

# SURVEY ON INDOOR INTRUSION DETECTION AND FILTERING SYSTEM

**1<sup>st</sup> Elumalai Govindarajan**  
Professor, Dept. of ECE  
Panimalar Engineering College  
Chennai, Tamil Nadu, India

**2<sup>nd</sup> Madhumita Kamaraj**  
UG Student, Dept. of ECE  
Panimalar Engineering College  
Chennai, Tamil Nadu, India

**3<sup>rd</sup> Harithaaa Srinivasan**  
UG Student, Dept. of ECE  
Panimalar Engineering College  
Chennai, Tamil Nadu, India

**4<sup>th</sup> Akshaya Nandakumar**  
UG Student, Dept. of ECE  
Panimalar Engineering College  
Chennai, Tamil Nadu, India

**5<sup>th</sup> Madhumitha Raja**  
UG Student, Dept. of ECE  
Panimalar Engineering College  
Chennai, Tamil Nadu, India

**Abstract**—In the world of technology, IoT is being used in all fields. The growing world becomes smarter and smart home are emerging faster. The latest technology in smart home is smart door lock system. This technology is also used in industry, hospital etc. The purpose of this technology is to provide security to the users and feel themselves secure. The aim of this project is to provide door automation technique more extensive. This project has been enlarged using embedded and android phone. When the door bell is pushed, the pc will capture the image of a person and sends the pictures to the owner's mobile phone using telegram chat bot. The programming has been established in embedded c for controller and python had been used for system programming. In addition to this we have also used PIR sensor to detect the motion during night times at the backyard. This project also contains SOS button to send the details of intrusion to the nearby police station.

**Keywords:** *IoT, Telegram, PIR Sensor, GSM Module, Arduino, python, Security.*

## I. INTRODUCTION

In today's world scenario, smart door lock system is emerging with multiple technologies and works under different algorithms. Here the technologies refer that fingerprint, iris recognition, password set up, etc. But these techniques tell the common thing that is presence of authorized person [known or owner] to access it and use it accordingly. In Fingerprint, iris recognition, these all comes under a kind of genetic algorithm where presence of authorized person to use their fingerprint impressions to access it and while considering the iris recognition, it also states the appearance iris shape or other features in eyeball. Then the next technique is password where even unknown person can also access by using password. So from these analyses the next level of technique that has been introduced for even more compact and easily accessible, that technique is face recognition and detection. In this method there are certain algorithm plays a vital role where it various based on accuracy, speed, etc. Here, both Face detection and Face recognition algorithms can be trained on large datasets of labelled images to improve their accuracy and performance.

These technologies involve certain domains and this proposed system integrates with many fields like embedded system, image processing, Artificial intelligence, IOT& Cloud, etc. Embedded systems are specialized computer systems designed to perform a specific task. They are used in various applications, ranging from simple home appliances to complex industrial machinery. These systems are designed to be highly reliable, efficient, and cost-effective. An embedded system typically consists of three main components: hardware, software, and a user interface.

Image processing is a field of study and practice that focuses on manipulating and analysing digital images. It involves using mathematical algorithms and computer-based techniques to enhance, transform, and analyse digital images. Image processing algorithms is divided into two types low-level and high-level. Low-level algorithms typically focus on enhancing or filtering the image by adjusting brightness, contrast, and sharpness, among other factors. High-level algorithms, on the other hand, are more complex and focus on extracting meaningful information from the image, such as object recognition, edge detection, and texture analysis.

Artificial Intelligence tell about the capacity of machines that performs various activities that typically needs human brain power level that recognise speech, managing proper output, and learning from experience. AI can be seen in vast field that comprises different methods such as machine & deep learning, and NLP, among others. These techniques enable machines to analyse huge information, analyse cues and forecast based on given information.

Machine learning, for example, involves training machines to recognize patterns and make predictions by feeding them large amounts of data. Deep learning is part of machine learning which uses NN method that complicates the patterns involved in data, such as images or sound. IOT devices are typically equipped with sensors, processors, and communication hardware that allow them to gather and transmit data, enabling them to be monitored, controlled, and optimized remotely. The information that is collected by IoT devices can be analyzed and can convey valuable insights that can be used to improve efficiency, reduce costs, and enhance the user experience.

## II. LITERATURE SURVEY

The movement occurred in front of camera is detected using motion detection sensor. This will be programmed by using python. Here, it tells about the system model that is associated with raspberry Pi that leads to advantage like low cost, etc. The components used here are win sound library, Opencv2 and tracker. Opencv2 is used in the detection of movable objects. When the movement is detected, it triggers an alarm. The motion of Object is detected using tracker and win sound library. Here in case if user is using embedded board for monitoring the actions of objects that are detected by using HDMI output or video streaming can be done in web server. [1]

This is a security system with face recognition method. It is mainly done with Raspberry pi. Eigen face and Principal Component Analysis are used for feature extraction and classification are the main algorithm used here. This works

through the magnetic lock which is present in the door. It captures live video for verification purposes. After verification it is decided whether to open the door or not. This is done using python. [2]

Here the intruders are detected from video sequences that will be stored in database where these techniques can be implemented using NN model. The requirements are used here is OpenCV, Caffe model, Python and numpy and these are involved in detection phase. The intruder are identified using image processing and NN model and then it will send video clipping to the authorized telegram chatbot to govern it. [3]

This system includes a motion detection sensor to sense the movements in front of the camera. This movement leads to ringing of doorbell. Motion sensor works as an alarm in emergency such as fire explosion. The guest can communicate to the owner on ringing the doorbell with the help of microphone. Here Arduino IDE is used to activate the sensor. The data is verified and the new set of images is saved for the verification of the owner. [4]

Face recognition where image are processed using MTCNN technique, then this captured image undergoes deep NN algorithm related to extracting facial features that converted to 128 dimensions vector. Here embedded vector forecasts the features of facial image of the person that is already stored in database where it is titled with their names. Here it also uses triplet loss, SVM concepts for easier identification. Here the dataset it consist of staff details and if any malicious act is executed the following were displayed classification based on program computed into classes a, b, unknown; access time, date; staff in on duty or not; picture of them. [5]

Human face detection is done on analysing the texture. For recognition of face they use Histogram of Gradients and Support Vector Machines. To ensure whether it is a live video, we use a mechanism known as blink detection mechanism. Here they use Raspberry pi with python including libraries like OpenCV and NumPy. [6]

The algorithm involved here is FPGA, hardware architecture, face detection, Haar classifier. To improve the efficiency and working speed during face detection that will remove excess iterations. When distinguishing the proposed system and conventional Haar classifier for identifying the face appeared using video graphics array image establish thirty face pictures in different position by improving its processing speed by 4.46% and even accuracy.[7]

Connected devices utilise Wireless Fidelity (Wi-Fi) to activate the smart door lock. With the help of software, the door can be accessible to certain limit and even in this methodology the information can also transmit. From this it conveys that user can manage this system within specific range.[8]

It is a smart door mechanism which works on the condition of RFID. Here only the authorised user can open the door without any permission. The GSM module and GPS(SIM 900) adds extra security for the system. It alerts the owner with voice notice and text message. The activities of the door are controlled by the owner by sending message to the board. [9]

The protractible security system is access. The major activity for this system is strengthening accessibility and dependability techniques. The house owner can monitor the presence of any intruder through mobile apps and even can see the mechanism of appliances, machinery, etc. The house owner can fix certain a period of authority to access the door,

by providing individual with short-term access. At the same time they can detect the activities of the person. [10]

It works on face recognition and face detection mechanism. Once face is detected, it undergoes face recognition mechanism which will compare with the extracted facial expression and if it is found same with the stored data, the solenoid will be move to on position or else it will move to off position. [11]

This system consists of face recognition and smart door lock. Deep learning is used for face detection whereas internet of things is used for door access. Raspberry Pi is used for controlling the system. It is known as small computer board. A camera is placed on the door to capture a picture of the guest for the verification of the owner so that the owner can check and grant permission to access. [12]

The paper involves security system. Raspberry Pi is used for the working of the system. Here we can capture images and record video. Incase of any suspicious of intruders , an image is captured and sent to the owner. Simultaneously an alarm is ringed to alert the owner. The recorded video is stored in an SD card for future evidences. It involves testing process like unit, system testing. [13]

The Security Approach based on Filter Execution (S.A.F.E.), it comes under the category of intrusion detection system that tells about identification processby executing the command and report filters. Establishing this method, it tellsabout a report filter modelling, optimization algorithms that speed ups by computing the detection indicators and accomplishing this on a real testbed. It also helps from preventing certain attacks like direct, sequential, temporal, over-solicitation. [14]

Any movement is detected in a confined place then the camera will arouse and starts to capture the unknown or intruder image and analyse it and verifies with the information that are located in database. If verification status not found mean leads to produce alarm system and sends email notifications to the authorised person. This information is gathered with raspberry pi processor that is programmed with java script. [15]

Facial recognition is done using CNN. Convolutional Neural Network is easy to implement and gives good accuracy. It is also used in object recognition system. Especially the Convolutional NN Alexnet facial recognition system is used in the door lock. The data's ate collected and stored for later use. The stages and process of working takes place: Homeowner face data collection, Training model , system implementation, person suspected to be an intruder if he/she not in the data collection list then it will notify the house owner by sending email and buzzer alert. [16]

The security for door lock systems allowing the smart phone controlled and to detect the buildings in Arduino UNO with Bluetooth connected system. Users can introduce close or open type door lock system in some Android applications like laptops, smart phones and tablet. Known person will login and use the verified database through the internet. The Buzzer rings when the expertise is valid and SMS alert is sent to the householders. [17]

The concept has intelligent door pop up. In Smart door bolt, there are many methods are used to unlock the door like smart card scanner, biometric (finger, palm, DNA, iris, Face), specific code, etc. from all this the face recognition is one which gives access with the door without touching anything and also gives more safety. Using face recognition in a security system will give good results in multiface detection

and stranger identification which are the most prior requirements that come under our home security. [18]

The system workflow is divided into three sectors face recognition, password Security and alert system through GSM module. During face recognition phase the iterations are decreased using LBP. The circuit operation consists of raspberry pi, can use web camera or pi camera for face detection and face recognition. Here suppose if we are accessing web camera that will be 16MP interpolated resolution and will plug and play with USB interface that will be integrated with Raspberry pi. [19]

This system works based on algorithm like HOG and SVM where its main purpose is to recognise and identify the presence of intruders or object, etc. Here it includes hardware components like raspberry pi 3, Arduino, PIR, webcam, etc. Here the inputs are received from sensors and considering the captured image as input so it is used in detection phase. Another sensor, PIR that helps in detection any kind of actions or movement around the restricted place. If it is found to be dubious then it will trigger the alarm system and alert information will be sent through email. [20]

Raspberry pi B3, PIR sensor, camera module, Wi-Fi module and telegram app are used in certain unit security purposes to implement. The telegram chat bot uses to know the person's who's arriving home and known persons have an accessibility to send message to Raspberry pi and unlock the door. This plays a major role in security networks so that Raspberry pi could not be hacked. The good network security and additional security is deals with SSH key and Fail2ban. [21]

The format of this mechanism is instinctive opening& closing door mechanism, activates the alarm system, capturing and transmitting the image and notification generates to an email for an unknown person or an intruder. This showcase standardised achievement in all features while testing. The minimum neighbour threshold and the detection threshold is more important in changing the order. These informs about testing motive. [22]

Mechanical design, electrical design, desktop software development and Arduino software development are the four steps in this mechanism. This also known construction design prototype tool is building in arrangement of building components. Second comes electrical designs an ATmega328 is based on Arduino microcontroller this includes the components. That is solenoid lock, power supply and LED lights that include transistors and resistors. Third one is the desktop software development. It must be connected by Microcontroller. Successively data is sending to the microcontroller through the first order. So it will save the face image and opens the door then sends a signal to a microcontroller that will help to open the door. Admin tables, dataset tables and log tables are the three tables. Admin table is used for authenticating purposes like username and password. Data set table is used to store person details, identity.. [23]

Message Queuing Telemetry Transport cloud is used as the communication barrier between door lock system and connected devices is the main idea to implement this effectively. PIR sensor is performed in the smart door lock to discover the motions that is close to the door. Here detecting sensor is located on the door where its role is to detect the person's hands. In case, if door is opened then alarm will triggers and sends alert message to the authorised person. [24]

The face recognition is integrated with the domains like artificial intelligence, machine learning and image processing

with rapid increase of information that leads to increase in efficiency of the system. The workflow of the system is using different methodology using various kind of machine learning that leads to security purpose, segregation in case any of unknown person is well known for authorised person and this leads to send alert messages to authorised person to access door mechanism. [25]

### III. PROBLEM IDENTIFICATION

As from analysis of different papers that are stated in this survey there are certain features are useful based on algorithms but for each algorithm there is some kind of lack in accuracy, speed in any of the cases during working analysis. Then other problems also exist like continuously capturing images even if person crosses or visible to the camera that leads to multiple pictures to capture that leads to storage issues in connected devices for accessing. Necessity of developing new application for accessing this system where it requires certain kind of network band to access it appropriately.

### IV. CONCLUSION

On analysing the above problems, the existing system provides accuracy, speed, delay process differs based on different algorithms. The solution will state a certain set of algorithm like Haar classifier, LBPH, Fuzzy logic where these algorithm are integrated together and produce output even more accurate, faster and effectively. System is proposed by combining face detection with PIR sensors and GSM module alerts, allowing users to receive real-time notifications of potential intruders. The system offers several advantages over existing home security systems, including its ability to recognize and detect intruders using face detection technology, and its integration with a Telegram chat bot for easy access of the user. The system also has the advantage of being customizable, allowing users to modify and adjust the system to meet their specific needs. This is a promising solution for enhancing home security and protecting against intruders. With further development and refinement, this system could offer significant benefits for homeowners, other industry purposes, etc.

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