



FACE RECOGNITION

DOOR UNLOCK

USING
RASPBERRY PI

***As this section of our “SMART HOME” project does't need to be connected with the Cloud Platform so we have't connected it to the IBM Watson.

Face recognition is an exciting field of computer vision with many possible applications to hardware and devices. Using embedded platforms like the Raspberry Pi and open source computer vision libraries like OpenCV we have made Smart & Secure door unlock system. Here we have used the OpenCV built in EigenFace Algorithmn. EigenFaces are images that can be added to a average face to create new facial images.

OVERVIEW OF PROJECT IMPLEMENTATION

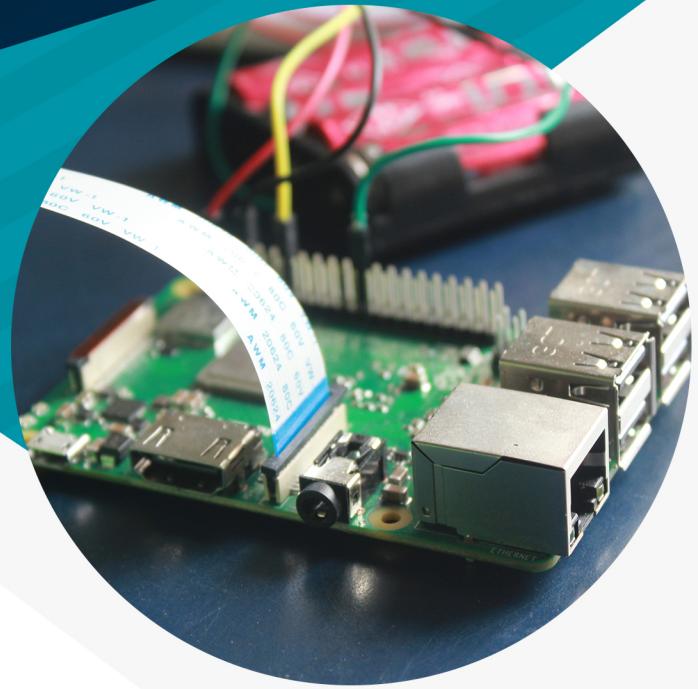
REQUIREMENT : Raspberry Pi B+
Raspberry Pi Camera
Servomotor

Power Supply
4x AA Battery Pack
Hookup wires

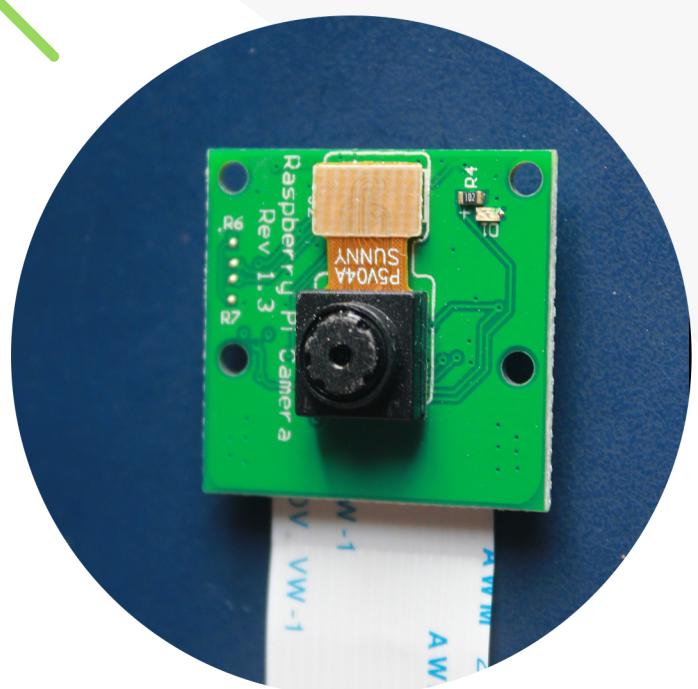
For this project we have first flashed **Raspbian Stretch** OS into our SD card which will next be used as the internal Memory of Raspberry Pi. Next we have installed Python 3.0 & OpenCV 3.3 in our Raspbian and the required dependencies. Then the implementation of the Project code comes in place, where the EigenFace algorithm does a great job detecting the postive training faces and rejecting the nagative training faces. And when it recognises the Positive face then it sends a PWM signal through GPIO 18 with which a servomotor is connected which rotates to a certain directon. We'll be using the servomotor to lock or unlock a Physical door.

ARCHITECTURE & COMPONENTS

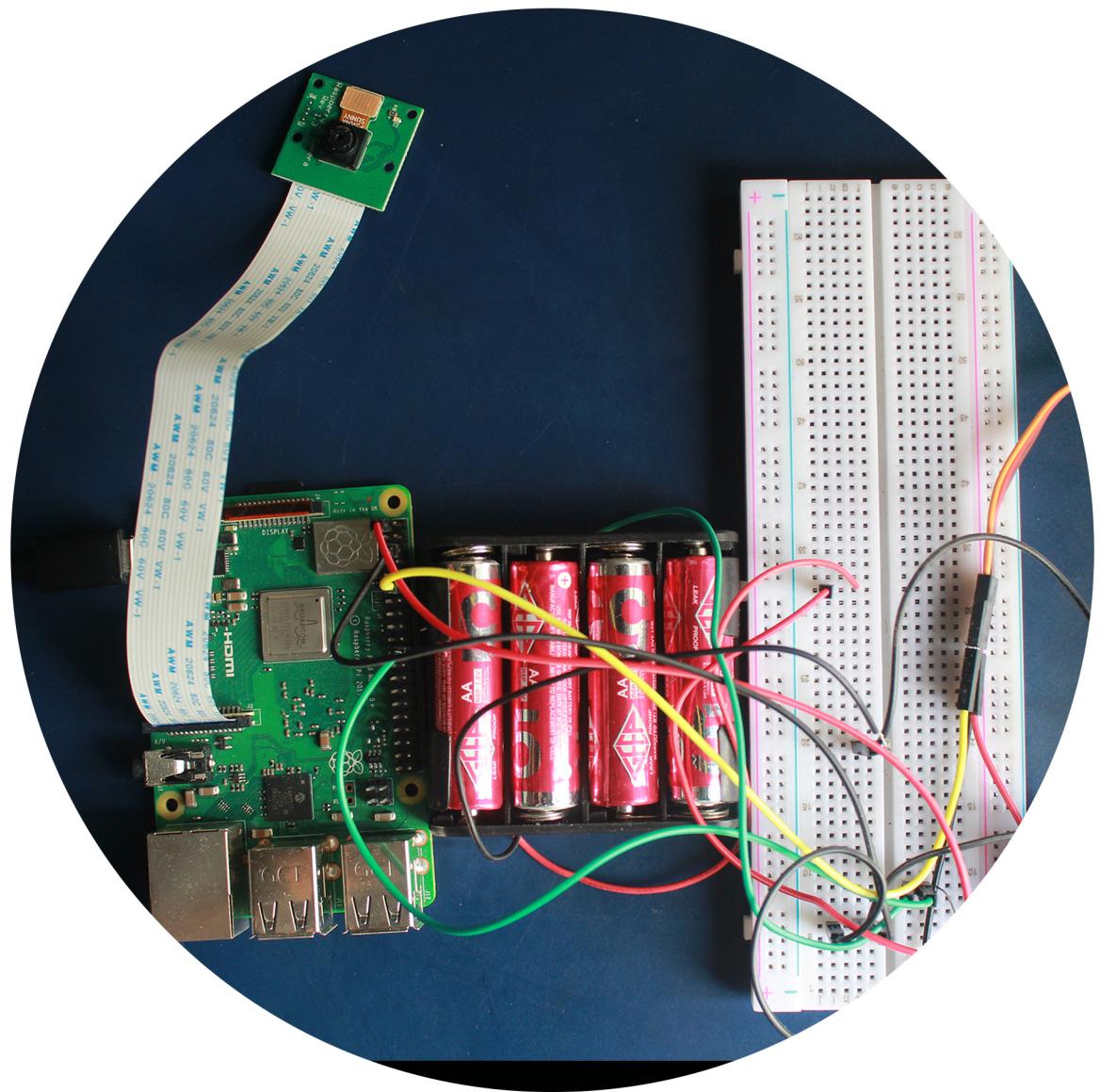
RASPBERRY PI B+



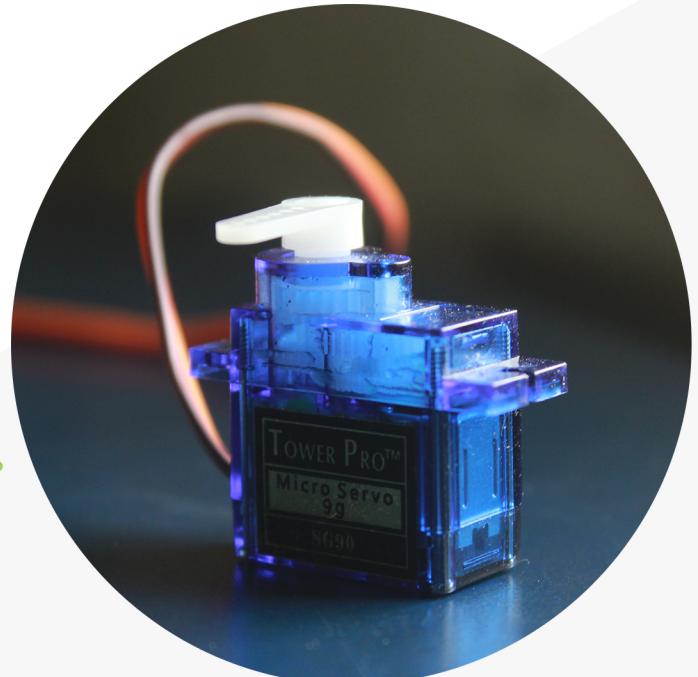
RASPBERRY PI CAMERA



CIRCUIT
DIAGRAM



SERVOMOTOR



EXECUTION GUIDE

After installation of all the Softwares (OpenCV,Python) and Dependencies, It's time to run our code that will use EigenFace to detect face. The steps are as follows :

CAPTURING POSITIVES : Power up the raspberry pi and make sure the Pi Cam is working correctly. Next open the LX terminal and navigate to our code directory

```
pi@raspberrypi:~ $ cd /home/pi/facerec-lock-master  
pi@raspberrypi:~/facerec-lock-master $
```

Then capture your face so that your face will be saved to the positives directory by using the command :

```
pi@raspberrypi:~/facerec-lock-master $ sudo python capture-positives.py  
Capturing positive training images.  
Press button or type c (and press enter) to capture an image.  
Press Ctrl-C to quit.
```

Make sure you capture 10+ images for better recognition process.

```
Capturing image...  
Found face and wrote training image ./training/positive/positive_023.pgm  
c  
Capturing image...  
Found face and wrote training image ./training/positive/positive_024.pgm  
c  
Capturing image...  
Found face and wrote training image ./training/positive/positive_025.pgm  
c  
Capturing image...  
Found face and wrote training image ./training/positive/positive_026.pgm  
c  
Capturing image...  
Found face and wrote training image ./training/positive/positive_027.pgm  
c  
Capturing image...  
Found face and wrote training image ./training/positive/positive_028.pgm
```

TRAINING : After execution of capturing the positive faces now it's time to train the data. Included in the project is a large set of face images that are negative and are't allowed to open the box. Now the positive training images that we have created are the ones who will be able to unlock the door. So we need to run the training command. Once the training is completed the training data is stored in the file **training.xml**.

```
pi@raspberrypi:~/facerec-lock-master $ python train.py
Reading training images...
('Read', 34, 'positive images and', 400, 'negative images.')
Training model...
```

After training is done our Installation is process is finally over and it's now ready to get tested. For this run the **door.py** file to start scanning face.

```
pi@raspberrypi:~/facerec-lock-master $ sudo python door.py
Loading training data...
```

```
Press button to lock (if unlocked), or unlock if the correct face is detected.
Press Ctrl-C to quit.
Button pressed, looking for face...
Predicted POSITIVE face with confidence 1508.20805162 (lower is more confident).
recognize face!
```

Finally, the door is unlocked if his/her faces are among the positive faces.
and when it satisfies the condition the Raspberry Pi sends a PWM signal to the Servomotor that rotates in such a direction that if a door is connected with it can surely be locked and unlocked .

MAKE SURE THE PI CAM IS DETECTING A SINGLE ACE AND IS HOLD CLOSE TO YOUR FACE

