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## SMART DOOR UNLOCK SYSTEM USING FACE RECOGNITION

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### ABSTRACT

Face recognition system is widely used for human identification particularly for security functions. The scope of this project is to develop a security access control application based on face recognition. This project proposes a survey on face recognition by using python programming and from Open CV library. Machine learning has been shown that is one of the most successful tool to build high performance face detection systems. The face is one of the easiest way to distinguish the individual identity of each other. The process of face detection mainly involves two important process detection and recognition. We designed an automated locking system by implementation this feature to 12 v solenoid electronic lock and an order to achieve a higher accuracy and effectiveness we use OpenCV libraries and python computer language.

**Keywords:** Python, Opencv, Face Recognition, Microsoft Visual Studio Code.

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### I. INTRODUCTION

Now-A-days in this world is connected to the smart devices there is a crucial need that is to improve the existing objects and make them smart. Especially to our door locks. The major disadvantages in a normal door locking system are that anybody can open a normal door by a duplicate key and it's very difficult if we want our friends and family to get into our house. This is why we cannot decrease these problems. So just change this normal door locking system into a facial recognition enabled smart door lock, which we can open the door whenever we want, so this implementation has come where devices can interact with the users and at the same time verify the safety and keeping them smart. To avoid thefts and identity fraud, a face recognition system should be established. The objective of the project is to develop a security management application supported by face recognition. Face recognition has become one of the most important user identification methods. For attaining the accuracy and effectiveness we tend to use OpenCV libraries and python computer-oriented language. Microsoft face API application is used, in hardware part we are using Microcontroller, Solenoid lock, Relay driver, and camera module etc.

### II. LITERATURE SURVEY

Paper name: I-Door: Intelligent Door Based on Smart Phone

year:2015

Mayank Agarwal: Proposed a methodology for face recognition based on information theory approach of coding and decoding the face image. The proposed technique is analyzed by varying the number of Eigen faces used for feature extraction and the maximum recognition rate obtained by using whole dataset

Paper name: Door Unlocking System using Face Recognition and Cloud Computing

year:2021

M.M. Krishna: The author uses Raspberry Pi to process the image. The door will open if the image of the person is present in the Raspberry pi database.

B. Manigandan: In the proposed system they used G graphical programming language in the lab view. The main disadvantage of this system is that MYRIO is costly compared to Raspberry pi.

G. Kaviyasanthosh: There was lots of research done for Face & biometric based access control. Several different methods are available to detect and recognise the person using live facial image. Every method have advantages as well as disadvantages compared with other.

They decided to use proven Python and OpenCV libraries which claim to produce up to 99% of accuracy and repeatability of the system despite some changes in face features (like change in beard styling, moustaches for men, and clear glass eyewear's for anyone).

These libraries use algorithms like face feature extraction using Gabor transform (frequency domain) along with spatial domain analysis like eyes-nose triangular area to get additional features of face of person.

### III. PROPOSED SYSTEM

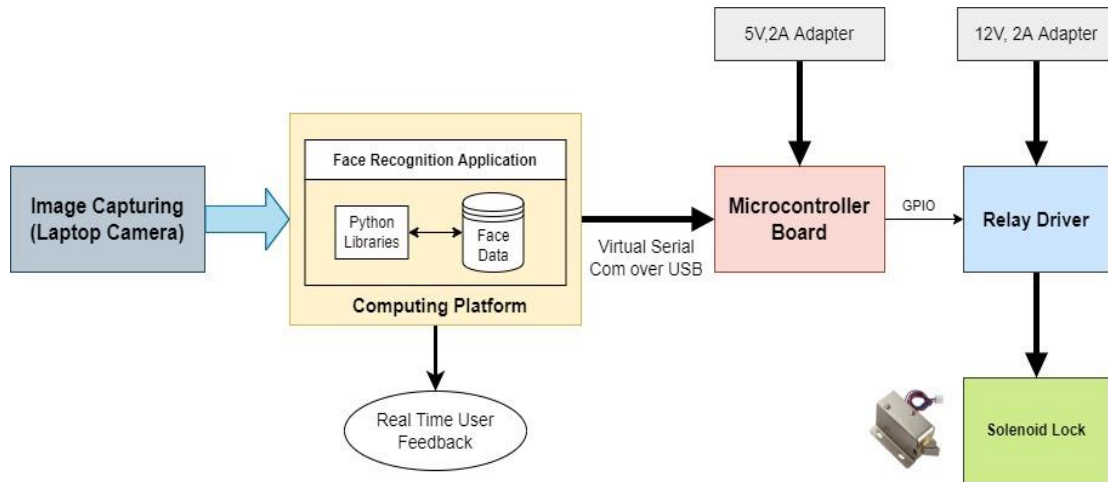


Figure 1: System Block Diagram

The system Block Diagram will be primarily a proof of concept (POC), thus requirement of computing platform and image capturing device will be a laptop, for convenience. In addition to it, laptop provide real time user feedback over screen and Graphical User Interface (GUI).

The System’s primary input will be image captured by a Laptop Camera. This image data will be processed by a Python based software application. For training the system, we need pre-captured face images and facial feature data in the training database. This will be integrated in the software application.

The microcontroller board control the automated solenoid lock. Since the microcontroller board doesn’t have on-board USB supporting hardware, we need to use a Virtual Serial Communication Port over USB connection. Through this Virtual COM port, the software application will give out command to microcontroller board. With General-purpose I/O (GPIO) pin, Relay driver board will drive solenoid lock, eventually allowing or denying access in the restricted area to the person subject to authentication.

### IV. HARDWARE

#### [1] Microcontroller Board (STM32):

This is STM32F103C8T6 Minimum System STM32 ARM Core Board. This is a low-cost Minimum System Development Board for ARM Microcontroller STM32F103C8T6. The microcontroller board control the automated solenoid lock. Through this Virtual COM port, the software application will give out command to microcontroller board. With General-purpose I/O (GPIO) pin, Relay driver board will drive solenoid lock, eventually allowing or denying access in the restricted area to the person subject to authentication.

#### Features:

1. 72MHz work frequency.
2. 64K flash memory, 20K SRAM.
3. 2.0-3.6V power, I/O.
4. Reset (POR/PDR).
5. 4-16MHz crystal.
6. Onboard Mini USB interface, you can give the board power supply and USB communication.



**[2] Relay Driver Board:**

It is a 5V 1 Channel Relay. The relay normally open interface maximum load: AC 250V/10A, DC 30V/10A. It has a trigger current of 5mA, and working voltage of DC 5V. Each channel of the relay can be triggered by a jumper to set a high or low level. Fault-tolerant design, even if the control line is not connected, the relay will not move. With status indicator: power (green), 1-channel relay status indicator (red). All module size interfaces can be directly connected through the terminal block, which is convenient and practical.



**[3] DC 12 V Solenoid Lock:**

Relay driver board will drive solenoid lock, eventually allowing or denying access in the restricted area to the person subject to authentication. It is steady, durable, and energy-saving and had a long lifespan. In the anti-theft and shockproof design, the lock is better than other kinds of locks. After connecting the wires and when the current is available, the electric lock can control the door's opening and closing.



**V. SOFTWARE**

**1. Python Software Development Kit:**

Python is a high-level general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation.

**2. Microsoft VS:**

Visual Studio Code is a code editor in layman's terms. Visual Studio Code is a free-editor that helps the programmer to write a correct code.

**3. OpenCV:**

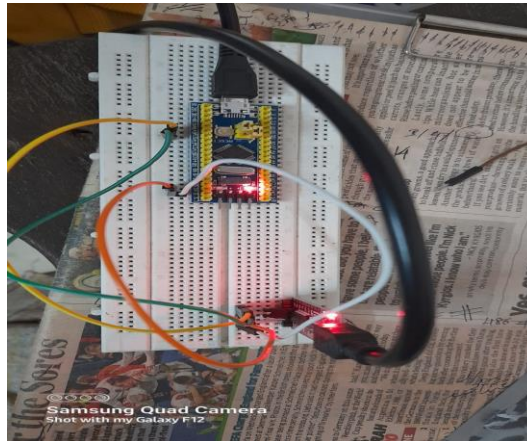
OpenCV is a great tool for image processing and performing computer vision tasks.

**4. Windows/Linux:**

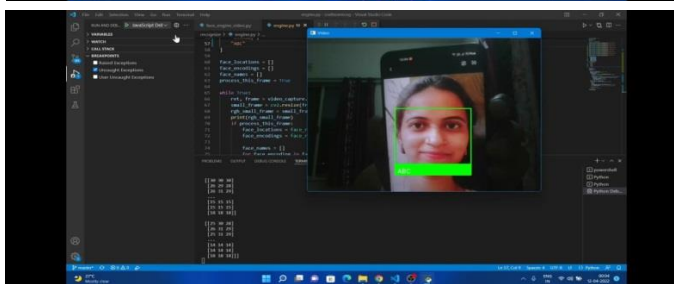
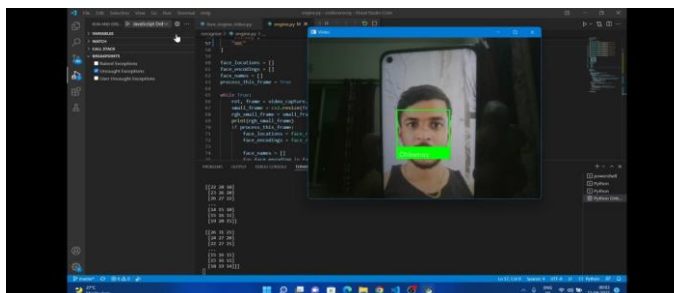
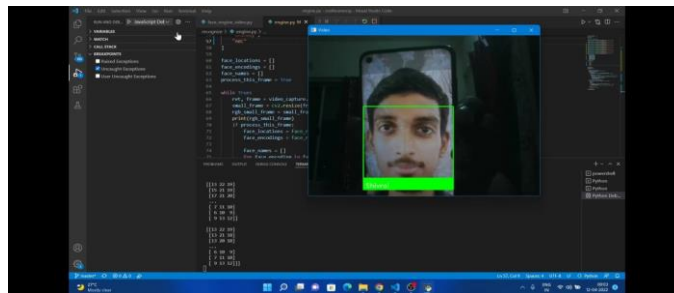
Operating Systems.

**VI. RESULTS AND DISCUSSION**

The person with recognized face will get access to the restricted area. The experimental results show two different cases like if it is an authenticated person then the door will be opened automatically and in the case of unauthenticated person the door will remain closed. The snap shot of the authenticated person is taken. The captured image is compared with the image in the database, by extracting the eigen face and eigen values. With these features the image is decided to be an authenticated one. Once the image is declared to be an authenticated one, then the door of the system will be opening automatically. Face recognition system has been developed in order to study the potential application for automated door access control.



Hardware photo



Face recognized output

## VII. CONCLUSION

Smart door unlock system has a lot of applications. Specially in restricted areas, in offices and colleges or schools. Importance of Face Recognition System as a Security Solution Face is considered as the most supreme part of our body. The system is able to accurately detect and recognize the face. Face recognition will be done through python application.

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