

Face Recognition Home Security Using Raspberry Pi & IOT

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Abstract— Home security is a growing field. To provide security to home, face recognition system can be implemented using different image processing methods. A standard USB camera captures the image to identify the person. It is a system that identifies the visitor. If the door recognizes the visitor, it will greet them by name, and door will be unlocked and opened. If they are not identified the door will remain locked. The system will perform the detection and recognition rapidly in real time. This project adds mainly four features: security, safety, control and monitoring to home automation. Firstly the system needs a face authentication for the user to be able to enter the home (locked/unlocked). When an unauthenticated person tries to log in, the face will be captured and would be sent to owner via Gmail as an attachment. The system also supports remote home control.

Keywords— Face Recognition, Image processing, IOT, Raspberry Pi, Pi Camera

Linux based Raspberry pi operating system on raspberry pi microcontroller board. For the door unlocking system, we will place a stepper motor at door latch. This motor will be program made in such a way that when they stem authenticates the person in front of the camera, the motor will rotate to open latch. We will use image processing technology to authenticate the person to enter in home. For image processing, we will use pi camera module. Pi camera module is attached to Raspberry pi, and it aids to store various faces in the databases. When someone wants to enter in home, he should stand in front of the camera. Camera will recognize the face and compares with the faces stored in the Face recognition database if the face matches, the door will be automatically unlocked. If the face does not get matched, then a call and message will be generated through GSM module to owner of the house, indicating the owner about the visitor in front of the door. Owner can check his Email to check who the visitor is. Owner can authenticate the visitor by controlling the door lock remotely via call or message. [5]

I. INTRODUCTION

Home Security has become a solemn issue in the society. Anyone can be harassed in its own house. Older security systems can't tackle some situations like hacking, break down in the system. Unwanted persons like thieves, murderers and some known criminals will try to intrude in the home any time they want. Also we know that the gadgets nowadays are not that secured and hence can be easily hacked. Even intruders have found their way to take over these gadgets. So to avoid such situations, we have to develop the system in such way that no one should get an intrusion the system. The use of IoT will enhance some security level as well as it will help in accessing and controlling the system remotely. Therefore we are trying to develop a face recognizable automated door unlocking system using an IoT. [2]

IoT will enable sensing, actuating and communication in the system. System can be made automated easily. So we can go on developing a smart home by extending this security system. To develop this we will use a Raspberry Pi micro-controller board for system development, a pi camera module for face recognition and a programmable stepper motor to open door lock. [4] We Will Install appropriate

II.BLOCK DIAGRAM AND WORKING

The block diagram comprises of the following units:

A) *Raspberry Pi 3 model B:*

Raspberry Pi is an ARM based credit card sized SBC (Single Board Computer) created by Raspberry A1900084285 Pi Foundation. Raspberry Pi runs Debian based GNU/Linux operating system. Raspberry Pi Foundation has announced a new version Raspberry Pi 3.

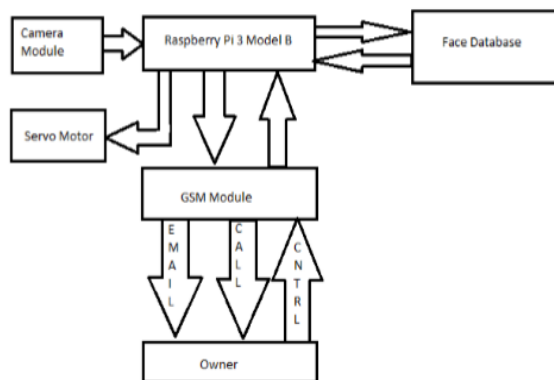


Fig.1 Block diagram

With on-board Wi-Fi / Bluetooth support and a 64bit Improved Processor, Raspberry Pi v3 will be an exciting board for Makers, Engineers and Students. Raspberry pi board is heart of this system .it will store face database & compare capture face image with existing database. it is act as controller.



Fig.2 Raspberry Pi 3 model B

B) Camera Module:

Pi Camera Module Interface with Raspberry Pi using Python. Pi Camera module is a camera which can be used to take pictures and high definition video. Raspberry Pi Board has CSI (Camera Serial Interface) interface to which we can attach Pi Camera module directly. This Pi Camera module can attach to the Raspberry Pi's CSI port using 15-pin ribbon cable.

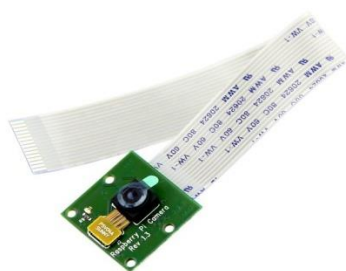


Fig.3 Pi Camera Module

C) GSM Module:

We use SIM 900 GSM module. Module is interfaced with raspberry pi. It is used to contact owner in case of unknown person want to enter in home via text message or call.



Fig.4 GSM Module

D) Servo Motor:

Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction) and Works just like the standard kinds but smaller. It is fitted into door latch to open and close the door. When system recognize the person servo move to open door else does not move.



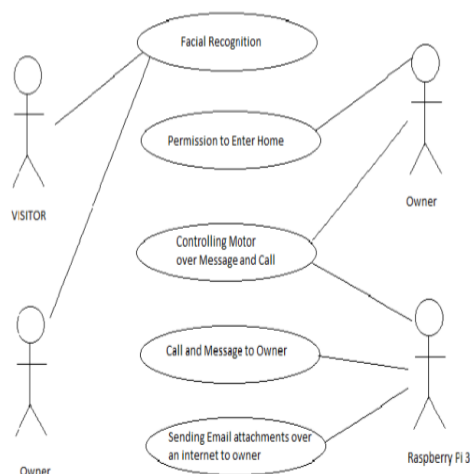
Fig.4 Servo Motor

III. METHODOLOGY

The IoT has an ability to make things self-instructed. Hence it can make significant impact on modern security technologies. The use of IoT will enhance some security level as well as it will help in accessing and controlling the system remotely. Therefore, we are trying to develop a face recognizable automated door unlocking system using an IoT. [6]

Fig.5 Methodology

IoT will enable sensing, actuating and communication in the system. System can be made automated easily. So we can go on developing a smart home by extending this security system. To develop this we will use a Raspberry Pi micro-controller board for system development, a pi camera module for face recognition and a programmable stepper motor to open door lock. We will install appropriate Linux



based Raspberry pi operating system on raspberry pi micro-controller board. For the door unlocking system, we will place a stepper motor at door latch. This motor will be program in such a way that when they stem authenticates the person in front of the camera, the motor will rotate to open latch (alternately we can use electronic door latch). [3]

We will use image processing technology to authenticate the person to enter in home. For image processing, we will use pi camera module. Pi camera module is attached to Raspberry pi, and it aids to store various faces in the databases. When someone wants to enter in home, he should stand in front of the camera. Here we created the database of family members & for each member we took 18 pictures that we can vary in code. Camera will recognize the face and compares with the faces stored in the face recognition database if the face matches, the door will be automatically unlocked. If the face does not get matched, then a message will be generated through GSM module owner of the house, indicating the owner about the visitor in front of the door. Raspberry pi capture visitors face & send to owner's email id then owner can check his email to check who the visitor is. Owner can authenticate the visitor by controlling the door lock remotely via call or message. [4]

IV. CONNECTION & TESTING

1. Connect Pi Camera to CSI interface of Raspberry Pi board as shown below,

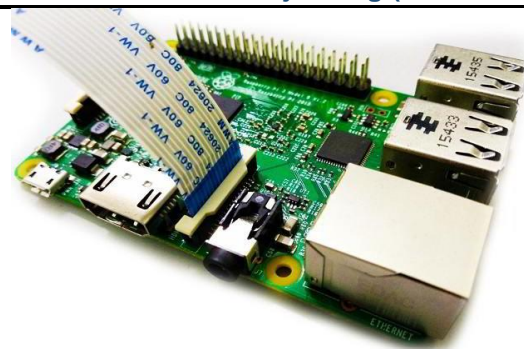


Fig.6 Connection of Raspberry Pi with Raspberry Pi camera

2. Testing of Pi Camera

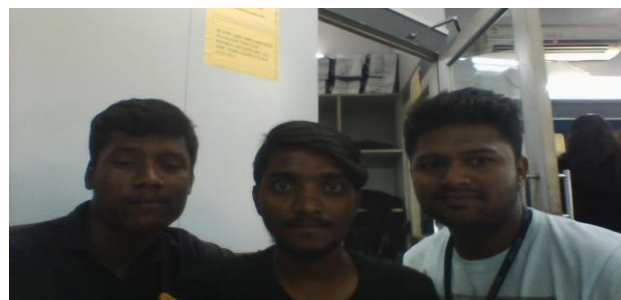


Fig.7 testing of raspberry pi camera module

3. Face & Eye Detection

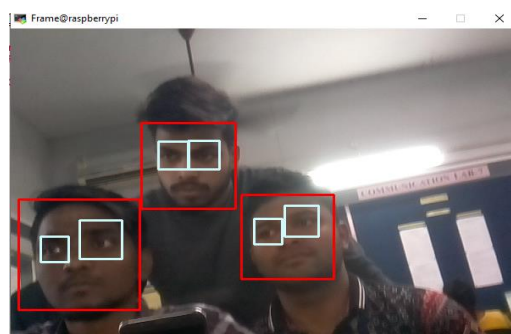


Fig. 8 Face & Eye detection using raspberry pi camera

4. Family member detection

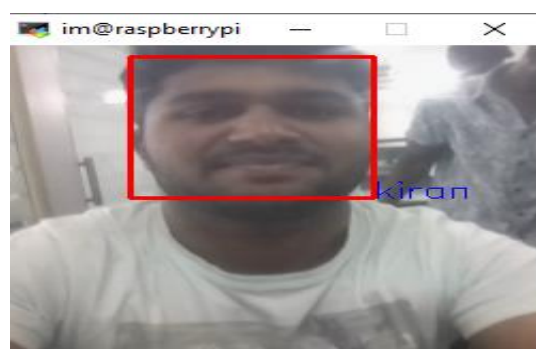


Fig. 9 family member 1 detection



Fig. 10 family member 2 detection

5. Unknown person detection

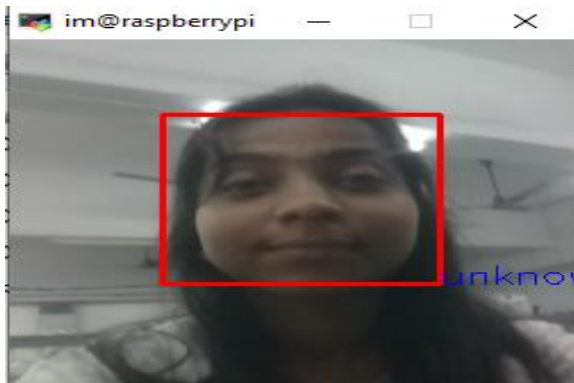


Fig. 11 Unknown person detection

6. Email to owner with visitor captured image

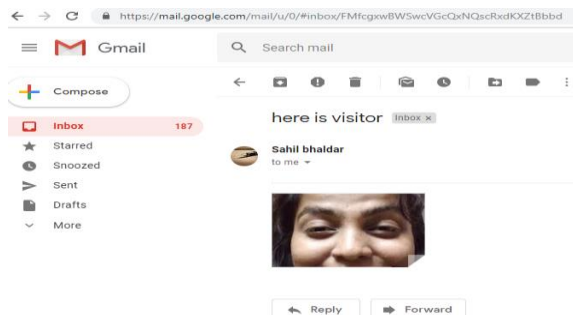


Fig.12 Email to owner with visitor captured Image as an attachment

V. CONCLUSION

The project “**Face Recognition Home Security Using Raspberry Pi & IOT**” is designed to create effective solution for home & office security. This project works on face recognition algorithm, which is latest technology in security so it increases the efficiency of system. IOT technology is also been used which enable system to operate from remote location. Simple design and user friendly are two most important advantages of the system. We think that this system can get huge success in field of home & office security.

VI. FUTURE SCOPE

This system is designed with considerations of home security hence we can use this system for commercial security purpose with necessary changes. Our project recognizes the frontal faces only so still there is scope for improvement to make the system more robust.

VI. REFERENCES

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