Pothole Detection Unit

Braeden Kurz

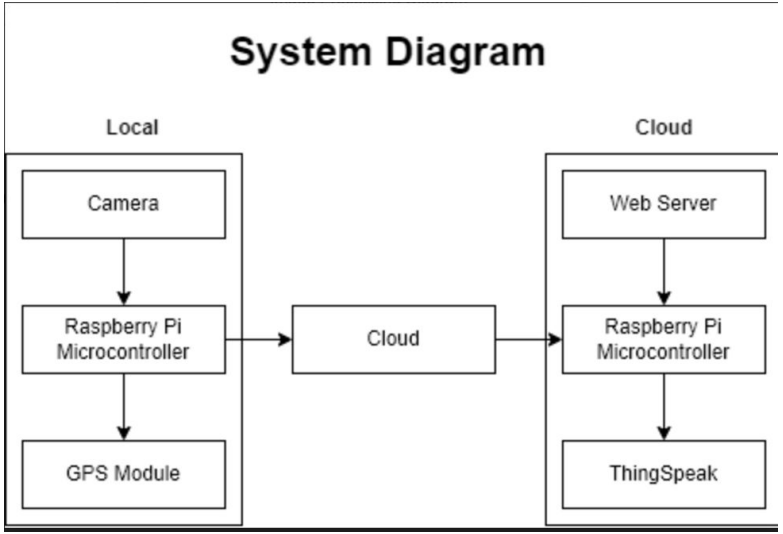
Faculty Advisor: Dr. Regentova

Background and Motivation

- Average cost of pothole-related repairs is $406 (based on an American Automobile Association survey)
- A common but life threatening issue
- Goal: A system designed to improve road safety reduce vehicle damage

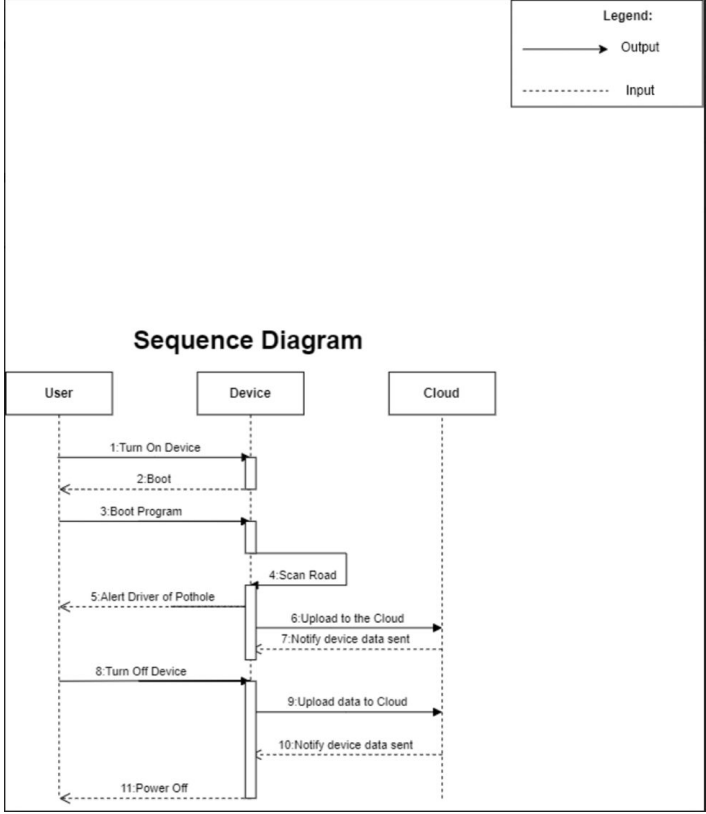
Design Specification

- Raspberry Pi 3 B+
- Arducam Camera Module
- Operates on the YOLOv4-Tiny model
- Dataset containing over 1.4k images
- Pothole Detection Range: ~10 meters
- Daytime/nighttime use
- Power Requirements: 5V, 2.5A
- Memory Requirement: At least 16GB



System Modeling & Analysis

- Camera detects changes to road caused by potholes
- Video input analyzed on Raspberry Pi determines if pothole is present
- Once detected, system triggers Piezoelectric buzzer and sends Coordinates to cloud
- System performs shutdown five seconds after power is off



Summary of Hardware/Software

Hardware

Raspberry Pi 3 B+

Arducam 5MP Camera Module OV5647

Power Supply w/ Car Adapter

HiLetgo GY-NEO6M

Software

Tensorflow-Lite

Opencv-Python

Roboflow (training dataset)

Kaggle (compiling pothole images)

Problems Encountered

Problems

- Battery pack too heavy, clunky, and uses a lot of batteries
- Training the set took too long on main PC
- Software errors (YOLOv4)

Solutions

- Swapped battery pack for Micro-USB cable w/ car adapter
- Google Colab to mitigate hardware usage
- Tensorflow-Lite (easier to use on RPI3)

Video Demo

References

- https://exchange.aaa.com/automotive/automotive-trends/potholes-and-vehicle-damage/