

Project Proposal: Trash Collector Bot

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Goal

Design a robot that finds and picks up trash. It uses machine learning (image processing) and real-time inference to know trash from non-trash.

How It Works

The robot learns to see trash with a machine learning system.

Camera: to move around and spot trash.

Proximity Sensors: To avoid obstacles and navigate.

Course Topics Addressed:

1. Sensors and Actuators
2. MBD & Modeling Physical Dynamics
3. Networking
4. TinyML

Schedule

Work 3 hours in lab every week. Details to come later.

Github Repo

<https://github.com/jimchen2/EECS-149-Final-Project>

Risks

Making the robot learn efficiently can be hard. The budget may affect our choices. Making all parts work smoothly together might be tricky.

Approach

Project Initialization(done):

1. Acquire necessary hardware components.
2. Set Up Raspberry Pi OS

Hardware Setup:

1. Assemble Raspberry Pi, attach camera.
2. Connect sensors, Set up motors
3. Test moving around with motors

Image Recognition:

1. Acquire and preprocess trash image dataset.
2. Train a CNN for trash identification.
3. Export model to Raspberry Pi.

Picking Up Trash:

1. Integrate a claw on the Raspberry Pi.
2. Integrate the picking up mechanism with Image Processing

Resources

Hardware

Item	Details
Raspberry Pi 4 Model B CanaKit	Ordered by J. C. Total Price: \$176.39
Camera Module V2-8 Megapixel, 1080p	Ordered by J. C. Total Price: \$27.24
L298N Motor Drive Controller Board	Ordered by J. C. Total Price: \$18.73
VGE Battery Pack, 5000mAh, 5V 2.0A	Ordered by J. C. Total Price: \$28.61
L293 IC Stepper Motor Drivers Controllers	Ordered by J. C. Total Price: \$9.79
4PCS Breadboards Kit	Ordered by J. C. Total Price: \$11.00
Chanzon 120pcs Header Jumper Wire	Ordered by J. C. Total Price: \$11.01
SUPULSE Lipo Charger	Ordered by J. C. Total Price: \$22.04
Proximity Sensors	—
Trash Pickup Claw	—
Vehicle frame	—

Software

Software	Purpose
Raspberry Pi OS	OS for Raspberry Pi
PyTorch	For implementing CNN
ChatGPT	For debugging, and formatting documents