Facial Recognition Enabled Lock

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Introduction

- Keys can be lost, passwords can be forgotten
- IoT is entering the realm of home security
- ML rapidly becoming more accessible
- Decided to build:

    Facial Recognition Locking Mechanism

Overview

Raspberry Pi

- Develop and apply a computer vision model
- Read image feed from camera
- Perform facial recognition
- Serial com to Arduino

Arduino

- Monitor keypad
- Monitor serial com
- Activate buzzer
- Actuate lock

ML Project Development

Machine Learning used to find and identify faces

- Small dataset: 10-20 images of each allowed user's face
- Deep metric learning computed for each photo, output: 128 floats
- Training accomplished in triplets: compare two correctly labeled photos and one incorrect photo
- RPi program calls OpenCV to grab images from the camera and compare features
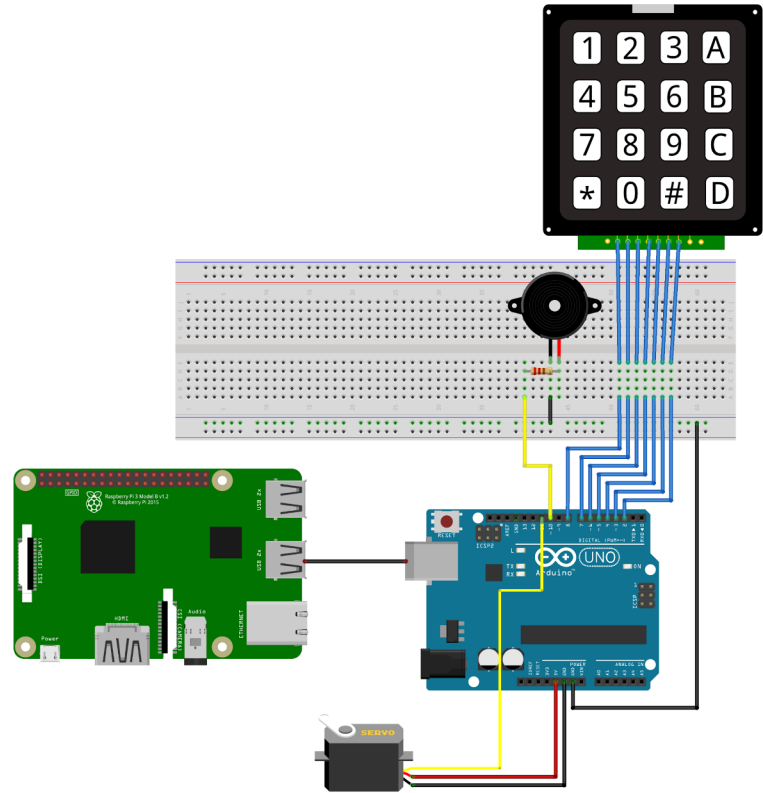
```
$ tree --dirsfirst
.
├── dataset
│   ├── nick_franchini
│   │   ├── IMG_0077.JPG
│   │   └── ...
│   ├── ryan_gonzalez
│   │   ├── ...
│   └── sravani_gandu
│       ├── ...
├── encode_faces.py
├── encodings.pickle
├── haarcascade_frontalface_default.xml
└── pi_face_recognition.py
```

Python Program Architecture

Lock Disarming Logic
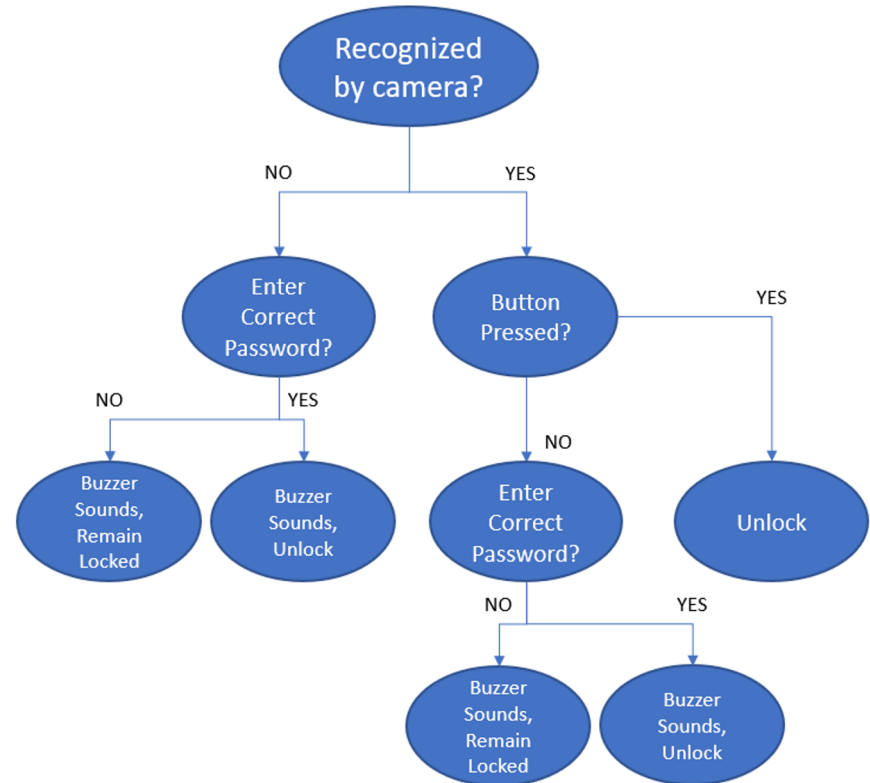
Electrical layout

Demonstration