e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:04/April-2023 Impact Factor- 7.868 www.irjmets.com

DOOR LOCKING SYSTEM USING FACE RECOGNITION

Mr. Rishabh Mantri[*1], Mr. Rohit Kalveni[*2], Mr. Mayur Vishwakarma[*3], Prof. Amruta B. Kale[*4]

[*1,2,3,4]Dept. Of Electronics And Telecommunication, Sinhgad College Of Engineering, Pune, India

DOI : https://www.doi.org/10.56726/IRJMETS36730

ABSTRACT

Computer vision has become an extremely evolving field in recent years, addressing strategies for getting, processing, examining, and understanding digital pictures. Face recognition in pc vision encompasses a very important role to play in security and police work, and the mechanisms for increasing the protection levels square measure strengthening day by day. The present face recognition system has been increased by introducing associate degree anti-spoofing mechanism which can facilitate to prevent a villainous person to designedly get around with the system. The system is predicated on object detection and identity verification code developed in Python programming language. To implement this concept, a low-end embedded platform (Raspberry Pi) provided a basic programming package with the and the system provided a common level analog signal in response. It also demonstrates the potential of IoT devices such as the Raspberry Pi being used in this project.

Keywords: Computer Vision, Image Recognition, Embedded Platform, GSM, PCA, LBPH, Security Door.

I. INTRODUCTION

We live in the twenty first century wherever everything is most well-liked to be quick contactless and automatic. COVID has even additional accrued the necessity for contactless systems. Well, here we tend to propose a contactless button further as safety system mistreatment IOT for automatic travel recognition and alerting homeowner.

Biometrics is unique to an individual and is used in many systems that involve security. Face is one of such biometrics that has gained importance in applications like security systems, identification of criminals, control of door access, attendance, identity verification, emotion recognition etc... Face recognition can be considered as one of the most reliable methods for security check since it is non-invasive and can be done without the subject being aware of it. The face recognition algorithms can be grouped into three categories: Holistic, Feature-based and Hybrid. The complete face is taken as input data in holistic methods, whereas in feature-based approach, the local features are extracted first. Hybrid method is a combination of both these methods. Most of the face recognition systems available today work under controlled environment. Variation in lighting, pose, facial expression, occlusion, ageing, etc., are some of the key factors that greatly influence the accuracy and efficiency of face detection and recognition.

When it comes to home security, door lock is one of the aspects to be looked upon. Now-a-days door locks can be accessed using systems that are incorporated with fingerprint sensors, passwords, RFIDs, face recognition etc. Face recognition is best suited for this purpose since it can also be used to monitor who is at the doorstep. The proposed door lock system is based on face recognition. The door will open only if the face of the person in front of the door matches with the images that are already in the database. Our proposed system is posing and illumination invariant.

II. LITERATURE SURVEY

Hassan, Hernani. et al proposed security framework utilizing face acknowledgment in which programmed magnetic lock associated with microcontroller is utilized. GUI based face acknowledgment framework is created in MATLABA2009A that orders to microcontroller utilizing sequential correspondence to open or close the magnetic door lock.

J. Shankar Kartik et al. have proposed system in which system uses a webcam to recognize the interloper that was working by program introduced on the computer and it utilizes web for correspondence, if camera detect

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:04/April-2023 Impact Factor- 7.868 www.irjmets.com

movement of any gate crasher the recognition software will communicate to homeowner via Internet and simultaneously it gives sound caution and system will send SMS to the house holder.

G. Senthilkumar.et al proposed system that was taking images from camera Using Raspberry Pi and compared it from accessible database however the confinement was his model could not work appropriately in the poor lighting.

H. Lwin.et al. introduced an entryway lock system which comprises of three subsystems: face recognition, face identification and last is door entry. The recognition is done by using PCA algorithm. The entrance gate will open automatically for the authorized person and caution will ring for the unapproved individual. Restriction of this framework was taking pictures using webcam consistently until stop button is pressed.

CA. Athira.et al. proposed a security framework which uses face as the biometric trait. Authors used PCA provided with MATLAB package. At the point when the face was perceived, a SMS ready will be given to approved individual using GSM. The precision of the framework was simply 85%. The execution time was higher since the program was executed in MATLAB.

Meera Mathew.et al. proposed secure gateway locking system with multi-factor confirmation also used various method for encryption by using RFID, which can authorize the user. his main target was to structure and deploy an advanced security system that can be used in critical place where simply authorized persons can be entered.

Ibrahim Mohammad Sayem.et al. presented face recognition security system using IOT in which raspberry pi is used with camera module for input taking image and compared to dataset, OpenCV library were used in python for feature extraction. His proposed system was able to recognize person from poor image quality.

Jaiswal, Arvind. et al presented real time security surveillance system due to public security concerns in this system IP CCTV Camera is used, for extracting features from every person's face LBPH algorithm is used and Haar Case Cade for face detection.

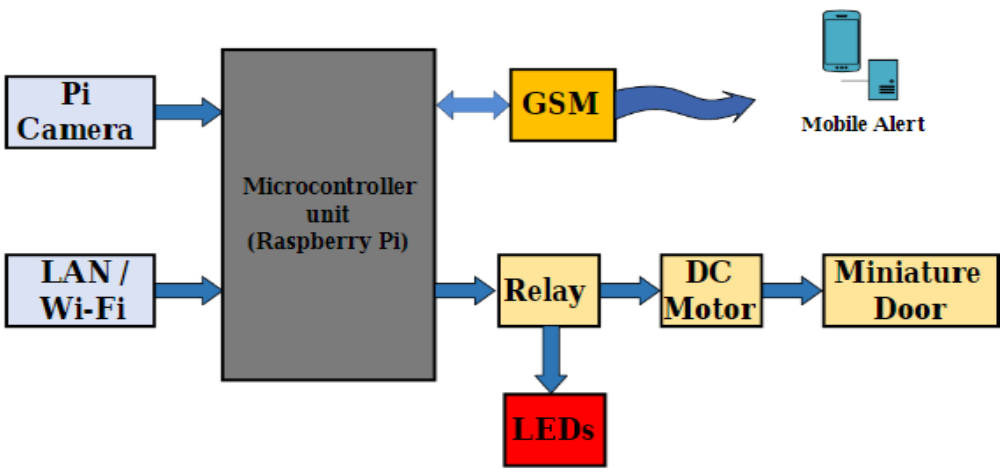
The existing methods mostly employ shallow learning algorithms which have been proven to not perform as good as deep learning methods. Moreover, the studies employing deep learning strategies mostly focus on a single tier recognition system. We prove in our ablation study that the single-tier recognition system fails to generalize the recognition performance when fake images or spoofed images from the Internet are used to gain the authorization access. In this work, we add another tier of security check in the form of discriminative learning strategy so that the diversified representation is learnt which can distinguish between the authorized and unauthorized users while dealing with spoofed images.

III. PROPOSED SYSTEM

1. DESCRIPTION:

We aim to develop a better method to implement proper image recognition system as well as how to transfer data from the hardware to the user's/owner portal via GSM, to achieve this goal we studied prior research on this subject. Face detection and face recognition can be performed using several algorithms.

2. BLOCK DIAGRAM OF PROPOSED SYSTEM



e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:04/April-2023 Impact Factor- 7.868 www.irjmets.com

IV. METHODOLOGY AND DISCUSSION

The block diagram shows how all the sensors are going to work together to control the face detection process. It shows how the flow of data should be throughout the process.

The Microcontroller Unit during this diagram i.e., RASPBERRY PI is that the brain of whole design because it connects each a part of the project with one another. The person who arrives outside the door, his/her image is captured victimization the Pi Camera.

Then that image is checked within the info that the owner has already created. This all is completed through the GSM module. If the image matches with the prestored image within the databases, then through raspberry pi the message is distributed to relay module to open the door. And if the image doesn't match them the message can move to the owner through the portal.

Then the owner can have full authority regarding what to try and do, whether to permit the person or not and consequently, save that person's information within the prestored info.

Algorithm Used:

Face Recognition: Local Binary Pattern Histogram (LBPH) The LBP algorithm assigns the pixels of an image with binary values by comparing each pixel with the neighbourhood. Suppose that we are interested in calculating the LBP value for the pixel. Local Binary Pattern Histogram (LBPH) algorithm is illumination invariant. If the lighting condition of the scene is changed, all the pixel values will vary but the relative difference between the pixels will remain same making the algorithm illumination invariant.

V. SYSTEM ARCHITECTURE

Figure below illustrates the system architecture of face recognition-based door lock system. The image of the person standing in front of the door will be captured by the camera. Then this image will be compared with the images in the database. The door will open automatically only for authorized access i.e., only if the face of the person matches with that in the database. If the face of the person does not match with images in the database, the system will conclude that the person at the doorstep is an intruder or trespasser, and the door will remain closed. The image is captured using webcam and all the processing is done in the laptop. As discussed LBPH is used for face recognition.

VI. IMPLEMENTATION

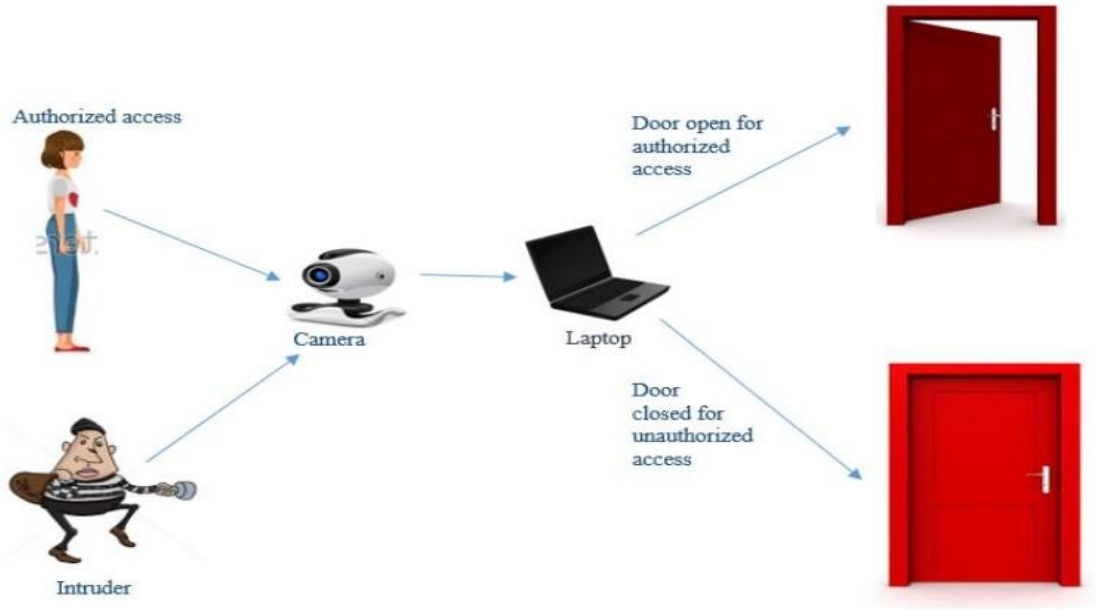


Fig 1. gives the steps carried out to perform face recognition.

1. The database is created which will contain the images of the persons to be recognized.
2. The features are extracted, and the system is trained using it.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:04/April-2023 Impact Factor- 7.868 www.irjmets.com

3. When an image is input to the system, first it checks whether the image contains any face with the help of face detection algorithm.

4. The features of the face are extracted and given to recognizer/ classifier.

5. The recognizer based on the input from the trainer and the features of the input image will recognize the face.

The flowchart for face recognition is depicted in Fig. (b) Initially images of the person to be recognized are captured and database is created. When the system is switched on, the camera is initialized, and images are captured, and face detection is done. The detected face is compared with the images in database.

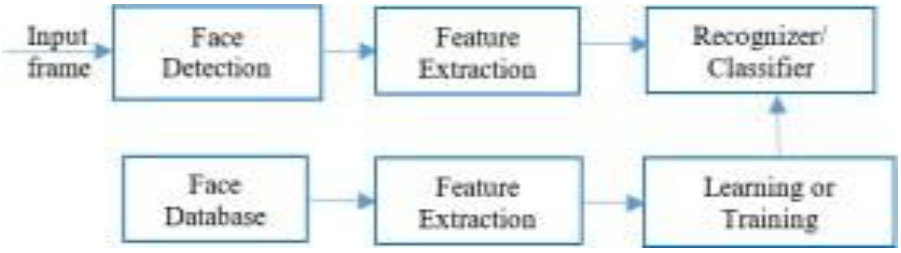


Fig 2. Face Recognition Workflow

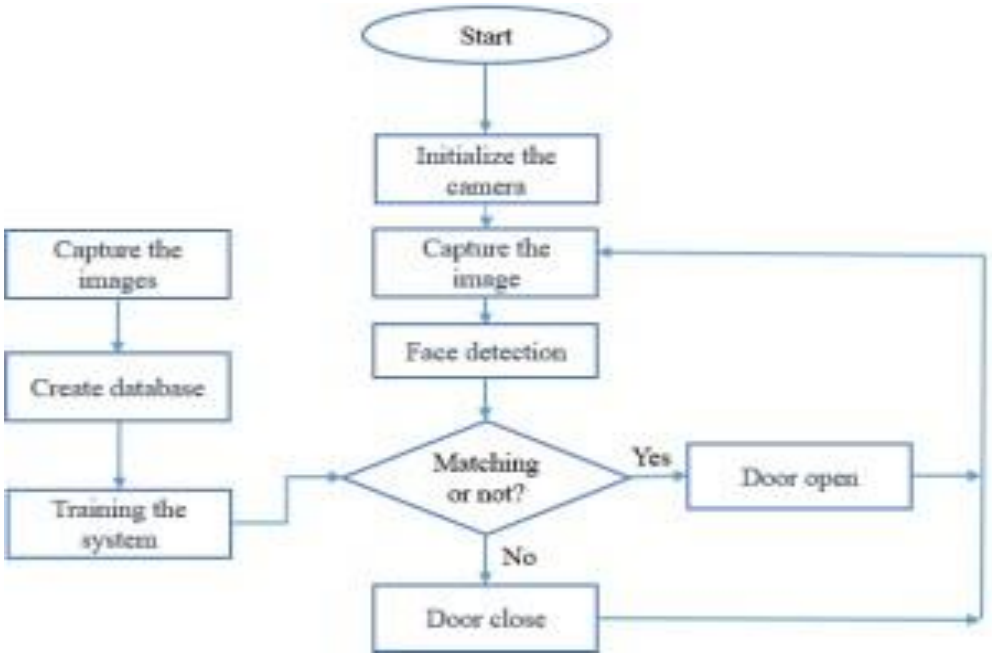
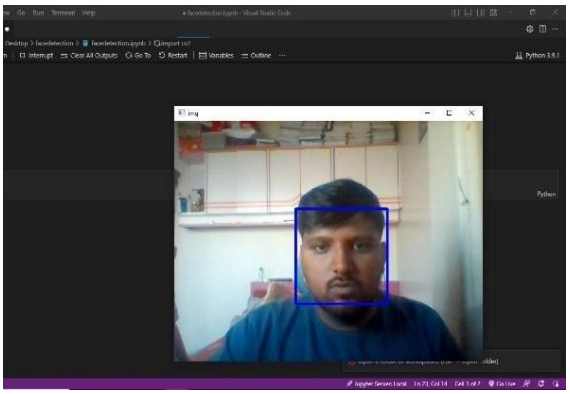


Fig 3. Flowchart

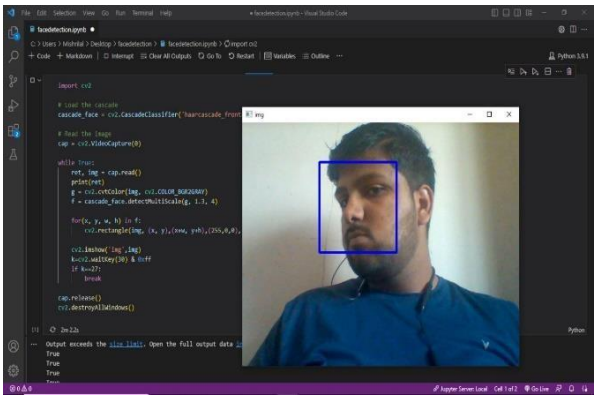
VII. RESULT

The experimental results show that the system detects and recognizes the face for different pose and illumination variations. Using LBPH for face recognition helped in achieving a good result in terms of recognizing face at varying lighting conditions since LBPH is inherently illumination invariant. Pose invariant system has been achieved by training the algorithm by feeding the database with images of person with varying pose, so that the system is capable of recognizing faces with different head orientation up to ±45° (along Z axis).

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:04/April-2023 Impact Factor- 7.868 www.irjmets.com

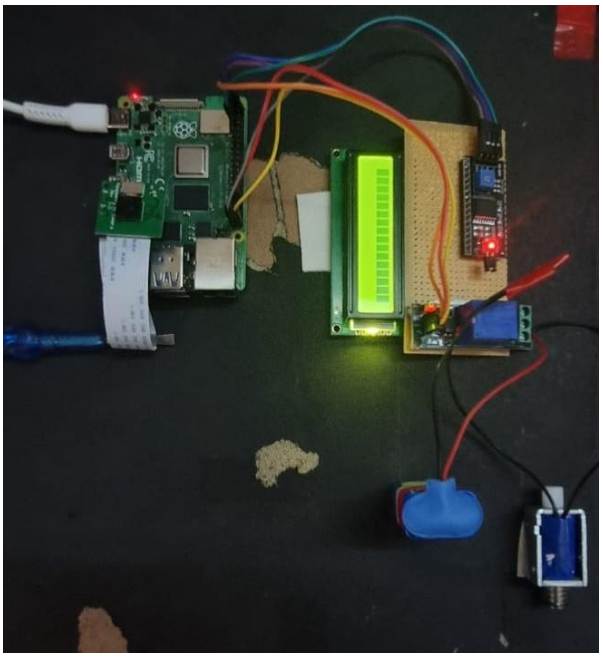


Face recognition for frontal face

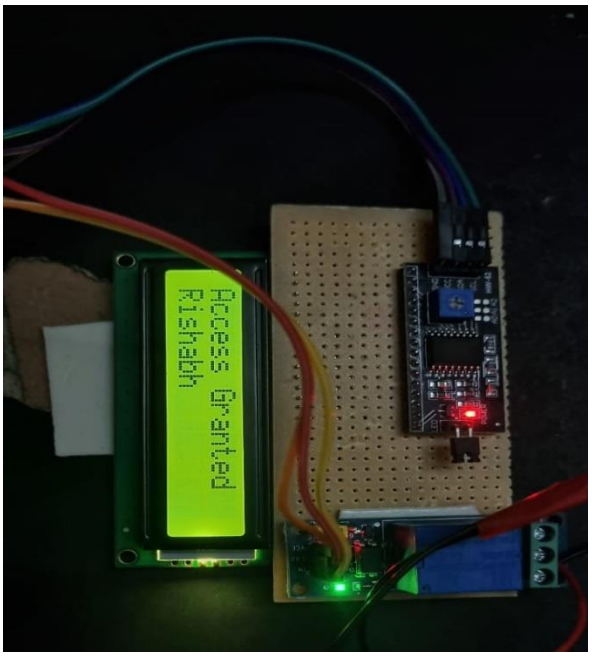


Face recognition for profile face

The result of our project is that with recognition of stored images in the database after recognizing the face the door lock will open. If any other person comes to the home whose image is not stored in the database, that time the image of the person will get captured and sends the image to the user portal. Also, it saves all the entries of the person that is given access, in the CSV file or Excel form with the time of their entry.

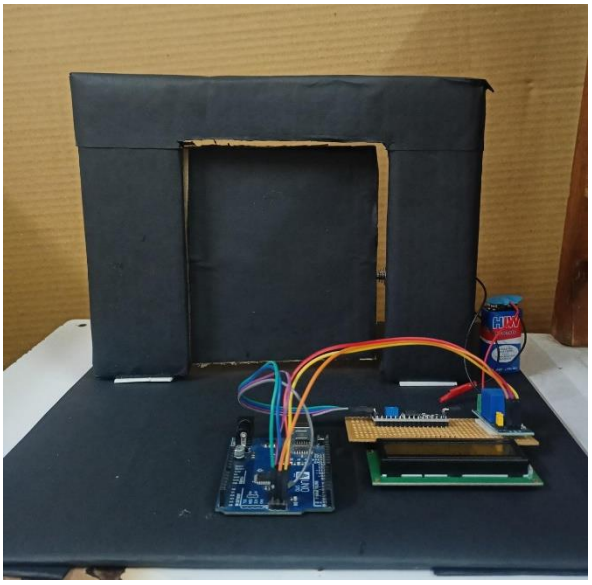


i - Hardware setup of the system



ii - Access Granted to the identified person.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:04/April-2023 Impact Factor- 7.868 www.irjmets.com



iii – Prototype of the system.

iv – Side profile of the project

VIII. CONCLUSION

This work has demonstrated the effectiveness of working with the Raspberry Pi to implement an initial version of a low-cost embedded facial recognition system for controlling an electromagnetic lock using deep learning techniques. However, the implemented system can be improved not only based on the purpose described on this work, such as an even more reliable facial recognition with a lower error rate, and implementing a more robust face spoofing detection algorithm such as the one presented in. Extra biometrical parameters for access control, such as voice authentication, can also be incorporated to increase security for authorized only personnel.

As future work, the face database should be enhanced by adding new instances. Other more powerful low-cost embedded processor such as the ODROID-N2, the new Raspberry Pi 4 B, or the Nvidia Jetson Nano will also be tested as the core of the facial detection and recognition system for increasing the FPS rate and implementing more complex networks for object detection and face detection in the embedded system. Finally, a separate test to prevent spoofing and an in-depth study about the limitations of the low-cost components (i.e., camera resolution, settings, etc.) should also be carried out to mitigate their impact on the system's performance.

IX. REFERENCES

[1] A. Purushothaman and S. Palaniswamy, "Pose and Illumination Invariant Face Recognition for Automation of Door Lock System," 2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT), 2018, pp. 1105-1108, doi: 10.1109/ICICCT.2018.8473103.

[2] V. Pandit, P. Majgaonkar, P. Meher, S. Sapaliga and S. Bojewar, "Intelligent security lock," 2017 International Conference on Trends in Electronics and Informatics (ICEI), 2017, pp. 713-716, doi: 10.1109/ICOEI.2017.8300795.

[3] A. Nag, J. N. Nikhilendra and M. Kalmath, "IOT Based Door Access Control Using Face Recognition," 2018 3rd International Conference for Convergence in Technology (I2CT), 2018, pp. 1-3, doi: 10.1109/I2CT.2018.8529749.

[4] M. Waseem, S. A. Khowaja, R. K. Ayyasamy and F. Bashir, "Face Recognition for Smart Door Lock System using Hierarchical Network," 2020 International Conference on Computational Intelligence (ICCI), 2020, pp. 51-56, doi:.1109/ICCI51257.2020.9247836.

[5] S. Jahnavi and C. Nandini, "Smart Anti-Theft Door locking System," 2019 1st International Conference on Advanced Technologies in Intelligent Control, Environment, Computing & Communication

Engineering (ICATIECE), 2019, pp. 205-208, doi: 1109/ICATIECE45860.2019.9063836.

[6] M. Sahani, C. Nanda, A. K. Sahu and B. Pattnaik, "Web-based online embedded door access control and home security system based on face recognition," 2015 International Conference on Circuits, Power and Computing Technologies [ICCPCT-2015], 2015, pp. 1-6, doi: 10.1109/ICCPCT.2015.7159473.

[7] Aamir Nizam Ansari & Mohamed Sedky "An Internet of Things Approach for Motion Detection using Raspberry Pi", Proceedings of 2015 International Conference on Intelligent Computing and Internet of Things, May 2015.

[8] Ying-Wen Bai, Li-Sih Shen and Zong-Han Li "Design and Implementation of an Embedded Surveillance System by Use of Multiple Ultrasonic Sensors", IEEE Transactions on Consumer, Volume: 56, Issue: 1, February 2010.

[9] Ying-Wen Bai, Zi-Li Xie and Zong-Han Li "Design and Implementation of a Home Embedded Surveillance System with UltraLow Alert Power", IEEE Transactions on Consumer Electronics.

[10] Prathamesh Timse, Pranav Aggarwal, Prakhar Sinha, Neel Vora, Face Recognition Based Door Lock System Using Opencv and C with Remote Access and Security Features, Int. Journal of Engineering Research and Applications, Vol. 4, Issue 4(Version 6), April 2014, ISSN: 2248-9622.

[11] https://ieeexplore.ieee.org/document/9247836

[12] https://ieeexplore.ieee.org/abstract/document/9785217

[13] https://ieeexplore.ieee.org/document/9632928