Facial Recognition Door Lock

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BACKGROUND

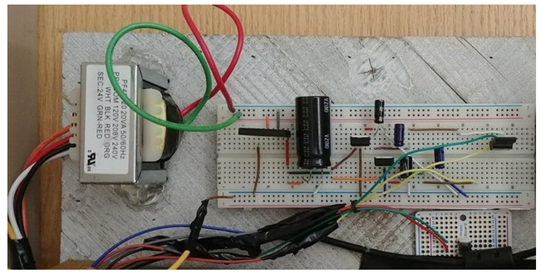
We found that using a key-based lock can be a hassle in most situations. If the door user is carrying something, it can be difficult to use a key without setting things down. It is also not uncommon for someone to forget or lose their key. Our team's goal was to create a lock that could be conveniently and easily used by nearly anyone. We determined that facial recognition would be an effective lock control mechanism because it is difficult to replicate a face and because the user will always have their face on them.

PROPOSED SOLUTION

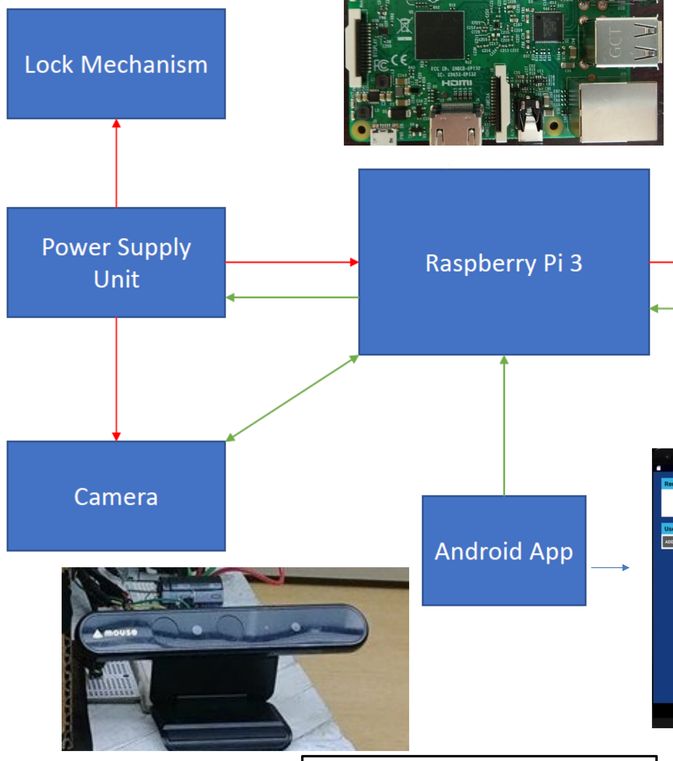
Our solution was a magnetic lock that was controlled using facial recognition. The facial recognition was done using Face API, a facial recognition software provided through Microsoft Azure. We accessed the software and controlled the lock with a Raspberry Pi 3. We also created a power supply to control the lock power and the Raspberry Pi power with the use of a single wall plug. We also created an Android application that can be used to add new users and to unlock the lock remotely. Our completed project can be seen below.

SYSTEM DESIGN

Lock Mechanism
We used an electromagnetic lock to keep our door secure. The lock is powered by our power supply. It's power is cut off when the Raspberry Pi sends output from one of its GPIO pins to a MOSFET.



Power Supply Unit
Our power supply was constructed with the goal of using a wall voltage of 120V to power the lock mechanism and the Raspberry Pi. It makes use of a transformer to reduce the voltage, a rectifier and a capacitor to convert from AC to DC voltage, and two voltage regulators to create the 5V and 12V that are needed.



Raspberry Pi 3
The Raspberry Pi is used to run the facial recognition software and is used to control the voltage that powers the lock.

Push Button
On the outside of the door, the push button starts the facial recognition. On the inside of the door, it unlocks the door.

Camera
Our camera is a pair of cameras. One is a traditional camera and the other is infrared. The infrared camera uses a depth sensor to prevent pictures from unlocking the door.

Android Application
Our Android application can be used to unlock the door remotely through Wi-Fi and it can be used to add new users to the system.

FUTURE DIRECTION

- Add an LED display for the outside of the door
- Make use of a more powerful facial recognition software
- Use a bolt lock for additional security
- Add a battery pack to account for power outages
- Camera access from the Android application
- Motion detection to remove the need for a push button

ACKNOWLEDGEMENTS

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