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A Review on the Smart Door Lock System with Face Recognition Method using Linux Platform Raspberry Pi

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ABSTRACT: Privacy and Security are two universal rights and, to ensure that in our daily life we are secure, a lot of research is going on in the field of home security. where we connect everyday objects to share data for our betterment. House security matters and people always try to make life easier at the same time. That's why we put up with this project, Face Recognition Door Lock System. Facial recognition is a well-established process in which the face is detected and identified out of the image. We aim to create a smart door, which secures the gateway on the basis of who we are. We want to develop this system based on Raspberry-pi, to make the house only accessible when your face is recognized by the recognition algorithms from Open CV library and meanwhile you are allowed in by the house owner, who could monitor entrance remotely.

KEYWORDS: Linux Platform, Raspberry Pi, Facial Recognition Door, Home Security

I. INTRODUCTION

One of in these modern times, home security is the need of the hour for the development of society as a whole which in turn will help make our cities smart, so the concept of facial recognition to gain access of the house is an idea which is used to make our place of living more secure. A facial recognition system is a system which captures facial images and verifies the identity of a person using a digital camera. The human face assumes an essential part in our social association, passing on individuals' character. Utilizing the human face as a key to security, biometric confront acknowledgment innovation has gotten tremendous consideration in the previous quite a while because of its potential for a wide assortment of utilizations. A facial acknowledgment framework is a framework which gets facial pictures and confirms the character of a man using a propelled camera. It is an application fit for distinguishing or checking a man from a computerized picture. One approach to do this is by looking at chose facial components from the picture and a face database. As stood out from other diverse biometrics frameworks utilizing unique mark/palm print and iris, confront acknowledgment has unmistakable favourable circumstances due to its non-contact handle. Face pictures can be caught from a separation without touching the individual being recognized, and the ID does not require participating with the individual. It is normally utilized.

II. LITERATURE REVIEW

S.Rajkumar et al (1):

Attendance for the students is an important task in class. When done manually it generally wastes a lot of productive time of the class. This proposed solution for the current problem is through automation of attendance system using face recognition. Face is the primary identification for any human. This project describes the method of detecting and recognizing the face in real-time. Raspberry Pi 2 model B is used for computation in the detection and recognition modules. This project describes an efficient algorithm using open-source image processing framework known as OpenCV. This system is built by five modules – Face Detection, Face Pre-processing, Face Training, Face Recognition and Attendance Database.



Wilson Feipeng Abaya et al (2)

In order to further maintain peace and provide security to people now a day, Closed-circuit television (CCTV) surveillance system is being utilized. This study focused on the design and implementation of a low cost smart security camera with night vision capability using Raspberry Pi (RPI) and OpenCV. The system was designed to be used inside a warehouse facility. It has human detection and smoke detection capability that can provide precaution to potential crimes and potential fire. The credit card size Raspberry Pi (RPI) with Open-Source Computer Vision (OpenCV) software handles the image processing, control algorithms for the alarms and sends captured pictures to user's email via Wi-Fi. As part of its alarm system, it will play the recorded sounds: "intruder" or "smoke detected" when there is a detection. The system uses ordinary webcam but its IR filter was removed in order to have night vision capability.

Anjali Patel et al (3)

This paper deals with the idea of secure locking automation utilizing IOT for door unlocking system to provide essential security to our homes, bank lockers and related control operations and security caution through the GSM module. It uses an image capturing technique in an embedded system based on raspberry pi server system. RPi (Raspberry pi) controls the video camera for catching it for turning on a relay for door unlocking. The module contains a secured face recognizer for automatic door unlocking. The camera catches the facial picture and compares it with the image which is stored in the database. If the picture is found in the database, then the door lock opens otherwise it will produce a SMS that an unknown person is trying to gain access.

Y. Januzaj. et al. [4]

proposed real time access control for face recognition using, Raspberry pi instead of GSM services and relay. The limitation of the work was it couldn't control the background light situation and ambient light conditions.

H. Lwin.etal.[5]

has proposed a door lock access system which consists of three subsystems: to be specific face recognition, face detection, and automated door access control. Face recognition is actualized by using the PCA (Principal Component Analysis). The door will open itself for the known person in command of the microcontroller and caution will ring for the unknown person. Demerit of this system is input images are taken through a web camera continuously until the 'stop camera' button is pressed. Somebody is required at the location to check unauthorized person's images or status of the system and take further appropriate action. Personal computer (PC) is associated with the microcontroller, The entire system will not work if PC is crashed or non-Function.

M. Chowdhury.et al. [6]

had implemented security system where if any person came at the door it was notified to the home owner via e-mail and twitter then the user could see the person standing at the door using camera from remote location. The image of the person got captured and sent to twitter and e-mail. They stated that user couldn't control the door remotely. They had concluded that this system was useful for preventing unauthorized access. The limitation of this work was that the alert generated was sent to the mail and twitter account but if the user didn't have internet connection on his/her phone, he/she couldn't check the mail and couldn't recognise that any unauthorized person was trying to access the door.

G. senthilkumar.et.al. [7] proposed a work on Embedded Image Capturing System Using Raspberry Pi. In this work, they captured the image and compared it with the database but the limitation was the system couldn't work properly in the ambient light condition.

M. Carikci et al. [8] proposed a work on A Face Recognition System based on Eigen face method in which they used Eigen method for face recognition and Euclidean distance method to compare the image of the person concerned with the images in the database. It was very efficient and fast method and also gave high accuracy.

S. Jogdand.et.al [9] proposed a work on Implementation of Automated Door Accessing System with Face Design and Recognition in which they used Viola Jones method for face detection and PCA (Principal Component Analysis) for the comparison of images. The limitation of this work was that it is not robust and the efficiency is less.

U. Sowmiya.et al [10]. Developed to connect any door with internet. In this system user also implemented PIR sensor and camera. PIR sensor used for detecting person and camera used for capturing the video of the person who comes at the door. The video was sent through 3g dongle to authorized person. They had also discussed some advantages of this



system. They had concluded use of this system in banks, hospitals etc. But their proposed model didn't provide the facility of sending messages to the authorized people.

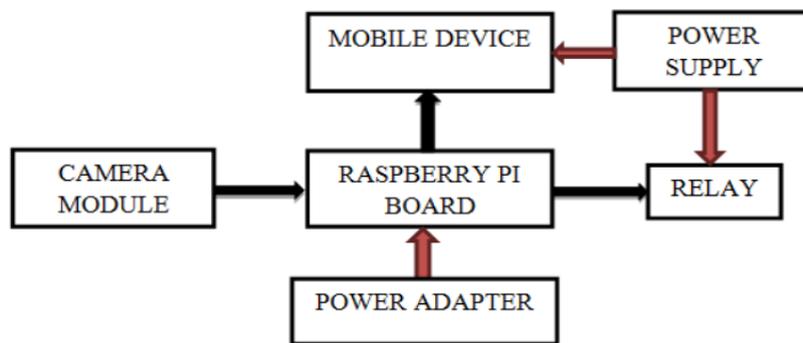
J. Kartik et al [11]. Have proposed two systems are proposed, one is based on GSM technology and other uses a web camera to detect the intruder. The first security system uses a web camera, installed in house premises, which is operated by software installed on the PC and it uses the Internet for communication. The camera identifies movement of any intruder before the camera measurements or camera range. The product imparts to the planned client through Internet arrange and, in the meantime, it gives a sound alarm. The second security system is SMS based and utilizes GSM innovation to send the SMS to the owner.

III.PROPOSED METHOD

RASPBERRY PI:

To implement such a project, the main and most important step was finding the hardware to use for the device. We have chosen a Raspberry Pi model B3 to use in our device. We have done a lot of research, and compared elements in different microcontrollers, like, cost, processing, and user friendliness. The main reasons why we have chosen this specific element are the high processing capacity, relatively low price, and its ability to adapt in different programming modes. The device uses Linux as an operating system, which has access to a large number of libraries and applications compatible with it. Raspberry Pi has an Ethernet port allowing us a network connection, as long as we are in the same subnet with the device we want to access and manage, 4 USB ports used to connect devices like a keyboard, mouse, camera, and other devices that connect through a USB port, and an HDMI port giving us access to the interface of the operating system installed, and can also be used the first time while installing the devices. It has 40 pins that allow us to receive and send signals. They are divided in half into two groups: the 3V, and the 5V group. Therefore, one side of the microcontroller gives a voltage of 3V, and the other 5V. Besides the 40 voltage pins, it has pins that are used to receive signals, which in our case was used to connect the button, that will send the signal for the face identification. Raspberry Pi does not have an operating system previously installed, but that can be downloaded from the Raspberry website, and transferred to an SD card, Figure 1 shows the Raspberry pi model B 3 along with its components. The foundation provides Debian and Arch Linux ARM distributions and also Python as the main programming language, with the support for BBC BASIC, C and Perl. The system is programmed using Python programming language. We have developed algorithms, for face detection and recognition for security.

IV.METHODOLOGY



The above fig shows the basic block diagram of the Raspberry pi based face recognition system for door unlocking. Our project system can be operated in two different sections, i.e. one for capturing and creating a data base and the other section is to capture the image and which is used for identifying or comparing the images in the database. Here in the second section we use hog+ svm algorithm used face recognition for finding the matches.



Camera module: Camera module is Pi camera interfacing to the raspberry pi module. Its resolution is 5-megapixel and still picture resolution 2592 x 1944, Max image transfer rate 1080p: 30fps, this Pi camera module is used for captures an image and send captured image to the Raspberry pi module. At the first time camera module captures 6 images to create a database of the authorized person as a train faces then secondly take a test face or live captured image to compare with train faces (Data base).

Raspberry pi module: Raspberry pi B3 module is small computer board. When image taken by the raspberry pi it is compared with Eigen face image. At the first time when we capture the image to create a data base raspberry pi module capture six types of the images to create a data base in the system and this data base is compared with the live captured image Raspberry pi consist of OPEN CV library in which we can write algorithm in JAVA, Python or C++. After comparing two images output is positive/negative then it gives commands to mobile device. From power adapter Raspberry pi takes 5V 2A supply.

Mobile Device: It is used to sending a message to the authorities after comparison output is positive or negative. If output is positive then "Person Identified!!DOOR OPENS!!"message send to the authority person otherwise send "UNKNOWN PERSON IS TRYING TO UNLOCK THE DOOR". mobile device is connected to the Raspberry pi board via RS 232 to USB convertor. It operates on Single supply voltage 3.4V – 4.5V.

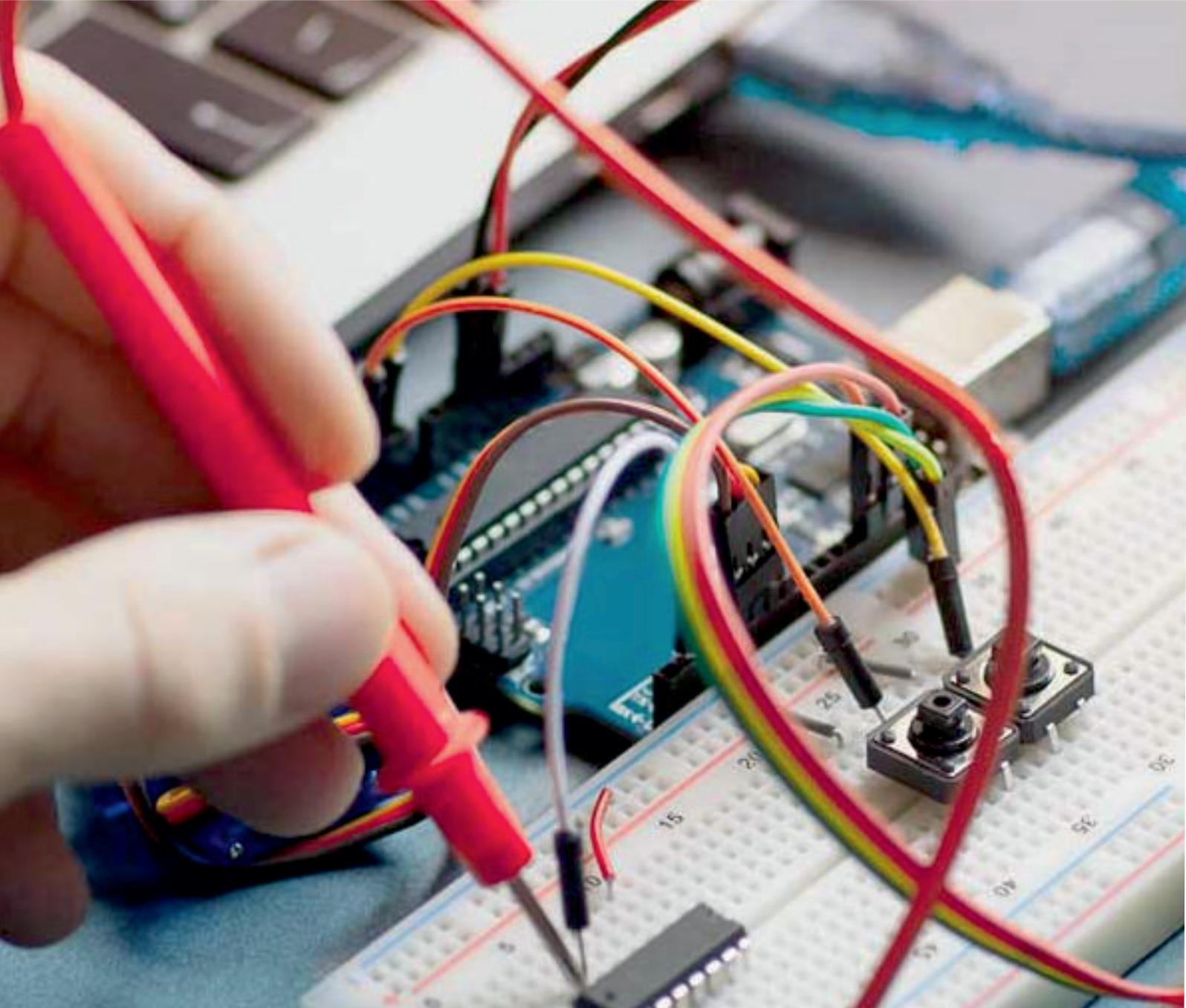
Relay: Here we use a 12V 1A Relay is as an output module which is used to unlock the door when known face is recognizing successfully. When a power is supplied to the coil, it generates a magnetic force that actuates the switch mechanism.

V.CONCLUSION

We successfully finished a face recognition door lock system as we planned. The passcode and face recognition works well. There is high accuracy in recognizing house owner faces and it could realize sending the matched face image to another Raspberry Pi in time and give a good output. And it takes a little bit time to recognize. At all, we all are satisfied to build it

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