

FACE RECOGNITION DOOR LOCK SYSTEM USING MACHINE LEARNING AND IMAGE PROCESSING

¹ **B.Padmini, Assistant Professor**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India.

² **V.Narendar, UG scholar**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: veshalanarendar870@gmail.com.

³ **S.Varanya, UG scholar**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: varanyashetty0303@gmail.com

⁴ **Y.Manish Reddy, UG scholar**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: manishreddy90865@gmail.com.

⁵ **K.Mahendar, UG scholar**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: kundarapumahender2003@gmail.com.

⁶ **K. V.Sai Krishna, UG scholar**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: saikrishnaveeramshetti3432@gmail.com.

ABSTRACT

Combining facial recognition with the webcam allows for more precise face identification, which is crucial for designing a door lock system. The webcam is run by a laptop, which also serves as the system's central nervous system; it uses the Nodemcu Micro controller to operate the door locks and unlocks. Facial recognition is the key to this door lock mechanism. Here, a private person's face is used to manage the door lock mechanism. In order to ensure the physical safety of the house, a door is a defensive element. A robber will have an easier time stealing from a residence whose doors are routinely left ajar. A physical key was formerly the only means of locking and unlocking a door, but technological progress has led to the

development of more contemporary alternatives, such as the digital door, which can execute the same functions without the need for a key at all. In order to monitor the door's state, operate it, and enhance security, we provide an app called Face Detection Door Lock, which is based on Arduino and makes use of Internet of Things (IoT) technology. The door may be programmed to lock or unlock automatically using a webcam on a laptop.

Keyword: *nodemcu, internet of things (IOT), image processing.*

1. INTRODUCTION

In order to keep the house safe from outside threats, a door is an important first line of defense. Thieves will have an easier

time stealing from a residence if the door is easy to access. In the beginning, a door would only have a physical key to lock or unlock it. However, as technology progressed, a new kind of door emerged—the digital door—that could lock or unlock itself. But it's also possible for the digital door to be damaged or destroyed when the property is unoccupied, and the inhabitants won't know about it until they go home. The residents will never leave the door unlocked, whether they are leaving the house or just sleeping inside, in order to keep the residence secure. But as a result of being in a rush to leave the house or just not sure if they have secured the door, people sometimes fail to do so. One thing that might compromise home security is this. The Internet of Things (IoT) is a system that allows everyday things and people to have unique identifiers and transfer data across networks without the need for human-to-human or human-to-computer handshakes. IoT makes advantage of sensors' capabilities, such as infrared (IR) sensors' capacity to detect motion, magnetic (MM) sensors' ability to determine if a door is open or closed, and internal touch sensors' ability to determine if the sensor is being touched or not. Smartphones have begun to use face detection in recent years. This is a fantastic piece of technology that will allow us to open locked phones or any app with stringent security requirements. Here we will attempt to build a simple project using ESP-8266 that uses our face as an ID. For video streaming and facial recognition, you may use the sample code that comes with the ESP8266 board, which is Camera Web Server. We built a Face Detection Door Lock System with ESP-8266 as part of this project. Any time the smart lock recognizes an enrolled face, it unlocks

immediately. The ESP-8266 module makes this a simple yet practical home automation project.

2. LITERATURE SURVEY

I. Yugashini, S. Vidhyasri, K. Gayathri Devi [1] Access control, security systems, credit card verification, and criminal identification are just a few of the numerous applications that have made facial recognition a hot topic in the past 20 years. The three primary subsystems suggested in this article are automatic door access control, face detection, and face recognition. In order to perform the face identification and detection procedure, we modified the principal component analysis (PCA) methodology to fast based principal component analysis (FBPCA). This method involves comparing the detected picture from the web camera with an existing photograph in our database. If the picture is legitimate, the door will open immediately. Otherwise, a GSM modem will send an SMS to the user alerting them that someone has entered their home without permission.

Faiz Aman; C Anitha [2] With the help of an Android app on a smartphone, this paper proposes a smart door system. In the past, homeowners may feel more secure in their homes thanks to the usage of smart locks. Since the suggested solution gives security to the door itself, the idea of a lock mechanism is unnecessary. A secure door without locks would be the end consequence of this. Raspberry pi and its associated embedded software make it possible to control the door's movement. There are several security benefits of integrating IoT with Android. When something moves in front of the door, the motion detectors will pick it up. Someone

walks in front of the door, which triggers a motion detector, which then takes a picture and notifies the owner.

Khalimov R.a, Rakhimbayeva Z.a, Shokayev A.a, [3] This study introduces a cheap smart door locking system that can use face recognition technology to make judgments. A pair of Arduino UNO boards and an Android-powered mobile device power the whole setup. Using the OpenCV libraries, it can independently carry out all steps of face recognition, including face detection, feature extraction, and face recognition. Users of the system will appreciate the added convenience of the quick and non-contact identification. In addition, the system includes an additional layer of protection, which may be utilized to expand its usefulness. This layer can be traditional, based on pin codes, or it can be RFID-based. The primary benefit of the system is its ability to operate independently; after installation, it does not require any more supervision. The technology is simple to adjust, and it's straightforward to update the facial recognition database using the Android OS.

Faiz Aman; C Anitha [4] With the help of an Android app on a smartphone, this paper proposes a smart door system. In the past, homeowners may feel more secure in their homes thanks to the usage of smart locks. Since the suggested solution gives security to the door itself, the idea of a lock mechanism is unnecessary. A secure door without locks would be the end consequence of this. Raspberry pi and its associated embedded software make it possible to control the door's movement. There are several security benefits of integrating IoT with Android. When

something moves in front of the door, the motion detectors will pick it up. Someone walks in front of the door, which triggers a motion detector, which then takes a picture and notifies the owner. Thus, the suggested system as a whole focuses on two technologies: first, a motion detector installed at the front entrance that can detect activity in real time, even when no one is home; and second, a smartphone app that allows the user to control the door's movement.

Syafeeza Ahmad Radzi, M.K. Mohd Fitri Alif, Y. Nursyifaa Athirah [5] Now more than ever, every house needs a home security system. Traditional methods of entry, such as keys, security cards, passwords, or patterns, were formerly sufficient for most doors. But alarming instances like robbery and identity fraud have resulted from things like lost keys. This is now a major concern. The introduction of facial recognition utilizing deep learning techniques and the efficient utilization of the Internet of Things (IoT) in door access control systems were two solutions to this challenge. The core controller for the facial recognition, youth system, and locking system is the tiny programmable computer board known as Raspberry Pi. Whenever someone stands in front of the door, the camera will snap a picture of them. The user may manage who has access to the door using an IoT system.

3. SYSTEM ANALYSIS

3.1 Existing system

Traditional key systems need you to either physically visit a key-cutting business to obtain keys for approved individuals or to conceal your key in plain sight outdoors.

Those with the highest expertise may be the ones who breach electronic lock codes. Since it is simpler to guess the number on crucial days, it is advised that you select a random password if your password is critical. This will enhance your security. Fingerprint scan door locks need electricity to function, therefore they may be rendered useless in the event of a power outage, in case you are unaware of the pros and cons of obtaining a biometric entry door lock. With the advent of the IoT, home automation has made great strides forward. There is a low-cost passive method that can operate many things by detecting the individual's infrared signal.

3.2 Proposed system

An internet of things (IoT) system that uses face recognition to open doors is currently in development. Now we'll see how it operates: Control Internet of Things capabilities with an in-person system. Our team is currently developing an IoT capability that will enable you to manage the gateway directly from the exit page. Now we'll see how it operates: Our current project is a "IOT-based gateway system employing face recognition" that will allow users to enter portals through the Internet of Things. In order to answer certain exam questions, the smart door system must be changed. It is necessary to modify the smart door system in order to resolve some test issues. Deploying hardware, software, and tablets is all part of the methods it offers for creating complicated building connections. In contrast to runners, this frame shows an effort to identify the owner-conscious individual trying to get into the sand. You may access your images whenever you want because they are kept in the cloud. In this approach, the data you'll require in the

future is stored on the cloud. An ESP8266 battery with door and knob controls is a great feature of this system. These services need the development of separate apps in smart gate systems because of communication issues. Complex compilation systems, hardware-integrated systems, computer control systems, and computer hardware are all part of the computer hardware that we provide for sale. A photo booth is used in these photographs to segregate people, unlike backpackers. Some people break into houses in an effort to help the people living there.

4. Block diagram

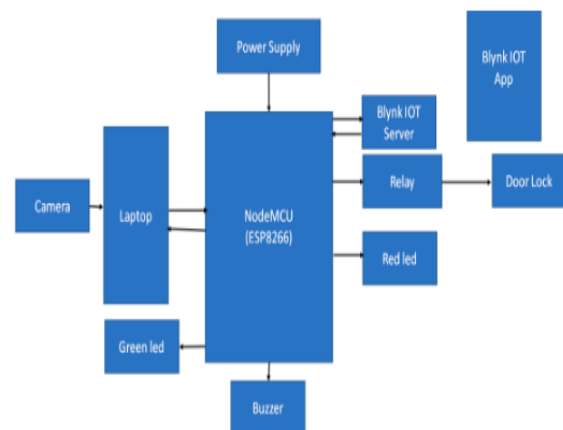


Fig. 1. Block diagram

4.1 Nodemcu esp8266

You may connect any microcontroller to your current Wi-Fi network with the inexpensive ESP8266 board, a Wi-Fi module. Being a System-On-Chip, it comes with its own built-in TCP/IP protocol stack. The ESP8266 may run its own apps or delegate Wi-Fi networking to another central processing unit. It was the August 2014 ESP-01 module, manufactured by the independent firm Ai-Thinker, that first drew the interest of

Western manufacturers in the chip. This little module allows the microcontroller to establish basic TCP/IP connections and connect to a Wi-Fi network using Hayes-style instructions. The chip and its instructions, however, initially had very little content in English. Numerous cybercriminals were eager to decipher and study the module, chip, and software on it because of its cheap pricing and absence of external components, which may make it cheap in mass in the future.



Fig . 2. Wi-Fi module ESP8266.

4.2 IR SENSOR

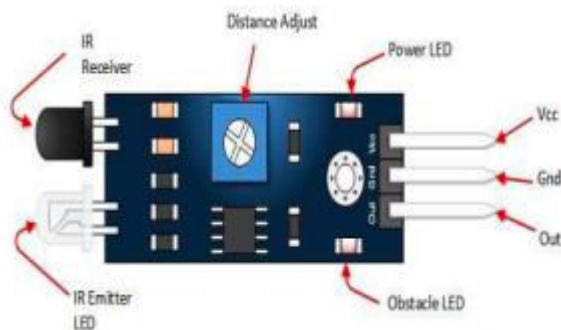
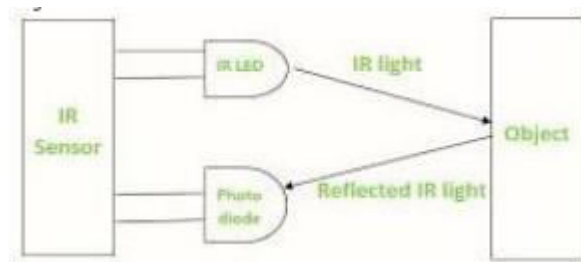


Fig.3. IR sensor

An infrared sensor is one that can detect objects in its immediate environment by means of light emissions. In addition to detecting motion, it can also measure an object's temperature. All items typically emit heat radiation in the infrared band. These.



Although infrared sensors cannot see certain forms of radiation, they are able to detect them. Resistances and output voltages are sensitive to the intensity of infrared light that reaches the photodiode. Together, an infrared light-emitting diode (LED) and an optical coupler (Opt coupler) form an infrared sensor. The IR Transmitter is an infrared light-emitting diode (LED). Even though infrared light-emitting diodes (LEDs) seem like conventional ones, the radiation they produce is undetectable to the naked eye.

4.3 Relay

A relay is an electrical device that uses electrical energy to turn on or off the switch contacts. The single-channel relay module is more than just an empty relay, it contains components that make switching and connecting easy and act as indicators to indicate whether the module is enabled and whether the relay is working or not.



Fig.4. relay .

5. Schematic Diagram

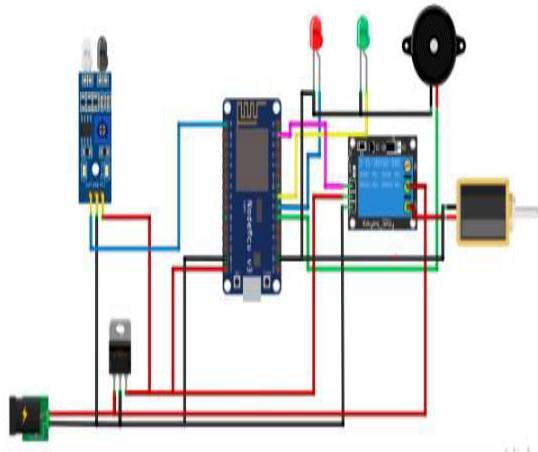


Fig.5. schematic diagram

6. RESULTS AND DISCUSSION

This door lock system is compatible with face detection technology. Authorized users can log in using the face detection technology. Nodemcu can be used by those without access to it to log in. Any time the laptop detects an illegal user, it will capture their photograph and notify the owner. The cloud is where all the produced data is stored. So, everything is under the cloud's control.

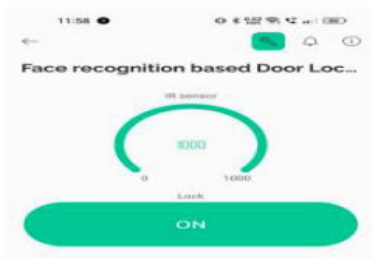
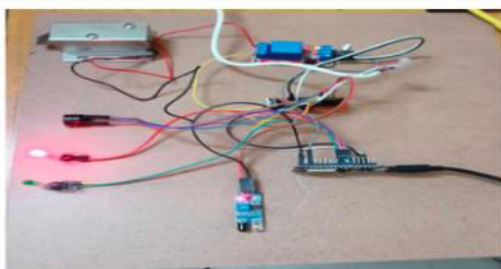


Fig-6. Face detection based automatic door opening and closing.

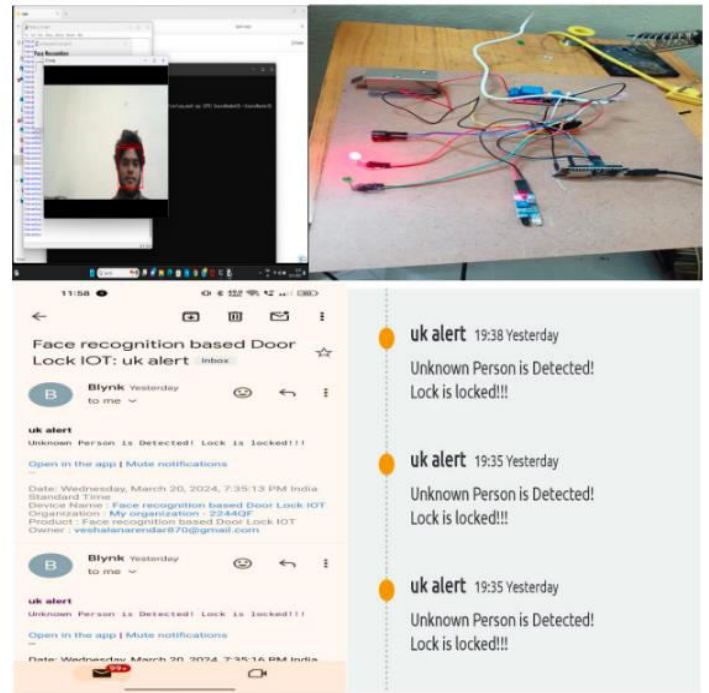
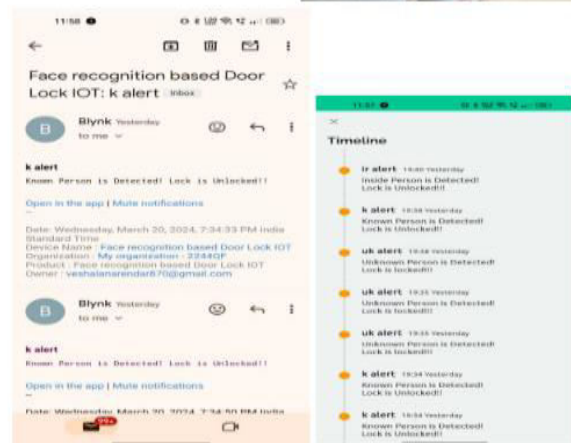
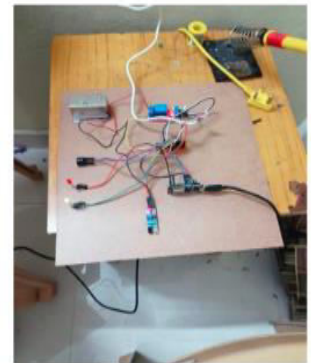


Fig.7. Unauthorized person detection

As seen in the graphic above, a warning is displayed if the face of an unauthorized individual is discovered.



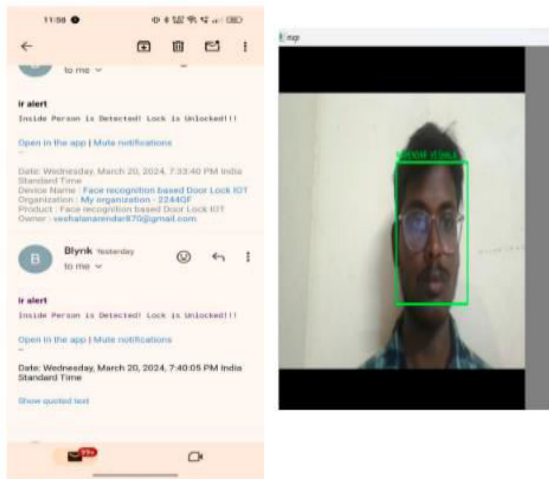


Fig.8. Authorized person detection

As seen in the illustration above, the door opens and a green block appears around the authorized person's face.

7. CONCLUSION

This research successfully developed a system for detecting faces in order to lock doors, which increases home security by monitoring the door's state. Now that we've reached the conclusion section, we can simply manage and compile the system we're working on. Our goal in creating this security-and surveillance-based system was to make our building impenetrable to would-be burglars and thieves. A person may unlock their door using their laptop's webcam, which captures photos of their face. Recently, CCTV has become widespread, although its main function is to provide a monitoring system. Given that people are already avoiding physical contact as a result of COVID-19, this is particularly useful for their safety, and we will be able to regulate break-ins and give a considerably stronger security platform (e.g., door lock after facial recognition) as a result. This method will lessen the necessity for physical interaction and the expense of employing personnel for safety

purposes. A system may be quickly and easily set up with little to no coding required.

REFERENCES

1. “ Embedded System Based Air Pollution Detection in Vehicles ” S. Arun, V. Siva Krishna, J.L Mazher Iqbal in International Journal of Emerging Technologies in Computational and Applied Sciences
2. Yamada, K. and M. Soga, A compact integrated visual motion sensor for ITS applications. Intelligent Transportation Systems, IEEE Transactions on, 2003.
3. Azrina Abd Aziz, Y. Ahmet S,ekercioglu, Paul Fitzpatrick, and Milosh Ivanovich, “A Survey on Distributed Topology Control Techniques for Extending the Lifetime of Battery Powered Wireless Sensor Networks”, IEEE communications surveys & tutorials, VOL. 15, NO. 1, FIRST QUARTER 2013
4. Sandborn, P.A.M. and P. Abshire. 2D motion sensor with programmable feature extraction. in Circuits and Systems (ISCA S), 2013 IEEE International Symposium on. 2013. [3] Kamnik, R., S. Stegel, and M. Munih. Design and Calibration of Three Axial Inertial Motion Sensor. in Power Electronics and Motion Control Conference,2006. EPE-PEMC 2006. 12thInternational. 2006. <http://invensense.com/mems/gyro/documents/RM-MPU6000A.pdf>.
5. Kosba, Ahmed E., and Moustafa Youssef. "RASID demo: A robust WLAN device-free passive motion detection system. "

6. Dipti Javale, Bharti Dixit ,Pankaj Javale, "Performance evaluation of wireless transmission using embedded system", IEEE paper, November 26 ,2009.
7. Flavia C. Delicato, Paulo F. Pires, Luci Pirmez, Thais Batista "Wireless Sensor Networks as a Service", 2010 17th IEEE International Conference and Workshops on Engineering of Co mputer-Based systems
8. X.Y. Chen & Z. G. Jin, "Research on key technology and ap plications for Internet of Things," Physics Procedia, vol. 33, pp. 561-566, 2012
9. Feng, X. & Laurence, T.Y.. 2012. Internet of Things. Int ernet of Things (2014), retrieved from Microsoft[ONLINE].