FACE RECOGNITION AUTHENTICATION SYSTEM FOR DOOR AUTOMATION USING RASPBERRYPI

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Abstract: This project aims to monitor and control the home lock using the internet of things. Here we follow the Video Surveillance process. Whenever a person comes and stands in front of the door the person's face get scanned and the comparison takes place with the database stored in the Raspberrypi. We use features like Haar cascade technique and Local Binary Pattern Histogram (LBPH) for Face Detection and Face Recognition which is carried out in three stages like extraction, matching and classification.

If the person's face get matched with the database then he is authorized, so that the door gets opened automatically. If not, the person's image will be sent to the email of authorized person through Wi-Fi. The door lock can also be controlled by using the webpage.

The photos are sent directly to the cloud server, when the cloud is not available then the data is stored locally on the Raspberrypi and sent when the connection resumes.

Keywords - IoT, Raspberry pi 0, IP Webcam application, Fing application

I. INTRODUCTION

The surveillance became a big challenging problem in the present world, sake of security purpose in phone or banks or other public places we are using many different security systems such as password, finger prints and pattern recognitions. The pattern or passwords used can be trapped easily once if the user is known well or if the pattern is seen once or well known. The finger print system doesn't achieve full-fledged result the through put is low because of the miss matches or a layer of distraction due to external sources and many other reasons. To provide a proper surveillance we are going for face recognition, the unique features of each individual are taken into consideration. There are different kinds of methods for face detection and recognition, in this paper face detection is done based on haar features and face recognition is done based on local binary pattern histogram. In this paper the Face recognition and detection is done using Open CV on to the Raspberry Pi 0.

Face Detection

Many kinds of face detections are used in plenty appliance occurrence management, surveillance eventualities, gaming, human-computer interaction, etc. Viola associated Jones devised an formula, known as Haar features classifiers, to chop-chop find any object, as well as human faces, victimization Haar classifier cascades that area unit supported Haar-Like options. Different types of ways area unit out there for detecting the face for identification and recognition. Face detection is using Haar like features, so we'll work with face detection.

Initially, the formula lots of positive pictures (images of faces) and negative pictures (images while not faces) to coach the classifier. Then we'd like to extract options from it. For these, haar features shown in image area unit used. Which are similar to our convolutional kernel. There are line features, edge features and rectangle features.

Face Recognition

Face recognition applications is categorized into the three categories: verification, identification and watch. Face confirmation part is considered to be a one. The system can compare face image to the face image(s) of a similar registered identity within the information to form call on whether declining or not acceptive the identity claim. In distinction, the face identification task may be a one: N matching drawback. The face image is conferred to the system while not associate degree mark claim and also the system can search through the existing identities within the information of face to compare the conferred face image. Usually, it's considered that the conferred face image belongs to at least one of the themes within the information. Lastly, the watch list task is typically very just like the identification task but in watch list task, the question subjects square measure usually larger than the themes within the information and thus the question subject might not exist within the information.

LOCAL BINARY PATTERN

Fisher faces and Eigen faces are comprehensive Techniques to face recognition. The pixels are the vector of the data some point in High dimensional vector space. High dimensional vector space gives some ambiguity during face recognition. So, we go for the sub space which are lower dimensions and space where the useful data is stored. Total scatter is maximum In Eigen faces approach if the variance is

calculated using external sources it may create a problem. Maximum variance components are not useful for the purpose face recognition, so to store some discriminate data we used a linear discrimination analysis and escalation in the fisher face method. In Fisher face we have to go for N number of data base if we have only one image the co variance will be very high and the through put is reduced.
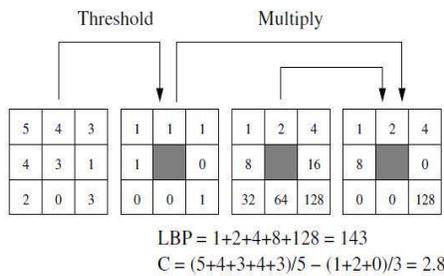

Fig: Calculating the original LBP code and a contrast measure

Local Binary Patterns Extension

The LBP operator was extended to make use of neighborhoods at different sizes. Using circular neighborhoods and bilinear interpolation of the pixel values, any radius and number of samples in the neighborhood can be handled.

(Q, R) which means Q sampling points on a circle of R radius.

Figures show some examples of different sampling points and radius:
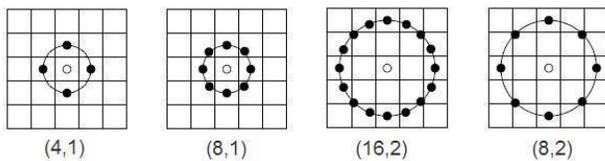

Fig: Circularly symmetric neighborhood sets.

In (4,1) case, the reason why the four points selected correspond to vertical and horizontal ones, is that faces contain more horizontal and vertical edges than diagonal ones.

II. LITERATURE SURVEY

Face recognition authentication system for door automation using raspberry pi is used mostly for security purpose in doors.

Basic components used in this project are

1. Raspberry pi.

2. Dc Motor.

3. Relay.

2.1 Dc Motor

An electric motor is a machine, which converts electrical energy into mechanical energy.

Principal of Dc Motor

When a current-carrying conductor is placed in a magnetic field, it experiences a mechanical force whose direction is given by Fleming's Left-hand rule and whose magnitude is given by

Force, $F = B\,i\,L$ Newton

Where 'B' is the magnetic field in weber/m2 'i' is the current in amperes 'L' is the length of the coil in meter

The force, current and the magnetic field are all in different directions.

Working

A direct current (DC) motor is a fairly simple electric motor that uses electricity and a magnetic field to produce torque, which. DC motor requires two magnets of opposite polarity and an electric coil, which acts as an electromagnet. The repellent and attractive electromagnetic forces of the magnets provide the torque that causes the DC motor to turn. DC motors are used for a variety of purposes, including electric razors, electric car windows, and remote control cars.

2.2 RELAYS

A relay is an electrical switch that opens and closes under the control of another electrical circuit.

Relays are usually SPDT (single pole double through switch) or DPDT (double pole double through switch) but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts

Basic operation of a Relay

An electric current through a conductor will produce a magnetic field at right angles to the direction of electron flow. If that conductor is wrapped into a coil shape, the magnetic field Produced will be oriented along the length of the coil .The greater the current, the greater the strength of the magnetic field, all other factors being equal.

Relay Circuit

III. BLOCK DIAGRAM
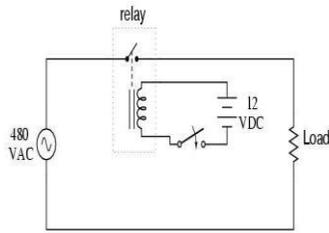
IV. FLOW CHART

A.   Components Required

1.   Raspberrypi zero W:

The Raspberry Pi Zero has proven to be one of the most popular and sought-after versions of the Raspberry since it came out in November 2015. However, many people thought it lacked one very important feature: inbuilt wireless internet. As of today, the Pi Zero lacks it no more:

Dimensions: 65mm × 30mm × 5mm

SoC: Broadcom BCM2835

CPU: ARM11 running at 1GHz

RAM: 512MB

Wireless: 2.4GHz 802.11n wireless LAN

Bluetooth: Bluetooth Classic 4.1 and Bluetooth LE

Power: 5V, supplied via micro USB connector

Video & Audio: 1080P HD video & stereo audio via mini-HDMI connector
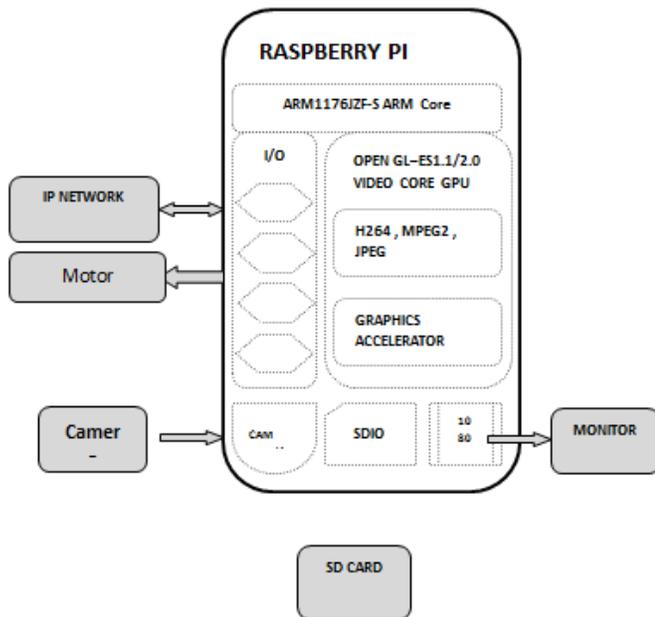
Storage: MicroSD card

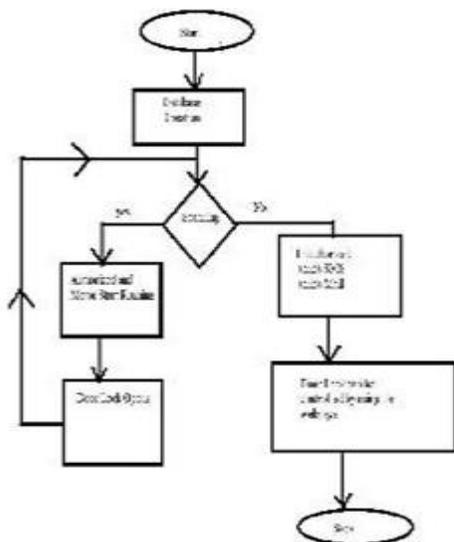**Output:** Micro USB

GPIO: 40-pin GPIO, unpopulated

Pins: Run mode, unpopulated; RCA composite, unpopulated

Camera Serial Interface (CSI)

It's almost identical to the previous Raspberry Pi Zero v1.3 (the one that added the camera connector) – importantly, all the chips and components are still only on the top side of the board.

2.   DC Motor:

The DC motor is a machine that transforms electric energy into mechanical energy in form of rotation. Its movement is produced by the physical behavior of electromagnetism. DC motors have inductors inside, which produce the magnetic field used to generate movement.

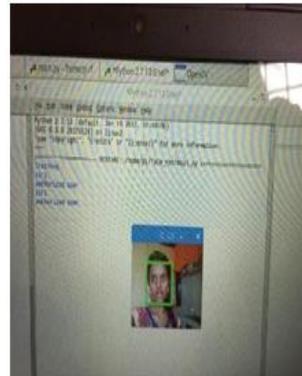**Working principle of a DC motor:**

The principle of working of a DC motor is that "whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force".

As terminal voltage increases or decreases, the speed of the connected DC motor also increases or decreases.
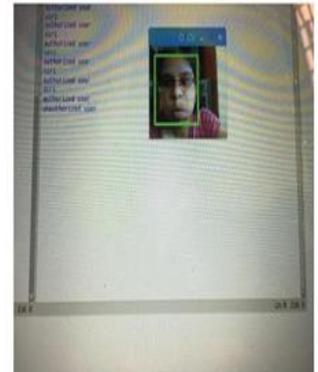
3. Fing application :

Fing is a wireless network discovery and audit tool which can be used to view the devices connected to your network. It provides services such as Ping, Trace route and WoL (Wake on LAN), among many others.   It has everything you need to analyze connection problems and find any computer connected to your network that should not be there.

With Fing, you can perform a trace   route to any computer connected to your Wi-Fi network, test any TCP connection or even awake any computer connected to our wireless network. It can also recognize almost every service out there, including the most common ones like Web Service (HTTP), File Transfer Service (FTP) and Domain Name Service (DNS). Using the Scan TCP ports option, it can detect all TCP services running on a target host or an entire network. You may also define your own service through a very simple configuration step.

4. IP Webcam application:

An Internet Protocol camera, or IP camera, is a type of digital video camera commonly employed for surveillance, and which, unlike analog closed -circuit television (CCTV) cameras, can send and receive data via a computer network and the Internet.

Step 1: Open the IP Webcam app on your Android device and make the necessary adjustments for resolution, quality, orientation, and FPS limit.
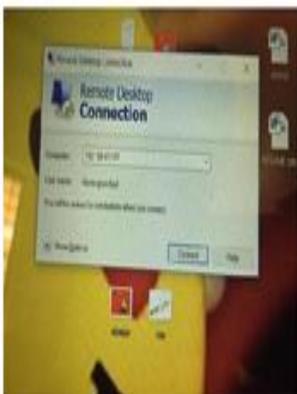
It is recommended that you set a username and password.

Step 2: Head to the IP address that appears at the bottom of the screen on your Android device in Chrome or Firefox.
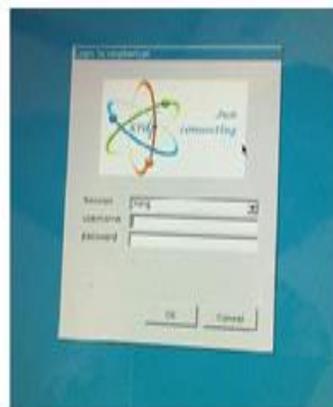
V. RESULTS

Authorized person   **Unauthorized person**
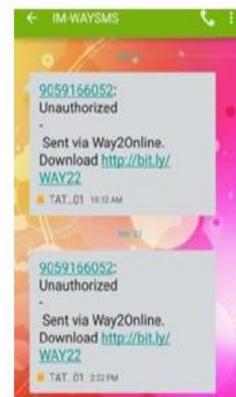
Message via Way2Sms and Webpage control using smart phone

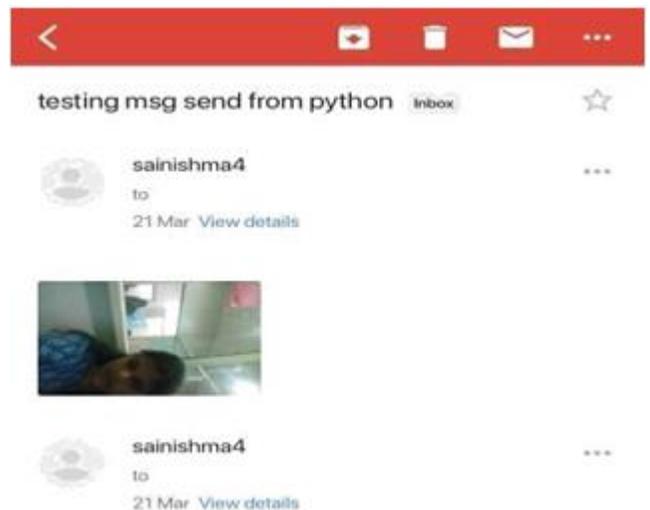

Connecting to remote   Login to Raspberrypi   A mail of unauthorized person's image to the authorized desktop   person

VI.　　CONLUSION

The face recognition was done using LBPH and raspberry pi platform. To reduce the false-positives drastically and increase the efficiency in this research, we are using haar like features and for recognition of face we are using LBPH (local binary pattern histogram).This reference design can be used for authentication in home security, and other public places. Thus for a safety purpose in real time we designed a face recognition system in minimum expenses using raspberry pi, open CV.

VII.　　FUTURE SCOPE

Feature enhancements and further extensions are always inescapable in present generation trending technologies. The proposed system can be used for night surveillance with maturity of raspberrypi security protocols.

It can be further extended by adding infrared emitting system to detect person's face if they wore mask.

We can also interface sensors like gas, smoke and fire to give alerts(only Possible for magnetic door lock system)

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