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
Lock Disarming Logic

- Recognized by camera?
  - NO: Enter Correct Password?
  - YES: Button Pressed?
    - NO: Unlock
    - YES: Enter Correct Password?
      - NO: Buzzer Sounds, Remain Locked
      - YES: Buzzer Sounds, Unlock
  - NO: Buzzer Sounds, Remain Locked
  - YES: Buzzer Sounds, Unlock
Electrical layout