

IoT Based Face Recognition Door Lock System Using Raspberry Pi

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ABSTRACT

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The world we live in today has become very advanced today. As we can see in the past we used lock and key system for centuries to lock the doors. In many cases we as humans have lost our keys and for getting in we had to break the door and which would be much costlier repairing or installing a new door. Robberies were also a security threat and making living away from the house more frustrating and stressful. But as we are advancing technologies in various fields our locks also need to be upgraded. Keeping that in mind we have designed a facial recognition-based security lock system using Raspberry pi as the main controller of the system. Our system uses a camera which is attached to the raspberry pi and the controller is programmed using opencv in such a way that only the registered faces could open the door.

Keywords : Raspberry Pi, IoT, Face Recognition

I. INTRODUCTION

Home security system is one of the main aspects of today's society which needs to be addressed. Because in our homes live our loved ones, our family our friends, taking care of home does not only mean to take care of the furniture or the materialistic things in the house but also securing our loved ones, families and friends from any external threat that could occur. Since centuries we have been deploying fences and walls, using a key and lock mechanism for securing the entrances to our home. In recent times too we have been using various advanced technologies such as smart cards, smart keys, password protected systems, etc. But in many cases it was possible for someone with access to the key or smart card or the

password to enter the house. And which was not much secure, say in cases if we lost the smart key someone would get the access to the key and still enter the house. Or someone taking wild guesses of our password could also enter the house.

Countering this security threat for our homes, our project group decided to build a Facial Recognition based Smart Lock system using Raspberry Pi making it secure. Our system is designed in such a way that, it will open door only if the person registered to the system is physically present at the entrance. The systems previously designed could be accessed with access to the Smart key, or password, which makes it vulnerable.

II. LITERATURE REVIEW

Hteik Htar Lwin et.al [1] said in their project that the MATLAB software on the PC is used to automatically recognise and detect the face. Based on input data received from your PC, Microcontroller is utilised to operate the door access technology. After the individual has been authentically confirmed, the door is opened instantly. The door is automatically shut after 2 seconds. But 2 seconds don't give a person enough time to get in. For real-time circumstances, thus, longer time should be set. For face detection, Viola Jones algorithm is employed. Since this technique can identify the face front just properly, there are limits on this system.

Lia Kamelia et. al [2] discussed about how this system offers an overview of how modern smart protection, notably door key locking, can be controlled. For interior and outdoor key lock system, we utilise android door lock system. It also gives Android phone owners a sense of security. The project is based on the Free Open Source Android platform. So the rate of development is cheap and by an ordinary person fair. With the Bluetooth wireless connection, the system may be installed more easily. The system was effectively developed. The goal is to manage the door condition with a Bluetooth-enabled Android phone through Bluetooth HC-05.

Shilpi Banerjee [3] shared details regarding the mechanism in which we may unlock the door using a predecided keyword have been provided in this paper. It improves the safety level to ensure that the attacker does not release unapproved. If the client fails to remember both passwords, the user can update or reset their password with this system. This automated password-based locking mechanism allows users to lock the machine more securely. First, you compare the user combination to the pre-registered password saved in your system memory. Before the system is

momentarily deactivated, users can travel to certain incorrect combinations.

Arpita Mishra et.al [4] reviewed that safety of any password-based system object or location plays a vital part in day to day living. In this article, a secure access for a door was developed that required a password to open a door. With the help of keypad, the door opens through a motor that is used to spin the door lock handle and if you correctly input the password. If improperly typed, the password will initially be inputted with three attempts. Additional functions are also controlled by the keyboard like adding new users and changing old password as normal. The user LCD module displays messages.

U. Sowmiya et. al [5] Developed system using the internet to link any door. PIR sensor and camera are also used by this system user. PIR sensor used to identify people and camera to capture a video of the person coming at the entrance. The video was delivered to the licenced person using a 3g dongle. Some advantages of this method have also been explored. The method had been used in banks, hospitals, etc. Yet their suggested architecture did not allow the authorised persons to send messages.

III. Proposed System

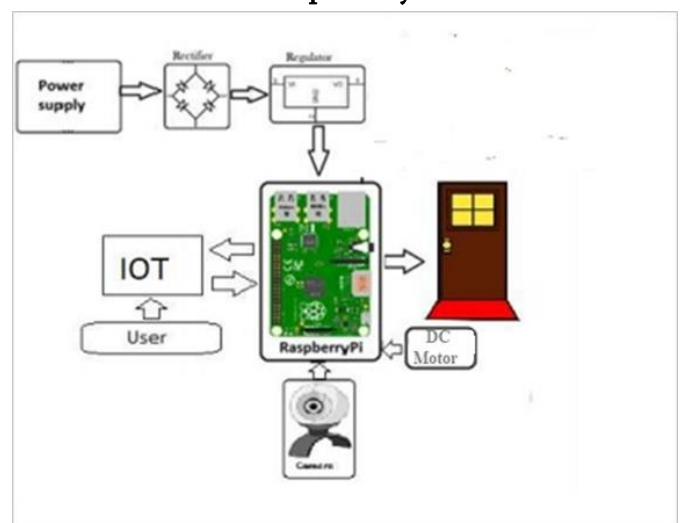


Fig 1. Block diagram of the system

Description and implementation of the proposed system

The system designed consists of hardware as well as software elements. The elements are listed and elaborated as per the implementation below.

Hardware elements

1. Raspberry Pi.

Raspberry Pi is the main unit in this project. Raspberry Pi is a mini computer used in our case to analyse and store the data. It is also interfaced with all the other modules of the project as input and output units. All the data from camera unit is being directly sent to Raspberry pi and the raspberry pi with the help of open cv decides whether the user is registered in the system and whether to admit the user accordingly.

2. Camera

Camera module is one of the main component of this project. It constantly takes pictures of the users or the interfaced object and sends it to Raspberry Pi for analysing the data. If the user comes in contact with the camera and is shown as unregistered it will not grant access to the house.

3. DC Motor

DC motor is used as a output module in this system. Say when the user is granted access after facial recognition, the motor slides the lock to the unlock stage thus opening the door.

Software elements

1. Thonny IDE

Thonny IDE is one of the open source python IDEs. It comes pre installed with the Raspbian OS. It is used to program the python code for facial recognition.

2. Open CV

Open CV ia called as Open Computer Vision. This project uses Open CV libraries for the facial

recognition part. Using this we can store the image of registered users and also identify and grant access to them.

Flowchart and Algorithm of the system

Flowchart

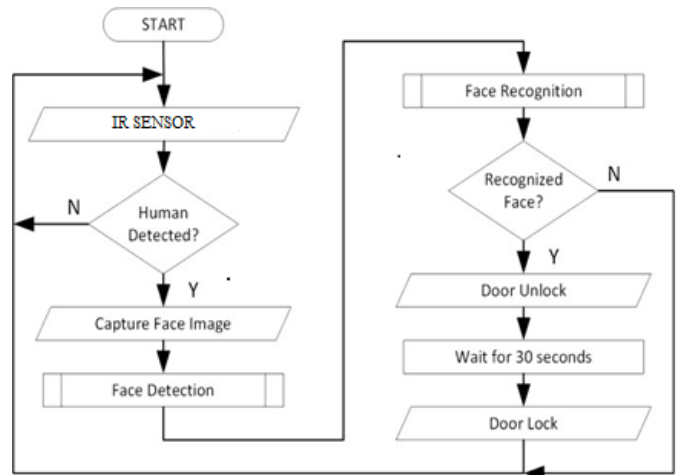


Fig 2. Flowchart of the system.

Algorithm

Step 1: Start.

Step 2: Read Ultrasonic Sensor.

Step 3: Human Detected.

Step 4:
Capture Face
Image.

Step 5: If,
Face is
Detected.

Step 6: Recognition is done.

Step 7: If, Face is Recognized

Step 8: Door is Unlocked

Step 9 : Wait For 30 Sec.

Step 10: Door is Locked.

IV. RESULT

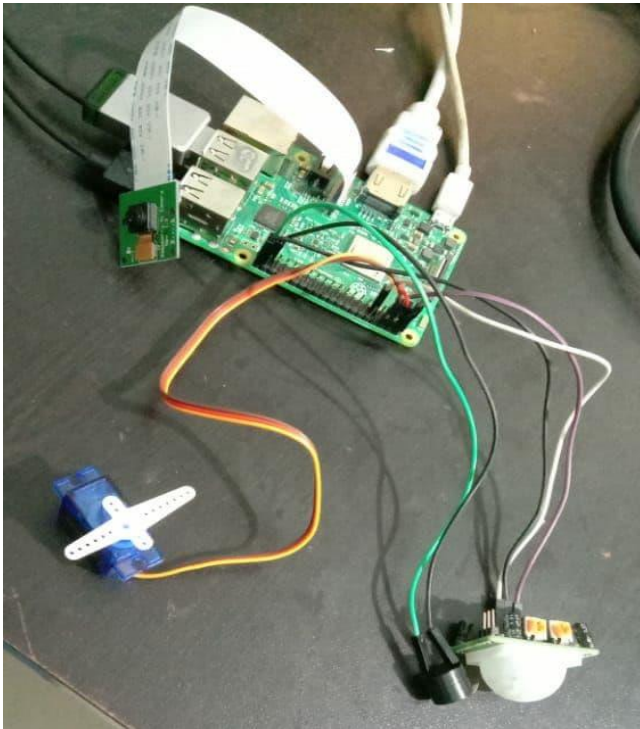


Fig 3. Overall Design of our system

The implemented system is fully capable and working security measure for the door lock system. The camera module captures the photo and the system with its algorithmic working analyses whether the user is registered or not and accordingly changes the status of the door to be open or close. If any unknown face is detected it makes the owner aware with the buzzer alarm and led light. Thus, IoT based Face Recognition Door Lock System is successfully developed and tested using Raspberry Pi module.

V. CONCLUSION

The system is a smart version of the lock system for the doors. It is based on facial recognition techniques and was built using Python language and Open CV libraries. The system was powered by Raspberry Pi which acted as a mini computer and carried out all the calculation and analysis of the input and gave output accordingly. Giving access, adding user, deleting user could all be done with the help of web

page and thus making our system as IoT Based Face Recognition Door Lock System Using Raspberry Pi.

VI. REFERENCES

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