

Project Background

Recent years have seen a surge in the population of black bears in Connecticut. Over time, these animals have begun venturing further into residential areas in search of food. Becoming more habituated to people could lead to dangerous interactions between humans and bears. In fact, our sponsor suffered an attack on her chicken coop a few years ago. A black bear came up to her house and quickly killed all the chickens inside.

Objective

- Build a device that detects bears and triggers a mechanism to scare them off
- Should detect bears from at least 50 ft away
 - Can be left running 24/7
 - Functions during the day and night
 - Cost stays under \$300

Field Testing

Testing was conducted in Simsbury, CT. During a two-day span in March, the device was left in a yard with food set up a few feet in front of it. An external camera was placed off to the side to monitor any interaction.



Destroyed chicken coop after bear attack



Testing setup



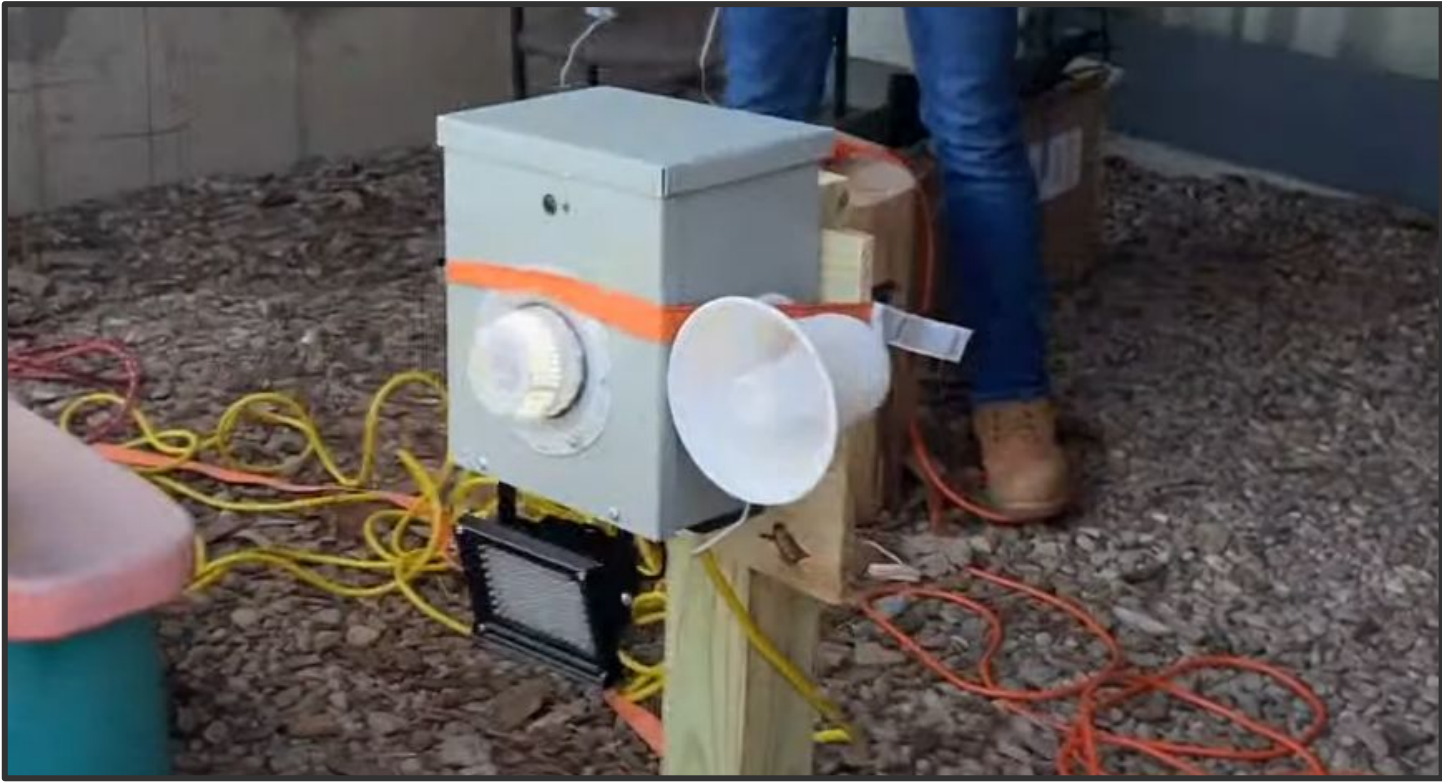
Bear detected by Pi during field testing

Future Expansions

- Notifications to alert the homeowner when a bear is detected
- The deterrence mechanism needs to be improved
 - Experiment with different sounds and intensity
 - Look into physical deterrents (sprinklers, etc.)
- Using a faster processor will allow the YOLO model to run faster
 - Can detect bears sooner
- Use a network of devices to protect a larger area

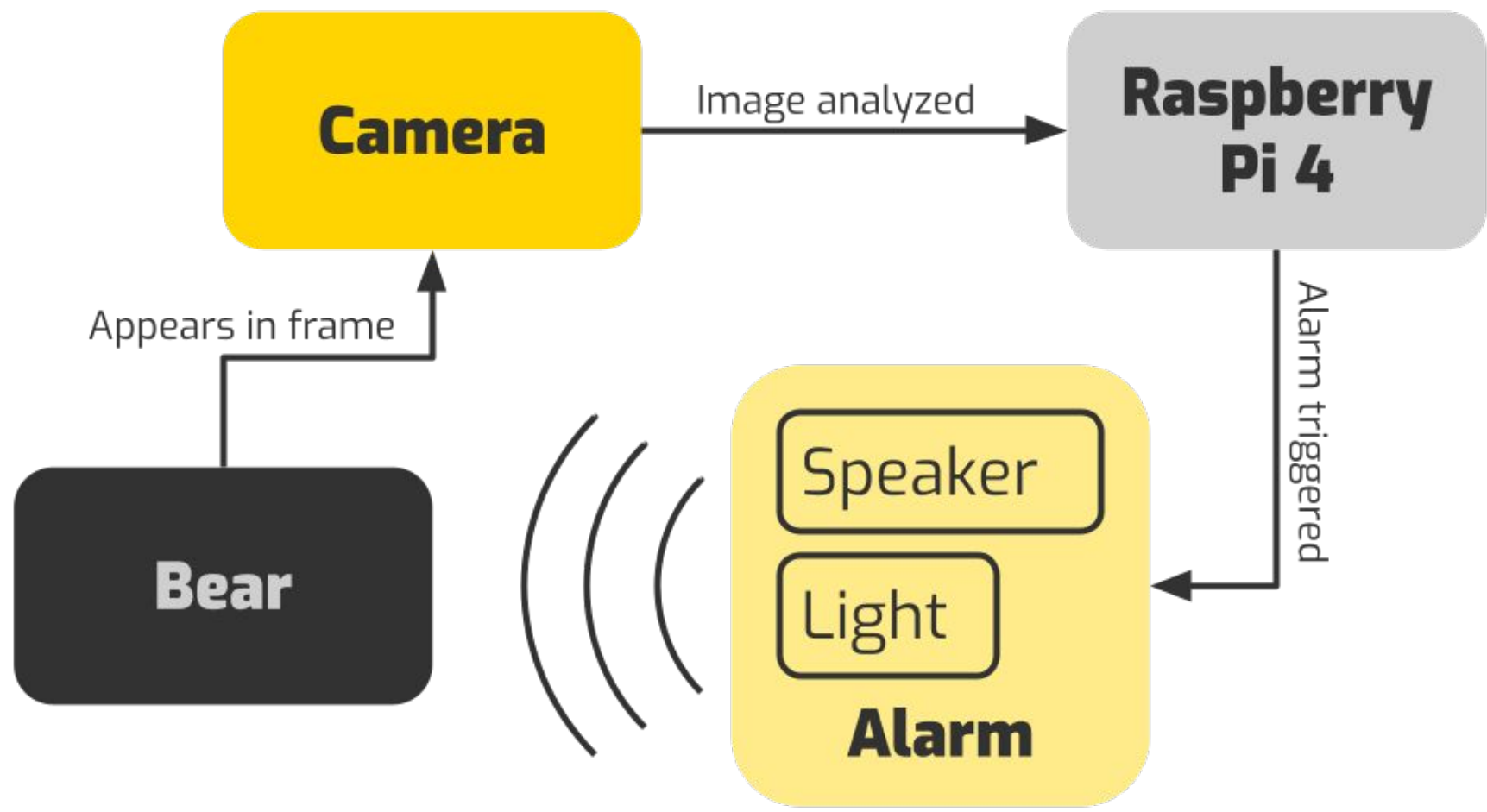
Testing Conclusions

- The deterrent was triggered successfully
 - Lights and sounds went off as expected, but the bear was not scared away
 - Detection happened during the day, so the strobing lights may have been less effective
- Bears living near neighborhoods are too used to humans
 - Will not be scared by stimuli without real consequences attached
 - May work better on wildlife less habituated to people
- The YOLO model worked very well for detecting the bear but was too slow
 - Running the model on the Raspberry Pi had about a 7-second delay
 - Runs much faster on a laptop



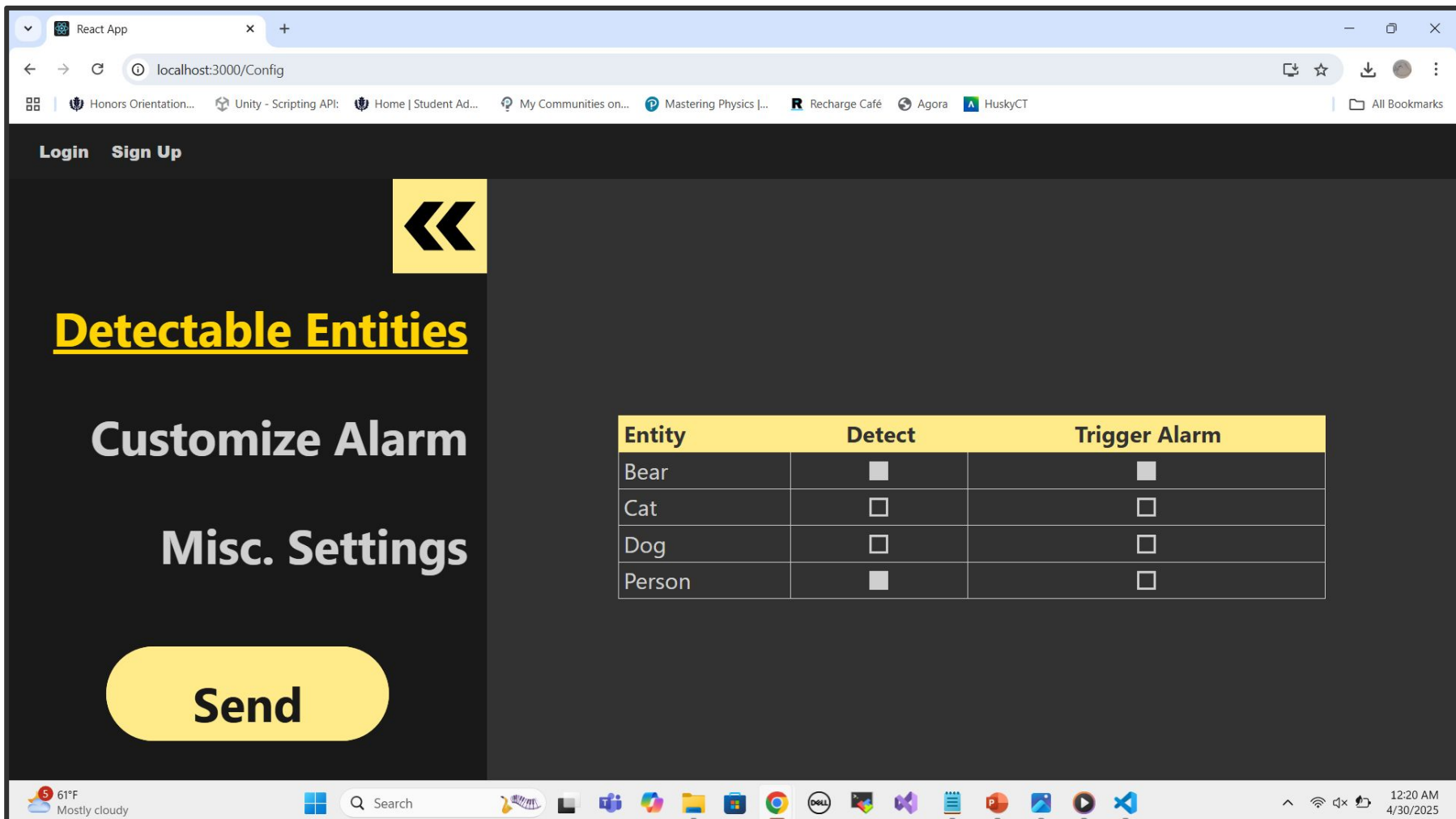
Basic Design

- Device is controlled by a Raspberry Pi 4
- Video input from an infrared camera is analyzed by a "You Only Look Once" (YOLO) model
 - Triggers an alarm if a bear is detected
- Alarm consists of light and sound
 - Device is connected to a speaker that plays loud noises when the alarm goes off
 - Uses sounds unfamiliar to bears
 - Ex. airhorn, whistle, etc.
 - Bright light flashes on and off as well
- Detections and general images from the camera are also saved to the device for future reference



Frontend

- The dashboard displays the most recently captured detection images along with relevant metadata like the animal detected and the timestamp
- The configuration page can be used to change the alarm sounds, which animals should be detected (bears, people, etc.), and other miscellaneous settings
- Ideally, users can create an account and login to see their own dashboard



Configuration (above), Dashboard (below)

