



# Door Lock System Using Face Authentication and Arduino UNO

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**Abstract-** Privacy and Security are two of the most important universal rights. Over the course of the past decade, security and automation systems have been gaining an incredible amount of popularity because of the advancements made in the field of science and the concomitant risks of breaking into the system, and face recognition has played a significant role in both phenomena. In a wide range of applications, including biometrics, surveillance, security, identity, and authentication, face recognition plays an essential function. In this paper, we have described a smart security system for highly secured places where access is limited to people whose faces are available in the training database and if an unauthorized person tries to access the system, then the system will immediately capture that person's image and sends an alert email to the owner with the captured image.

**Keywords -** LED, GSM, CCTV, CV, LBPH, GPIO

## 1.INTRODUCTION

In today's world, as technology advances, so do human facilities. With the adoption of numerous technologies, people's daily life has significantly improved. Yet, it also leads to security problems. Traditional door locks have the drawback that virtually anyone can pick them up and gain entry to your home. As a result, solving these issues is extremely difficult. Most of the time, people use CCTV to secure their homes. Pictures will be kept in the database so that they can be retrieved when a suspicious situation occurs. This method of action is passive. Yet, a proactive strategy is required. This kind of strategy is nothing more than the one that allows for quick action once a security threat materializes. Thus, a face recognition system can be employed, which recognizes the face of the person standing close to the entrance and compares it to the uploaded faces saved in the database. The door will open to welcome everyone who is recognized. The owner will receive a mail with an image of the intruder.

## 2.LITERATURE REVIEW

### 1. Smart IoT-based Facial Recognition Door Lock System:

It is a smart IoT-based door lock system that uses facial recognition technology to detect intruders and take proactive security measures. The system works by comparing the faces of individuals near the door with those stored in a database, and if an unknown person is detected, a message and email with an intruder image are sent to the owner. The system employs Raspberry Pi, a Pi camera, DC motors, LEDs, and a GSM module to open the door, indicate its status, and send notifications to the owner's mobile number. However, while the system has potential benefits for security, it's crucial to address privacy and security concerns related to facial recognition technology and ensure that the system is reliable and accurate in identifying individuals.

2. Color Image Edge Detection" aims to reduce the amount of data required for facial recognition by decreasing the information needed to be stored for each user. By using this technique, it is possible to create a CV of a person's face using either greyscale or colored images, which provide sharp edges to the individual. This results in using less data traffic to transfer information between the accessor and the primary user. It can make the process of entering new user details more efficient and accurate, as the primary user performs image reconstruction and edging. However, the accuracy of edge defining may not be sufficient for verification purposes because people with similar face cuts may have comparable edges. Therefore, it is crucial to consider the limitations of this method before implementing it for facial recognition. Moreover, while this technique may speed up the process of entering new user details when the primary user is located remotely, it is important to prioritize accuracy to ensure the system is effective in verifying the user's identity. In conclusion, the Color Image Edge Detection technique is useful in reducing the amount of data required for facial recognition, but accuracy should always be the top priority.

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describe the creation of a low-cost password-based door lock system using an ARDUINO UNO. This system enables authorized individuals to enter a designated zone by inputting the correct code to unlock the door. The authors suggest that this system can be bid on by individuals who want to secure their valuables without breaking the bank. Overall, this article provides valuable information on the development of a cost-effective locking system that can enhance security measures for personal items.

### 3.PROPOSED MODEL

In the proposed model, a prototype of a smart security system is designed. The project makes a use of two machine learning algorithms-Linear Binary Pattern Histogram (LPBH) and Haar Cascade algorithm to detect and recognize the faces of the people. A servo motor is used for the opening and closing of the door. The controlling of the door is done wirelessly through Wi-Fi. This smart security system is designed to only give the access to the authorized people and send an alert email to the owner of the system if any unauthorized person tries to enter. This system can be used for any high security places like homes, offices, banks etc.

### 4.BLOCK DIAGRAM

For developing this Smart Security Door Lock System, we have used an Arduino UNO microprocessor. We have used a web camera to detect a person. The microprocessor is given 5V power supply through computer. The captured image is compared with the stored database and checks whether the person is an authorized or not. If the person is authorized then the command is passed to microprocessor which rotates the servomotor. If the person is unauthorized then then a mail is sent to the owner. This door lock system is implemented by using servomotor (SG90) that works on a degree of rotation of 180 degree. This motor is connected to GPIO of Arduino.

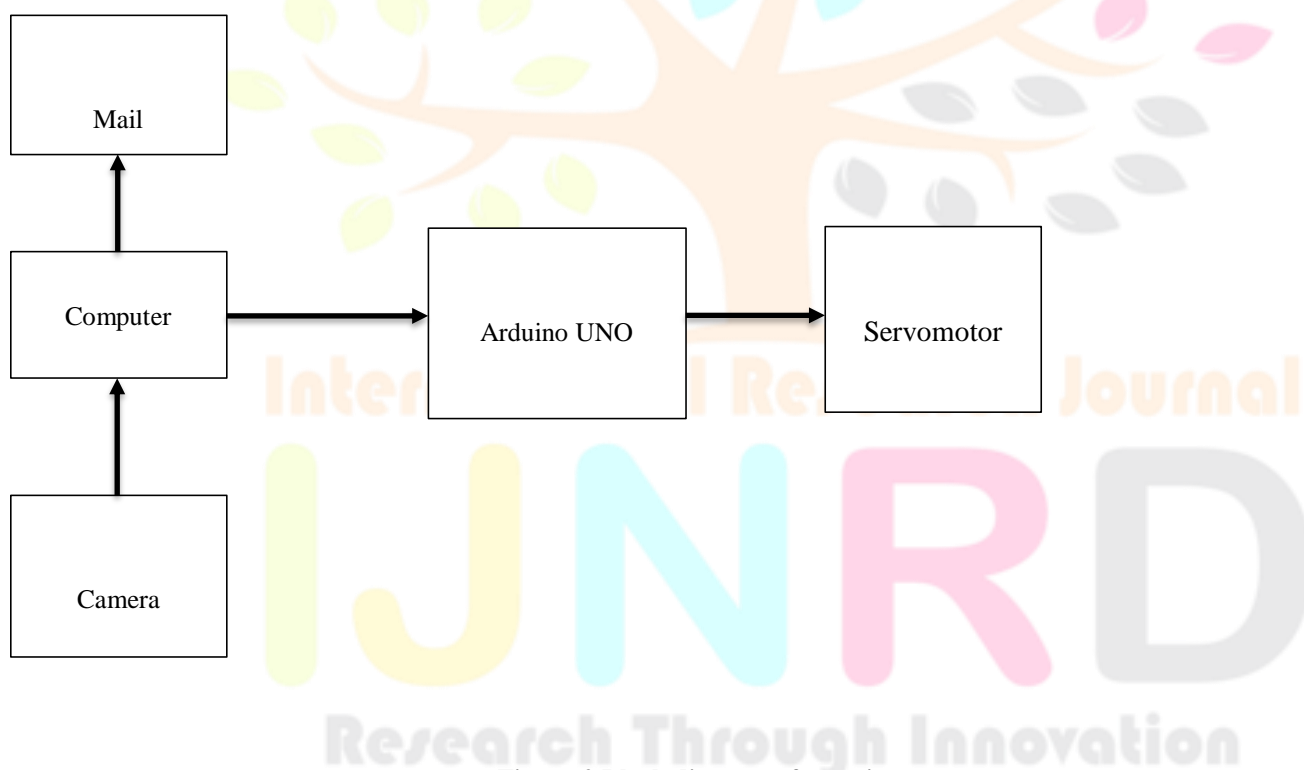


Figure-2 Block diagram of security system.

## 5.METHODOLOGY

This project comprises of two parts – Hardware and Software. The Hardware part consists of ARDUINO UNO microprocessor and a Servomotor. Considering the software part, we have built a website for face recognition and the image is captured. The face recognition is done using HAAR Classifier and Local Binary Pattern Histogram(LBPH). If the captured image is an authorized person, then the authorized person's name is shown and the servomotor unlocks the door. If an unauthorized person stands in front of the webcam, then unknown is displayed on the website and mail is sent to the authorized/ owners mail as an alert containing the image of the unknown person.

## 6.RESULTS

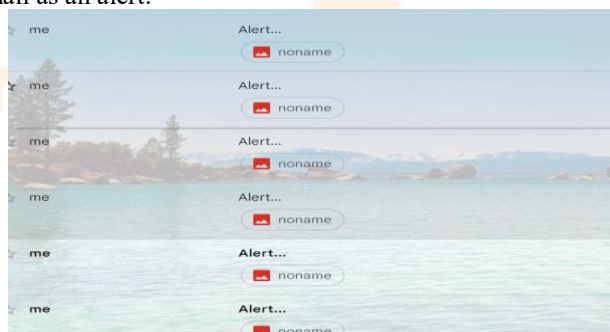
Once, the code is run on the computer, a link gets generated,

- 1.On clicking the link a website gets opened.
- 2.If the authorized person's stands in front of the camera.
3. The camera recognizes the person and displays his/her name.



**Figure-3 Website displaying the authorized person's name**

4. The laptop send the command to microprocessor which in turn opens the door.
5. An email is sent to the owner's mail as an alert.



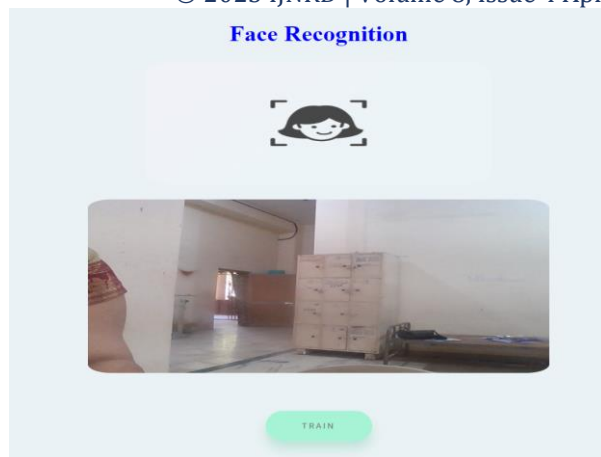
**Figure- 4 The alert message sent to the owner's mail**

6. If an unknown person stands in front of the camera, then the system displays UNKNOWN.



**Figure- 5 Unknown person's photo is sent to the owner's mail**

7. The data can be added or we can train the computer as an authorized person just by clicking TRAIN button on the website.



**Figure- 6 To train we need to click on the train button**

8. The following gets opened and we need to just upload at least 10-12 photos of a person in various angles and the name of the person needs to be entered.

**Figure- 7 To Upload the photos and name of a person in order For the system to detect that person as an authorized person**

## 7.CONCLUSION

Since, the traditional lock systems are outdated and carrying the keys or cards might be misplaced and duplicate copies might be created which invades privacy. Hence, to have a reliable and more secured system we have implemented a simple low budget security system. We have designed a website that captures the image and compares the image with the data given and checks if he/she is authorized or not. If yes, the person's name is displayed on the website and door gets unlocked else an email is sent to the owner with the image of the unknown person and unknown is labeled on the image as an alert.

## 8.REFERENCES

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