

Team D2 - Wednesday 11:30

Meobot

Project Proposal Presentation

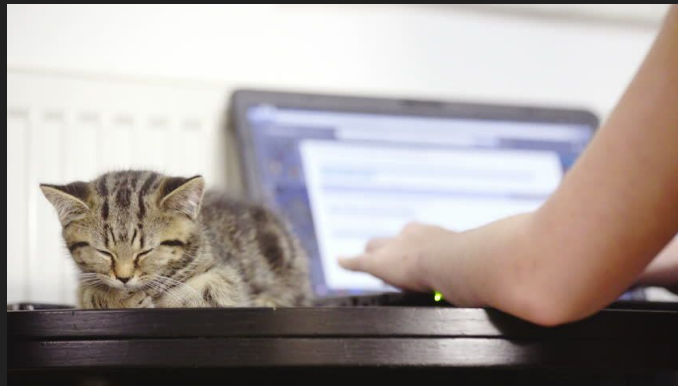
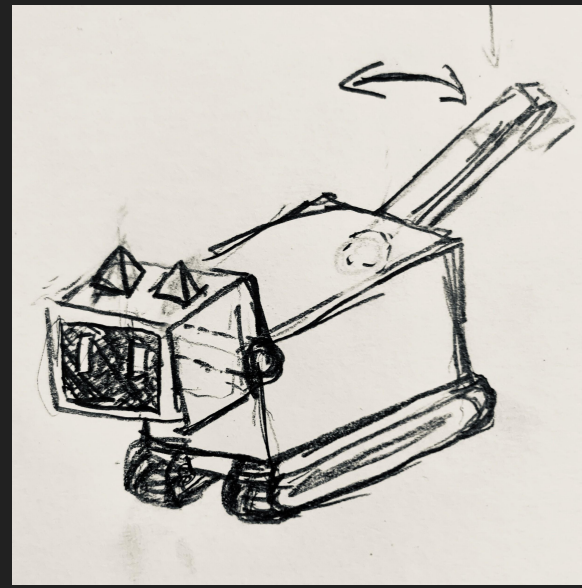
Olivia Xu, Yanying Zhu and Haohan Shi

Use Case

A “Desk Companion Pet”

Inspired by ANKI’s Vector

It can get familiar with its surroundings, execute commands, display important information, and be your friend.



Use Case

Problem Area:

Robot companion as a virtual assistance as well as de-stress buddy

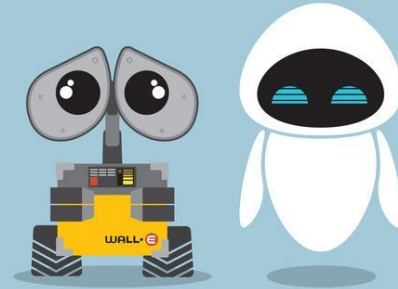
Related ECE Areas:

Software System, Circuit Design and Signal Processing



MVP Requirements

- Control robot movement
- Obstacle and edge detection
- Voice command input recognition
 - Activation word “Hi Meo”
- Execute commands with voice and video (on its cat face) output
 - Weather
 - Taking photos
 - Countdown
 - Alarms
- Make cute expressions based on its “mood”



Stretch Requirements

- Facial Recognition
 - Recognize and remember people
- Command localization
 - Figure out who and where is giving commands
- More movement possibility
 - Rotate head, swing tail
 - More reactions and gestures
- A control panel
 - Via web page or mobile app, view photo library
- Interactive mini games



Solution Approach - Hardware

- Pololu's robot kit
 - May need to redesign into four wheels for stability
 - Sensors on underside for edge and obstacle detection
 - No need for arduino
 - Built in display and LED for debugging
- Raspberry Pi
 - Camera, microphone, internet, computing, LED display
- Additional Sensors
 - Pressure sensor to detect petting
 - More IR sensors for better obstacle detection
- Circuit design
 - 5V, 1A for raspberry pi
 - Correctly integrate all sensors and parts



m3pi Robot + mbed NXP LPC1768



Solution Approach - Software (1)

- Robot Control System
 - Modular design with control center framework and other plugins for components
 - Serial port communication between Raspberry Pi and m3pi robot
- Internet Integration
 - Online API call for time, weather etc.
 - Upload photos to online library
- Voice command recognition
 - Train for wake up word: "Hi Meo"
 - May use 3rd party STT service like Google
 - Train to detect who the sound is from

Solution Approach - Software (2)

- Facial Recognition
 - Learn team member faces
 - Keep facing the person if it “knows” him/her
- User Interface
 - Use existing library and driver for LCD display
 - Build interface for displaying “expression”
 - Build basic control panel and online photo library

Testing and Verification

Unit test and integration test for each component

Example: Microphone

- Unit Test
 - Does it pickup sound correctly?
 - Can we successfully turn on/off by code?
 - Does audio file store correctly?
 - ...
- Integration Test
 - Does audio processing function work on the audio?
 - Do we need additional noise cancelling and filtering?
 - ...



Metrics

- Obstacle and Edge detection
 - Success rate
 - Latency between “sensing” and “reacting”
- Voice Command
 - Activation word detection rate
 - Command detection correctness
 - Command execution success rate
- LCD screen
 - Latency between fetching information and displaying
 - Display information correctness
- Computation
 - Internet API call RTT
 - Voice/Image processing time

Tasks and Division of Labor

Hardware design: Yanying Zhu

Circuit design and component integration: Yanying Zhu, Olivia Xu

Software (computation): Haohan Shi

Software (control): Haohan Shi, Olivia Xu

Schedule

