**Smart Guest Identifier with Remote Access Management**

**ABSTRACT**

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.



**INTRODUCTION**

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 favorable 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 as a part of security frameworks and can be contrasted with different biometrics. It has additionally turned out to be main stream as a commercial recognizable proof and advertising instrument.

**Internet of things:** The internet of things, additionally called the internet of articles, refers to a remote system between items. The term IOT has come to portray various advances and research teach that empower the web to connect into this present reality of physical articles.

There are various technologies that enable IOT:

* RFID and near-field communication
* Optical tags and quick response codes
* Bluetooth low energy
* ZigBee

In this work we utilized raspberry pi 3 is a single board PC created in the United Kingdom by the raspberry pi establishment. Raspberry pi has many generations. What we are using here is pi3.It replaced pi2 model b in February 2016. Raspberry pi3 is believed to be approximately 80%faster than RPi2 in parallelized task. It has architecture of ARM v8(64/32 bit), Broadcom BCM 2837 System on chip used along with the CPU of 1.2GHz 64/32 bit quad core ARM cortex A53. The memory of Raspberry pi 3 is 1GB and the storage is in the micro SDHC slot. It has an additional feature of Wi-Fi and Bluetooth as compared to other versions of Raspberry Pi.

**IBM Blue mix** is an open standard cloud based platform as a service (PaaS) developed by IBM. It supports several programming languages and services as well as integrated DevOps to build, run, deploy and manage all types of applications on the cloud. Bluemix depends on Cloud Foundry open technology and keeps running on Soft Layer infrastructure. Bluemix supports several programming languages including Java, Node.js, PHP, Swift, Python, Ruby, etc.

**IBM Watson IOT:** It is a cognitive system that learns from, and infuses intelligence into a physical world.

**Node-Red** is a programming device for wiring together hardware gadgets, APIs, and online organizations in new and intriguing ways. It gives a program-based supervisor that makes it easy to wire together streams utilizing the extensive variety of hubs in the palette that can be passed on to its runtime in a single click.

The light-weight runtime depends on Node.js, taking full perspective of its, occasion driven, on-blocking model. This makes it immaculate to continue running at the edge of the system on ease equipment, for example, the Raspberry Pi and also in the cloud.

In the late time, cloud computing has advanced as a net driven, benefit arranged processing model. As characterized by National Foundation of Measures and Innovation (NIST), cloud computing is show which empowers the advantageous, on-request organize access to a common pool of configurable registering assets (e.g., servers , administrations , applications, systems, stockpiling, and systems,).

In a facial recognition security system the Raspberry pi is combined with Cloud Computing to provide the communication between the person and the security system. Cloud is a service provider or a type of internet based computing that provides shared computers processing resource and other devices on demand.

Cloud computing is a gathering of advances that permit IT assets to be virtualized, utilized on an on-request premise and conveyed by means of the Web as administrations. Cloud computing can be viewed as another processing worldview in so far as it permits the use of a figuring framework at least one levels of deliberation, as an on-request benefit made accessible over the Web or other PC organize. It is sold on request, normally incrementally or the hour; it is versatile - a client can have to such an extent or as meagre of an administration as they need at any given time and the administration is completely overseen by the supplier. Due to its elements of more prominent adaptability and accessibility at lower cost, Cloud computing is a subject that has been getting a decent arrangement of consideration.

Cloud computing can be ordered into 4 sorts on the premise of area where the cloud is facilitated.

The cloud stage is utilized as a part of this venture is IBM Blue mix. It is an open standard, cloud based stage for building, overseeing and running utilizations of different types (web, versatile, huge information, and new brilliant gadgets, so on).

**WORKING OF THE PRPOPOSED SYSTEM**

The proposed works are as follows:

* Interfacing of camera to capture live face images.
* Create a database of authorized person if they exist.
* Capturing current image, save it and compare with the database image.
* Interface GSM module to send alert to authorized person while unlocking the locked door in the form of SMS and CALL.
* The project can also be used for surveillance. For instance, it can capture the images of unidentified individuals and store it which can later be used to determine the impostors who tried to gain illegitimate access.
* Interface relay as an output.



**Fig : Block diagram of “Raspberry pi based face recognition system for door unlocking”.**

The system will works in two different parts. The first part is for capturing and creating a database by storing the image. And the second one is to compare the image with the stored images in the database .For feature extraction we will use Eigen faces methodology and Euclidian distances will used for recognition of the face.

**Camera module:** Camera module is pi camera interfacing to the raspberry pi module. It is used to capture images and send the clicked images to the raspberry pi module. Camera contains LEDs and flashes to handle that light condition that is not explicitly supplied by the environment and these light conditions are known as ambient light conditions.

**Raspberry pi module:** raspberry pi 3 module is a small computer board. When an image is taken by raspberry pi it is compared with database image. For the first time when we capture an image to Create a database raspberry pi module captures many images to create a database in the system and this database is compared with the live captured images. After comparing the two images, based on whether the output is positive or negative it gives commands to GSM module.

**GSM Module:** GSM module is used to send a message to the authorized people based on the output. If the output is positive “Information matched Access granted” message will be sent to the authorized people, otherwise in case of unauthorized access it will send an “Access denied. Some unknown person is trying to unlock the door”. Message to the certified users of the system.

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**Fig : Flowchart of Image capturing and database comparison**

**Components used:**

**A. Raspberry Pi**

** Fig** : Raspberry PI

Raspberry Pi board is a micro-controller board used for development of various embedded level projects. Its size is no more than a credit card. It has a Broad-com BCM2835 system on chip (SoC) multimedia processor [11]. It also has 512 MB memory chip on the board at the centre. Its IAS (Instruction Set Architecture) is different than other architectures and it is used for ARM (Advanced RISC Machines). The Raspberry Pi runs on Raspberry Pi compatible operating system which is known as GNU/Linux Raspbian. Operating systems like windows, IOS are also compatible to Raspberry Pi. But the reason of using Linus is that the LINUX is open source and programming oriented and hence becomes easy for development.

**Features of the Raspberry Pi**:

1. CPU quad core 64 bit ARM Cortex A53 clocked at 1.2 GHz.

2. GPU: 400 Mhz VideoCore IV multimedia.

3. Memory: 1GB LPDDR2 900 SDRAM i.e. (900MHz)

4. Video outputs: HDMI, Composite Video (PAL and NTSC) via 3.5mm jack

5. Network 10/100 Mbps Ethernet abd 802.11n wireless LAN

6. Bluetooth version 4.1

7. width: 85.60 mm\* 56.5 mm

8. Weight: 45g

**B. Camera Module**

The Raspberry Pi Camera Module is a custom designed add-on for Raspberry Pi. It attaches to Raspberry Pi by way of one of the two small sockets on the board upper surface. This interface uses the dedicated CSI interface, which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively



**Fig** : Camera Module

**C. Stepper Motor**

A stepper motor is a brushless, and can be both synchronous as well as asynchronous electrical motor. Due to this, the motor can convert digital pulses into mechanical rotations. When the motor revolves, its revolutions are divided into particular steps, and hence it is known as stepper motor. These steps are discrete and for every step the motor is sent a pulse. All steps of the stepper motor are equal and they are divided for unit time.



**Fig** : Stepper Motor

Each of these pulses causes the motor to rotate in particular angle. The motor speed is depending upon the frequency of the pulses. As the frequency changes, the rotational speed also changes. The speed of the motor is directly proportional to the frequency of the digital pulses. If the frequency increases, the speed of the motor also increases. Stepper motors are low cost, highly reliable and their performance rate is high at low digital frequency.

**Final code:**

# Import OpenCV2 for image processing

import cv2

import requests

# Import numpy for matrices calculations

import numpy as np

import os

def assure\_path\_exists(path):

dir = os.path.dirname(path)

if not os.path.exists(dir):

os.makedirs(dir)

# Create Local Binary Patterns Histograms for face recognization

recognizer = cv2.face.LBPHFaceRecognizer\_create()

assure\_path\_exists("trainer/")

# Load the trained mode

recognizer.read('trainer/trainer.yml')

# Load prebuilt model for Frontal Face

cascadePath = "haarcascade\_frontalface\_default.xml"

# Create classifier from prebuilt model

faceCascade = cv2.CascadeClassifier(cascadePath);

# Set the font style

font = cv2.FONT\_HERSHEY\_SIMPLEX

# Initialize and start the video frame capture

cam = cv2.VideoCapture(0)

# Loop

while True:

# Read the video frame

ret, im =cam.read()

# Convert the captured frame into grayscale

gray = cv2.cvtColor(im,cv2.COLOR\_BGR2GRAY)

# Get all face from the video frame

faces = faceCascade.detectMultiScale(gray, 1.2,5)

# For each face in faces

for(x,y,w,h) in faces:

# Create rectangle around the face

cv2.rectangle(im, (x-20,y-20), (x+w+20,y+h+20), (0,255,0), 4)

# Recognize the face belongs to which ID

Id, confidence = recognizer.predict(gray[y:y+h,x:x+w])

# Check the ID if exist

if(Id == 1):

Id = "Parthu {0:.2f}%".format(round(100 - confidence, 2))

r = requests.get('https://parthu45.eu-gb.mybluemix.net/person?name=Parthu')

r.status\_code

elif(Id == 2):

Id = "Pavan {0:.2f}%".format(round(100 - confidence, 2))

r = requests.get('https://parthu45.eu-gb.mybluemix.net/person?name=Pavan')

r.status\_code

elif(Id == 3):

Id = "Bhargava {0:.2f}%".format(round(100 - confidence, 2))

r = requests.get('https://parthu45.eu-gb.mybluemix.net/person?name=Bhargava')

r.status\_code

# Put text describe who is in the picture

cv2.rectangle(im, (x-22,y-90), (x+w+22, y-22), (0,255,0), -1)

cv2.putText(im, str(Id), (x,y-40), font, 1, (255,255,255), 3)

# Display the video frame with the bounded rectangle

cv2.imshow('im',im)

# If 'q' is pressed, close program

if cv2.waitKey(10) & 0xFF == ord('q'):

break

# Stop the camera

cam.release()

# Close all windows

cv2.destroyAllWindows()

**ADVANTAGES:**

1. It is low cost system which can be made under 5000 INR.
2. Using this system, the home can be monitored and controlled remotely, as we can place sensors at the different places.
3. This is an IoT based system and hence can be made automated [12].
4. By using Raspberry Pi, the system becomes scalable and flexible.
5. The system can be modified easily without disturbing the other components in the system.
6. As we will use Raspberry Pi to develop the system, the total system has become low power system.
7. New embedded technologies can be easily inserted into this development, due to the use of raspberry pi.
8. New connections like cascade connections, parallel connection, series connection to extend the system.
9. The system can work on both modes online and offline mode. In online mode, the system can use internet at its working time. In offline mode, the system does not use any internet connection.

**FUTURE SCOPE:**

This security system is a combination of face recognition system and IoT. These two technologies are growing technologies and with the help of them, much advancement can be done. There are many face recognition algorithms developed till date but none of them are proper and hence each one has its disadvantages. Hence in the future a proper designing in the face recognition algorithm can be done and a new algorithm can be introduced. The technology is scalable therefore new modifications can be easily done. New hardware can be easily attached hence new smart home concept can be implemented. Everything in that home will be smart. That means we don’t need to give command to hardware every time. Hardware itself will know do’s and don’ts.

**CONCLUSION:**

The security system, proposed, is low cost, low power consuming system. This system can easily provide high level of security as it combines two modern technologies together i.e. Face recognition and IoT. These are rapidly growing technologies in industries and scientists are still researching on them. Therefore these two have made a significant impact on security system development. Due to these, the security will almost double. Remote controlling and monitoring is possible because of using IoT and Face recognition has made it almost impossible to hack.

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