	3/18	3/25	4/1	4/8	4/15	4/22	4/29
1 Pololu - Edge detection										
2 Pololu - Obstacle detection & path finding solution										
3 Pololu - Communication and command processing										
4 RPI - Control flow skeleton										
5 RPI - Microphone input and speaker output										
6 RPI - Hotword and command recognition										
7 RPI - Camera input and photo taking										
8 RPI - Facial recognition										
9 RPI & Pololu integration										
10 LCD - Basic drivers										
11 LCD - Character, weather, Facial expression										
12 LCD & RPI integration										
13 Appearance design										
14 Appearance implementation										
15 User testing										
16 Stretch goal implementation										

Legend:
- Team
- Alex
- Olivia
- Maureen