Feather Feed 2023

NOVEMBER 24

Peter Fortune
Student ID: 20011462

Project Proposal

Problem

I enjoy feeding and watching birds in my garden. It's frustrating to return to an empty feeder, not knowing what types of birds visited. I wish I could monitor them and receive alerts when birds are feeding, to observe them or remotely schedule feed releases.

Solution

'Feather Feed' is a bird feeder monitoring system that combines a Raspberry Pi Zero 2W with a camera and motion sensor to detect birds at the feeder. When a visitor is spotted, it streams the footage to a Raspberry Pi 4 indoors, which uses AI to identify the species. Detection events are communicated via MQTT to a web service, which saves an image, logs the activity, and alerts the user through a web app. Additionally, users can opt to watch the birds live through the app.
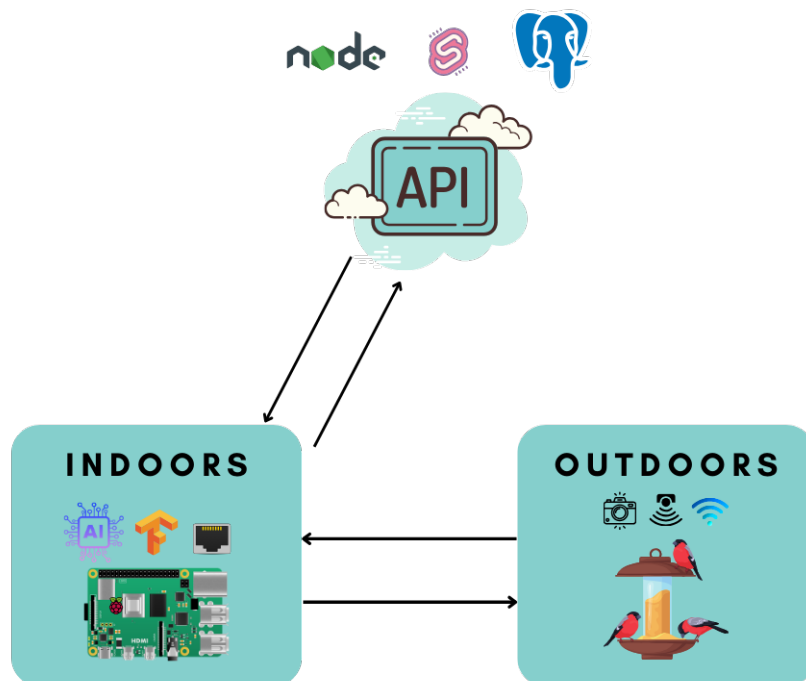
Technologies

Hardware

I plan on using the following hardware:
- **Raspberry Pi 4B 4GB**, used indoors, will serve as the main processing unit and communication hub
- **Raspberry Pi Zero 2W**, used outdoors, equipped with a **NoIR camera** for video capture and a **PIR motion sensor** for motion detection.
- **Google Coral TPU**, for accelerated machine learning to enhance TensorFlow's capabilities in species identification
- **Power Bank**, will be used to power the **Raspberry Pi Zero 2W**

Software

- Operating System: Raspbian
- Machine Learning: TensorFlow Lite to classify bird species with the support of the Google Coral TPU
- Communication: An MQTT broker for managing message queuing between devices
- Python will be used on the Raspberry Pi and Pi Zero
- Web Service: Node.js with the Hapi framework to build the API.
- Data Storage: PostgreSQL for persistent data storage using Supabase.
- Frontend: Vercel for hosting, with SvelteKit and Tailwind CSS for the web interface/app

Protocols

- RTSP (Real-Time Streaming Protocol) will be used over UDP for video steaming due to its lower latency from outdoor to indoor Raspberry Pi.
- TCP for reliable transmission of sensor data and communication with the web service.
- MQTT will be used for lightweight and efficient communication between the devices and the webservice.