

# Face Recognition Door Lock System Using Raspberry Pi

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**Abstract**— In our daily life we are facing so many security issues in every aspect. By using updated technology, we have to resolve these issues. In this project, implemented a face recognition module for security purposes. By using face recognition, it will capture pictures of a person by utilizing the camera and that image is saved in the database of that. The picture is useful for unlocking the door. The lock on the door will be released when the person will stand ahead of the camera, the camera will verify the person's face if it matches the image already stored in the database then only the door will be unlocked. If the system cannot recognize the face, then that time the system will generate a warning message to the user. Face recognition is one of the most Secured Systems in biometric verification. At this time, going to implement a new technological environment, by seeing the worldwide basis, can see the increasing count of theft and fraud are significantly going on day by day in recent years. So, in this project, implemented new technology and develop the Face recognition Door Lock System using Raspberry pi. Raspberry Pi is smaller and lighter and it uses less power than a computer or a standard- PC for face recognition. So, project can be implemented with the Raspberry Pi module. Raspberry pi is a secured system once data given, cannot modify that data. It is more secure so used in this project. This project is not only used for home hold purposes, it's also used for banks, Hospitals, MNC companies, military purposes and taking attendance for students and faculty in colleges. By using this system, we can decrease the security issues in our daily life because it is the most securable system to get rid of thieves and frauds or other people around our society.

**Keywords**— *biometric, face recognition, raspberry pi*

## I. INTRODUCTION

Nowadays for us, security and privacy had become fundamental rights whether we are secure or not and everything became intelligent and become digitization. Because of this security has become more priority for us. And there is also a rapid increase in interest in the Face recognition Door Lock System. This system is a practical and affordable option for small establishments, residences, and other facilities because it utilizes the Raspberry Pi as its computer base. A low-cost, simple-to-use computer with open-source software, the Raspberry Pi is suitable for a wide range of tasks. It is now possible to create powerful face recognition systems on the Raspberry Pi thanks to the availability of machine learning techniques and frameworks like OpenCV and TensorFlow [1]. Using this face recognition door lock system, we can lock or open the doors using our phones or similar technology. And certain facial recognition algorithms have been created, like corselet transform algorithm also know that security is most important. Many people use security to protect their important things. one of the major securities to protect the things to lock the main door in our home. there are several ways to protect the things like fingerprint locker, voice recognition lockers and using normal keys to lock the door. So, our goal is to lock the door by using face recognition. In addition of the project, added the things like two pir sensors and servo motors it makes the project different to others. Traditional access control methods that rely on keys or cards are readily lost, stolen, or copied, putting security at risk. Access control can be handled more securely and conveniently with a face recognition door lock system powered by a Raspberry Pi [2]. And facial recognition spread across various fields and sectors that changed them completely [1]. Here the updated camera detects the image of a person and sends the image to the related database, so it checks the image to see whether it matches the admin or not. if it does not match, the alarm turns on and sends the message to the admin. This can be wonder how these things can be done. all these things are done in raspberry pi. usually, raspberry pi works on Linux and is available to all users is an open-source operating system. The Raspberry Pi will be

linked to the home control system. so that it can give the information required [3]. And, raspberry pi costs us very low, and of course, this provides and creates a lot of IoT solutions. The advantage here is the admin or owner controls the functionality of the door lock from anywhere in the world with the help of mobiles or laptops, which can improve the security system. The lock mechanism is physically turned by a servo motor to which the Raspberry Pi is attached.. The system can be controlled in a variety of ways, including through a web interface, and mobile applications [4]. For added convenience and security, the raspberry pi can be set up to communicate with other gadgets like security cameras and motion detectors. Overall, it is a flexible and affordable home security solution [5].

## II. LITERATURE REVIEW

For the past few years, there are so many industries working on projects based on the Internet of Things, big data analytics, artificial intelligence, and machine learning. Making something simple and lovely is the basic goal of all these enterprises. The main difference of this project is can be operating the door by using a mobile and servo motor can be use or Dc motor as per requirements. Here you can perform efficient and reliable facial recognition using a USB connection and an HD Webcam [4] and store them for future needs via cloud computing. In this project, implemented a securable system for detecting thefts and fraud. A facial recognition door lock system powered by a Raspberry Pi can assist in addressing the issues with conventional access control systems, offer a more safe and practical way to manage access control, and possibly enhance the general security of residences, workplaces, and other facilities. So, here developed a new technology for stopping these alerts in our daily life. The face recognition module is the most Secured System. Because nowadays finger bio-metrics also forgery by doing some types of surgery [5]. That's why here implementing face recognition, the face cannot be a forgery by anyone. In my survey about face recognition Door Lock Systems using the Raspberry pi project, many people can implement this project in different ways but also it cannot come out for daily use. Because they are using slightly complicated things for implementing that project. So, here we can identify that and can use some cheapest materials for helping poor people also. Facial recognition identifies who the visitor is and automatically opens the door if the face is identified in a stored database, or alerts the owner if not [4].

## III. PROPOSED SYSTEM

Safety is the most important factor today. Technology is advancing day by day in the world. Criminal organizations are also improving their technology to carry out their operations. So, to protect what's important, technology must be up to date. People use doors to lock their homes and protect important items in the house. There are countless ways to lock the door, such as bar-codes, fingerprint recognition, and keys. In this project, can access the door based on face data already stored in the Raspberry Pi. Used a Raspberry Pi to make this project because it's faster, takes up less space and has better performance than any other computer.

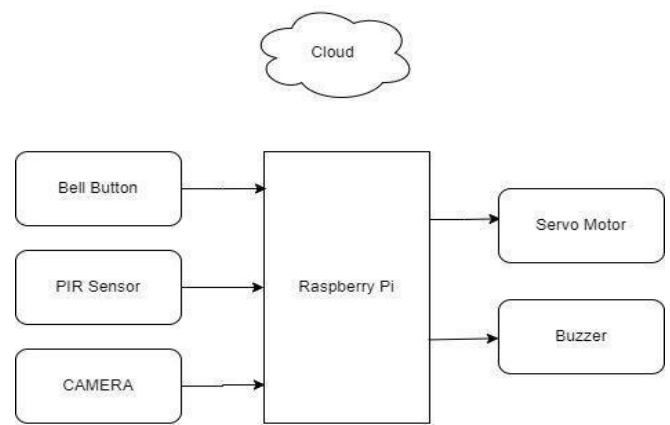


Fig 1. Block diagram of the project

If a person comes front of the door PIR will detect and camera will open and check if the person is known door will open and also notified to the owner when the person is unknown then raspberry pi will send the live images of the person to the visitor through g mail. If anyone want to do any project, need to implement on software by making of software project Proteus is the good thing to use.

In Simple words how the Components will be going to work

- **BELL BUTTON:** If a visitor presses the bell, then the buzzer will ring and an alert notification will send to the owner.
- **SERVO MOTOR:** It is used to rotate or flex the door or any object.
- **PIR SENSOR:** An electronic device used to determine if something is present or not a specific area. For the making of these projects, added two sensors inside and outside of the home.
- **RASPBERRY PI:** It will store the data of face images. If it matches then the door will open if not then it will perform the operation.
- **CAMERA:** It captures live images of the visitor after a human is detected by a PIR sensor.
- **BUZZER:** which makes some sound or noise when it detects any irregular activity.

## IV. REAL-TIME IMPLEMENTATION

If any visitor comes in front of the door and presses the bell switch then the raspberry pi camera will open and capture the image, check the visitor is a well-known individual or an unknown person. when the visitor is a known person then the PIR sensor will detect the human motion inside the home whether any person is present inside the home or not. If the visitor data was not stored in Raspberry pi.

If not, then the raspberry pi will send the live images of the visitor to the owner through the mail. The owner will identify whether the visitor is a known person or not. If the visitor is a known person, then the owner can operate the door using his mobile. So, this project can be implemented anywhere in the house.

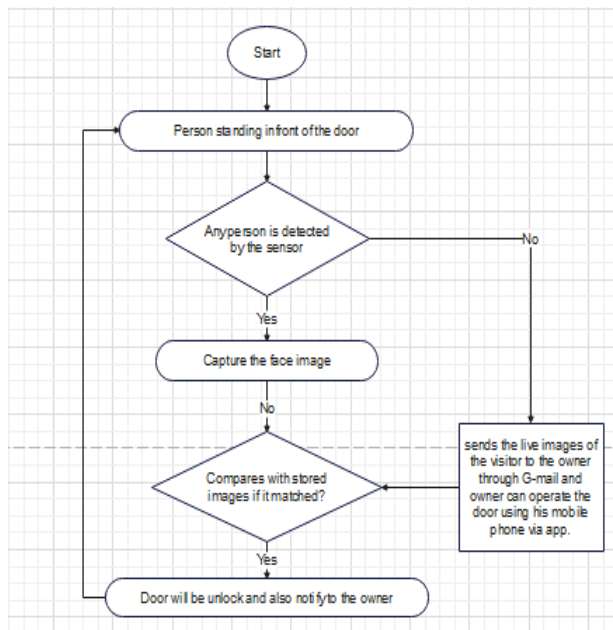


Fig 2. Flow of implementation Project simulation:

- If any visitor comes in front of the door PIR sensor will detect and LCD will display “welcome”

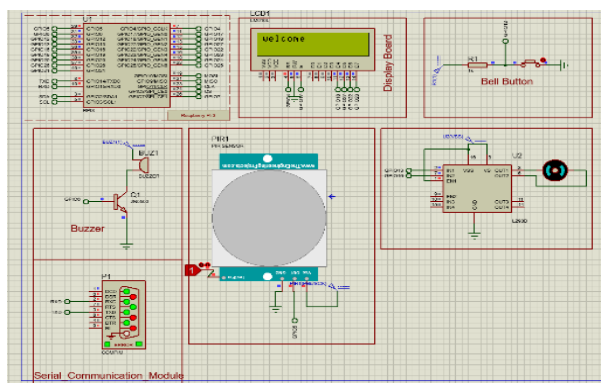


Fig 3. Simulation of the project LCD displaying welcome when switch is in on condition.

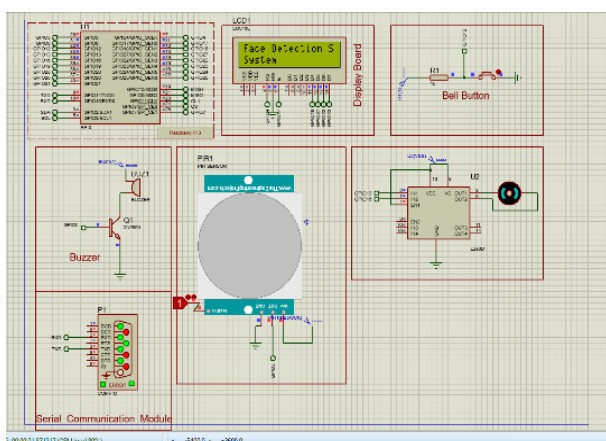


Fig 4. Simulation of the project switch is in on condition LCD Displaying Face detection system.

## V. CONCLUSION

Introducing face identification-based door lock system utilizing raspberry pi and GSM Module. It has designed a technique that provides users with reliable door locks which can provide easy and safe and energy efficient. At home, the, the bank and other public locations this technology can be used to authenticate IDs. A webcam, Raspberry Pi and relay and electromagnetic door lock were used in tandem to make this system. For face detection, the Haar cascade classifier approach was used and for face recognition, LBPH (local binary histogram) was used. Numerous operations have undergone successful testing with the outcomes being recorded.

## VI. FUTURE SCOPE

The advanced technique is economical and elements are highly obtainable. It is movable and comfortably expandable. By integrating the various sensors along with the advanced technique, many elegant applications such as home automation, Eagle visual surveillance, college hostel entry facility, and bank door security can be created.

- Many different things can be done with face recognition technology.
- These involve:
  - Phones unlatch
  - Enforcement of peace
  - Airports control
  - Finding lost people
  - Security
  - Sales and promoting
  - Medicare
  - Keep in a site of students or physical biometric
  - Identifying drivers
  - Keep an eye on gambling addictions
  - Improving retail experience

## REFERENCES

- [1] Swati Sahu, Prof. Vijay Sharma. Internet of Things Approach for Face Detection & Face Recognition. IJSRD - International Journal for Scientific Research & Development| Vol. 5, Issue 10, 2017 | ISSN (online): 2321-0613.
- [2] A tutorial Swati.P, V. D. Ugale2, Vishal. P, Aditya.P, Nikhil.P(2020), Review Paper Based on Smart Locking System for Illegally Parked Vehicle, IJRAR March 2020, Volume 7, Issue 1 ISSN 2348-1269, P- ISSN 2349-5138).
- [3] Analysis and Recognition in Image and Videos, Face Recognition using corselet transform, Project Report, Rami COHEN, Technion - Israel Institute of Technology, arXiv:1107.2781v1 [cs.CV] 14 July 2011.
- [4] W. ZHAO, R. CHELLAPPA. Face Recognition: A Literature Survey, ACM Computing Surveys, Vol. 35, No. 4, December 2003, pp. 399–458.
- [5] Varun Garg, Kritika Garg, Face Recognition Using Haar Cascade Classifier, Journal of Emerging Technology and Innovative Research (JETIR), Decem-ber 2016, Volume3, Issue 12
- [6] Anjali Patel, Ashok Verma. IOT based Facial

- Recognition Door Access Control Home Security System. International Journal of Computer Applications (0975 – 8887) Volume 172 – No.7, August 2017
- [7] Prof. Sandeep V, Guru Prasad Hegde. Face Detection based Locker Security System using Raspberry Pi. International Journal of Scientific & Engineering Research, Volume 7, Issue 5, May-2016. ISSN 2229- 5518.
- [8] R. Manjunatha, Dr. R. Nagaraja. Home Security System and Door Access Control Based on Face Recognition. International Research Journal of Engineering and Technology (IRJET). Volume: 04 Issue: 03. Mar -2017. E-ISSN: 2395 -0056.
- [9] Zhao and R. Chellappa “Robust face recognition using symmetric shape from-shading” Technical Report, Center for Automation Research, University of Maryland, 1999.
- [10] Priyanka G, Rachana J, Vijayalakshmi N, Abhisheka G S, Vinutha D C (2019), IoT Door Lock Security System using Google Assistance, International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN:2278-3075, Volume-9 Issue-2S
- [11] S McManus, M Cook. Raspberry Pi for dummies. John Wiley & Sons. 2017.
- [12] T S Gunawan, IRH Yaldi, M Kartiwi, N Ismail, NF Za'bah, H Mansor, AN Nordin. Prototype Design of Smart Home System using Internet of Things. Indonesian Journal of Electrical Engineering and Computer Science. 2017; 7: 107-115.
- [13] E Upton, G Halfacree. Meet the Raspberry Pi. John Wiley & Sons. 2012.
- [14] Zheng Xiang, Hengliang Tan, Wienling Ye. The excellent properties of dense gird-based HOG features on face recognition compare to gabor and LBP, 2018 volume issue 99.
- [15] D.chen, and H Jiu-qiang “An FPGA-based face recognition using combined 5/3 DWT with PCA method”. Journal of communication and computer, ISSN 848-7709, USA, \volume 6, no.10 (Serial No.59), oct.2009.
- [16] Zheng Xiang, Hengliang Tan, Wienling Ye. The excellent properties of dense gird-based HOG features on face recognition compare to gabor and LBP, 2018 volume issue 99.
- [17] E. Manjunatha, Dr. R. Nagaraja. Home Security System and Door Access Control Based on Face Recognition. International Research Journal of Engineering and Technology (IRJET). Volume: 04 Issue: 03. Mar -2017. E- ISSN: 2395 -0056.
- [18] Kuldeep Soni, Indian Institute of Technology Kanpur, June 22, 2014, ksoni@iitk.ac.in
- [19] Medak Teena Ravali, Prof. Rangasai Komaragiri “Image processing platform on raspberry pi for face recognition” Global Journal of Advanced Engineering Technologies, ISSN 2277-6370 Vol3, Issue4- 2014.
- [20] Keun-Chang Kwak and W. Pedrycz, “Face recognition using an enhanced independent component analysis approach in Neural Networks, IEEE Transactions on, vol.18, no.2, pp.530–541, 2007.
- [21] Anoop Mishra “Embedded Image Capturing & Digital Converting Process using Raspberry pi System interfacing and Comparison of Generation 2 verses Generation 1 models in Raspberry pi” et al, / (IJSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (2), 2015, 1798-1801.
- [22] K. Gopalakrishnan, V. Sathish Kumar “embedded image capturing system using raspberry pi system” international Journal of Emerging Trends & Technology in Computer Science (IJETTCS) Volume 3, Issue2, March–April 2014. WebSite: [www.ijettcs.org](http://www.ijettcs.org)
- [23] Paola Campadelli and Raffaella Lanzarotti, “A face recognition system based on local feature characterization” in Advanced Studies in Biometrics.
- [24] Khalimov R., Rakhimbayeva Z., Shokayev A., Kamalov B., Md. Hazrat Ali “Development of Intelligent Door Locking System Based on Face Recognition Technology”, 2020 11th International Conference on Mechanical and Aerospace Engineering 978-1-7281-8322-0/20/\$31.00 ©2020 IEEE.
- [25] Hema N. “Secure Home Entry Using Raspberry Pi with Notification via Telegram” 978-1-7281-5493 0/20/\$31.00 ©2020 IEEE.
- [26] M. amanullah, (2013), Microsontroller based reprogrammable digital door lock security system by using keypad & GSM/CDMA technology, IOSR Journal of Electrical and Electronics Engineering.
- [27] A tutorial on Principal Component Analysis, Lindsay I Smith, February 26, 2002.
- [28] Shaez. U.A, Adnan. I, Afhal. P, Aswin. P. K. (2015), GS M based digital door lock security system, International Conference on Power, Instrumentation, Computing And Control, 1109/PICC.2015.7455796.
- [29] Door Lock System through Face Recognition Using MATLAB, Ayushi Gupta\*1, Ekta Sharma2, Neha Sachan3 and Neha Tiwari4 \*1, 2, 3, 4 Kanpur institute of technology, Kanpur, India.