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HOME SECURITY SYSTEM USING FACE DETECTION

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ABSTRACT

Design and Implementation of an IOT Networked Contactless Doorway Security System for Remote Monitoring and Control Using ESP32-CAM and a Cloud Server is the project that is being reported on here. When inside or outside of their houses, people seek security wherever it is possible. An anti-theft system is a tool or technique used to stop or discourage trespassing or unlawful entry within its coverage area. The system that was put into use was created using both hardware and software. It is a distinctive security system built with inexpensive wireless cameras and sensors that allowed for remote control and monitoring of doorways. The system empowered the user to monitor the doorway by capturing images using a high performance wireless camera i.e. ESP32-CAM connecting other devices and sensors in an IOT network.

Keywords: *Arduino UNO, Components ESP32-CAM, LCD Display, Relay Module,Solenoid lock, Voltage regulator, UART TTL Programmer.*

1. INTRODUCTION

The research that was done here gave insight into how IOT systems are being developed. In recent years, multidisciplinary growth and progress have been seen in the Internet of Things research field. The Internet of Things (IOT) is the interconnection of physical objects such as furniture, machinery, buildings, and other things with electronics, software, sensors, actuators, and network connectivity that allow them to gather and share data. The Internet of Things (IOT) is made up of the conventional domains of embedded systems, wireless sensor networks, control systems, and automation systems. The revolutionary success of mobile and the internet network is therefore built upon by the internet of things. A person can be recognised exactly by their distinctive facial features. Nowadays, employing biometric information instead of cards, passwords, or patterns has become commonplace for automatic person identification in access control. The majority of biometric data must be gathered using specialised equipment like fingerprint scanners, palm print scanners, DNA analysers, etc.

However, there are some benefits to facial recognition in this particular field. In that onedoesn't have to touch anything in order to be identified or recognised, it is hassle-free.

Face recognition technology is thus one of the areas in biometry that is expanding the fastest. The rise in business interest and the creation of technologies that can enable the developmentof facial recognition are to blame for the current surge in interest in this technology.

Biometrics, law enforcement and surveillance, human-computer interaction, multimedia management (such as the automatic tagging of a specific person within a collection of digital photographs), smart cards, passport checks, criminal investigations, access control, etc. are major areas of the commercial use of face recognition. However, due to several erratic features of a human face, face detection can occasionally be difficult. For instance, spectaclesand a beard will impair the precision of the detection. Additionally, varied lighting types and angles will produce uneven brightness on the face, which will affect detection.

2. LITERATURE REVIEW

The face detection framework utilising Principal Component Analysis has been proposed by the authors [1]. (PCA). The system is quick and effective, but MATLAB, which was used to run the algorithm, requires a lot of memory and computing power. As a result, it is expensiveand has a slow processing speed. We use the more effective Linus Base Operating System.

Raspberry-pi was used to implement the embedded image-taking system by Senthilkumar et al. [2]. In this study, a photograph was taken and compared to a database, but there was an efficiency issue due to the low light conditions. Results are 95% accurate when we compared a specific image to 500 Database. The system based on IoT was proposed by Sowmiya et al. [3]. They employed a PIR (passive infrared) sensor and camera in this framework. PIR sensorwas used to identify people, and Table 1's camera was used. We are creating a system that cantransmit messages on Number in addition to Telegram. In place of traditional telegraph, Karri and Daniel's proposed GSM-based telegram-based system would transmit notifications to the home's

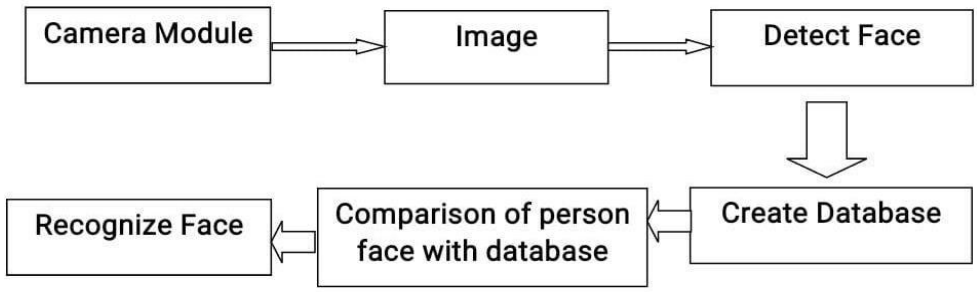
owner. For instance, spectacles and a beard will impair the precision of the detection. Additionally, varied lighting types and angles will produce uneven brightness on the face, which will affect detection. For unlocking doors, Jayashri and Arvind successfully created finger authentication. Unauthorized persons are prevented by this mechanism, which may be observed. This system has additional safety features including gas and smoke leak detection. It could be expensive and expensive to some extent to scan fingerprints. Because fingerprint seniors are simple to duplicate, some experts believe it is not a good idea to rely solely on them. This drawback can be overcome by using a PIN password, voice detection, or any other mechanism. The facial recognition system proposed by Dwiet et al. [6] makes use of the MyRIO 1900 controller. The controller contains a facial detection programme. The result is shown on a personal computer, and programming is done using Lab VIEW. The MyRIO module's high price is the issue, though. We utilized, which is inexpensive and simple to use. A system of home security employing the TI-CC3200 Launchpad board, which leverages Wi-Fi and the internet to control and monitor home appliances, has been proposed by Kodali et al. [7]. The TI-CC3200 Launchpad board's restriction is that it has less memory, computingpower, and functionality than the Raspberry Pi.

Problem Statement:

All people now have a room of their own where they keep their possessions with the aid of locks to prevent intrusion into their private or personal property, but these locks have many flaws, including easy penetration, insufficient security, and the challenge of escaping a lock-in. A facial recognition anti-theft system is ideal for addressing security concerns and providing versatility for smart home control.

3. PROPOSED METHODOLOGY

Block diagram:



Description of Proposed System:

The proposed system for real-time face detection and face recognition is shown in Fig it can be categorized into five sections: Face Detection, Creation of a data set of

The individuals, Training the classifier, Recognition of the face in the stored data set and theIOT. The complete working flow of the proposed system is shown in Fig.

Face Detection:

We will first put the camera to the test in this part. A person approaches the camera. The frontal face of the subject will be captured by the camera. The algorithm is then used to identify the person's face. We apply the Haar Cascade method. This classifier is employed to find the things for which it has previously received training. It works well for detecting objects. A collection of both positive and negative images instructs a cascade. The features must be removed from it. Four steps are covered by this method. Characteristic of Haar. In order to calculate the difference, it adds the pixel intensities in each division, ranges at specific locations in the discovery window, and checks adjacent rectangular fields. The total of all pixel values that existed prior to the current pixel at any place makes up integral pictures. Out of 160000 features, Ada boost picks the top ones and trains them. It offers an enormous amount of possible features. The cascade classifier consists of several phases, eachof which categories poor learners. The decision stumps are the weak students. A weighted average of decisions is used to train a highly accurate classifier at each stage using the boosting technique. A window will move in a specific direction across the input image during the detection distinct period while Haar characteristics are computed. The threshold distinguishes between items and non-objects. We have established the number of steps, feature types, and other function parameters to accomplish detection's accuracy. Gray scale, scale factor, neighborhood connectedness, picture size, eyes detection, and face detection are the features that are extracted for face detection. The RGB image is converted to a grey imageto produce the grey image. This scale factor describes the smoothness and quantifies how much the size of the image decreases at each scale. How many neighbors should be displayed in the specific person's photograph is determined by the neighborhood connectivity. The neighbor in our project is zero. The image's size is specified. It specifies the perimeter of the rectangle that encloses the image. The rectangle measures 640 by 480. The proposed system now includes the eyes detection capability for increased accuracy. The frontal face of the specific person is then measured and detected. The image being displayed is a rectangle with dimensions of 640 * 480. A blue rectangle serves as the image's marker.

Creation of Data sets of the Individuals:

In this section, we'll build a database of every person, their unique ID, and the quantity of grayscale photos needed for face detection. In order to generate a data collection and store thephotographs in XML files, all of the images of the specific person are gathered. For each person's ID, we used 1000 samples because this increased the accuracy of the image of the individual.

Training Data sets:

The YML file contains the created data set of the authorized individuals. For picture training, the Local Binary Pattern Histogram (LBPH) method is employed. The pixels of the photos arelabelled using the LBPH. The following metrics are available to compare the histograms in the LBPH package:

Chi-Square:

This formula is used to characterize a person's expression. In our project, it is employed toassess the character of a certain individual whose database is recorded in an XML file.

Distance in Euclid: The separation between straight lines is calculated using this equation. Itis used to determine the image's dimension after being stored in a data collection.

Normalized Euclidean Distance:

The length of the line segment between the two points, Hist1 and Hist2, is their Euclidean distance (hist1, hist2). A Euclidean vector is a representation of a point's location in Euclideann-space. This formula scaled the image's length and created a square box around it.

Absolute Value:

After being acquired by the camera, the image is trained using both positive and negativeimages using the Haar Cascade Classifier. It is employed to change grayscale photographsinto colorful ones.

4. RECOGNITION OF FACE THROUGH STORED DATABASE

After being acquired by the camera, the image is trained using both positive and negative images using the Haar Cascade Classifier. It is employed to change grayscale photographsinto colorful ones.

IOT Platform:

We have employed IOT to make our houses smarter and safer. When an uninvited guest attempted to enter the house. The owner will receive a telegram with the illegal person's image. If the owner is a long way from his home, he can use the internet to monitor and manage the door. If the home's owner wants to allow someone who is not invited inside, Heonly needs to grant access, and the door will be unlocked.

5. PROJECT FLOWCHART

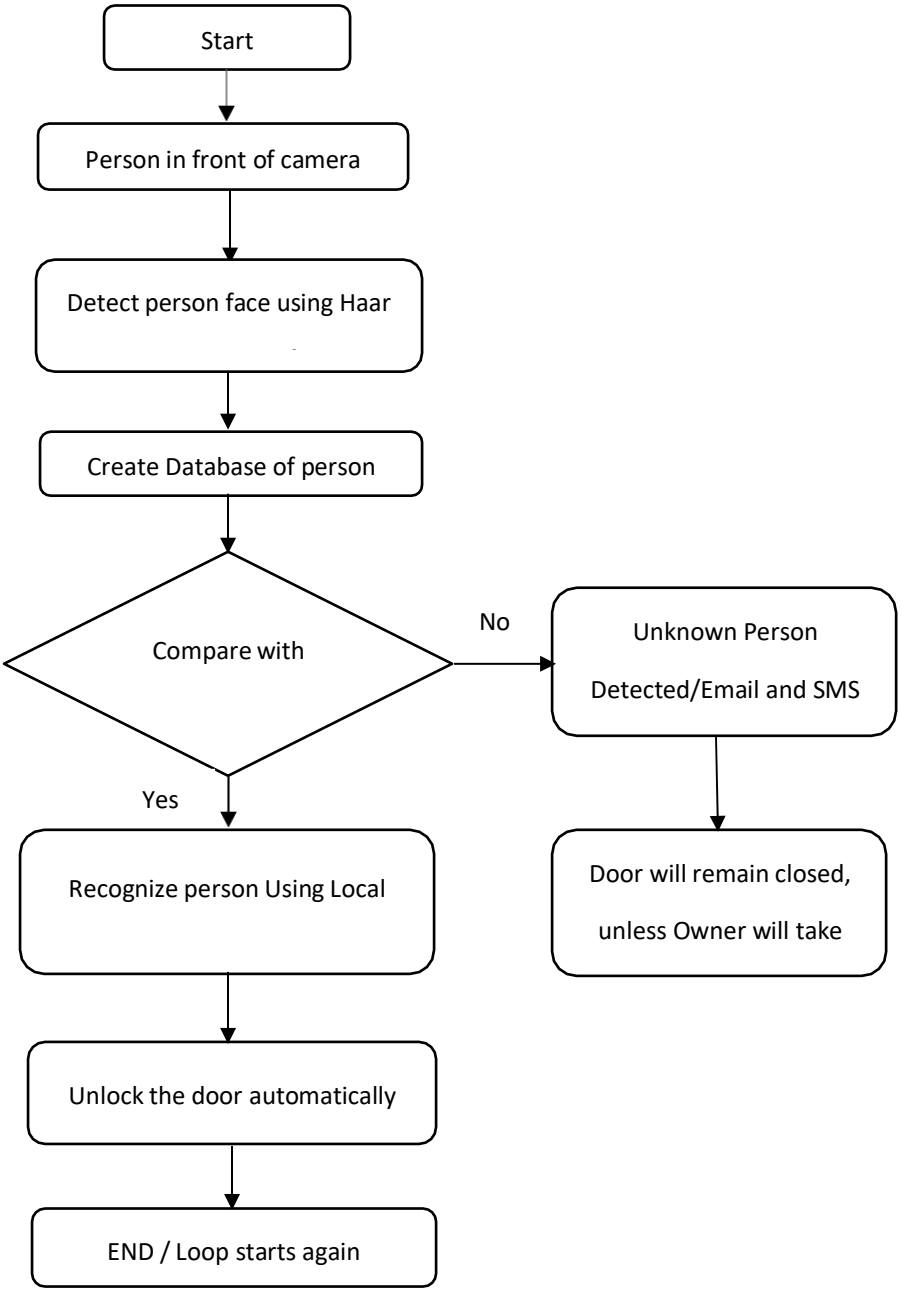


Figure.2.Flowchart for the proposed system

6. EXPERIMENTAL RESULTS

The results of the experiments showed that this system will deal with security issues andprovide flexibility to smart house control.

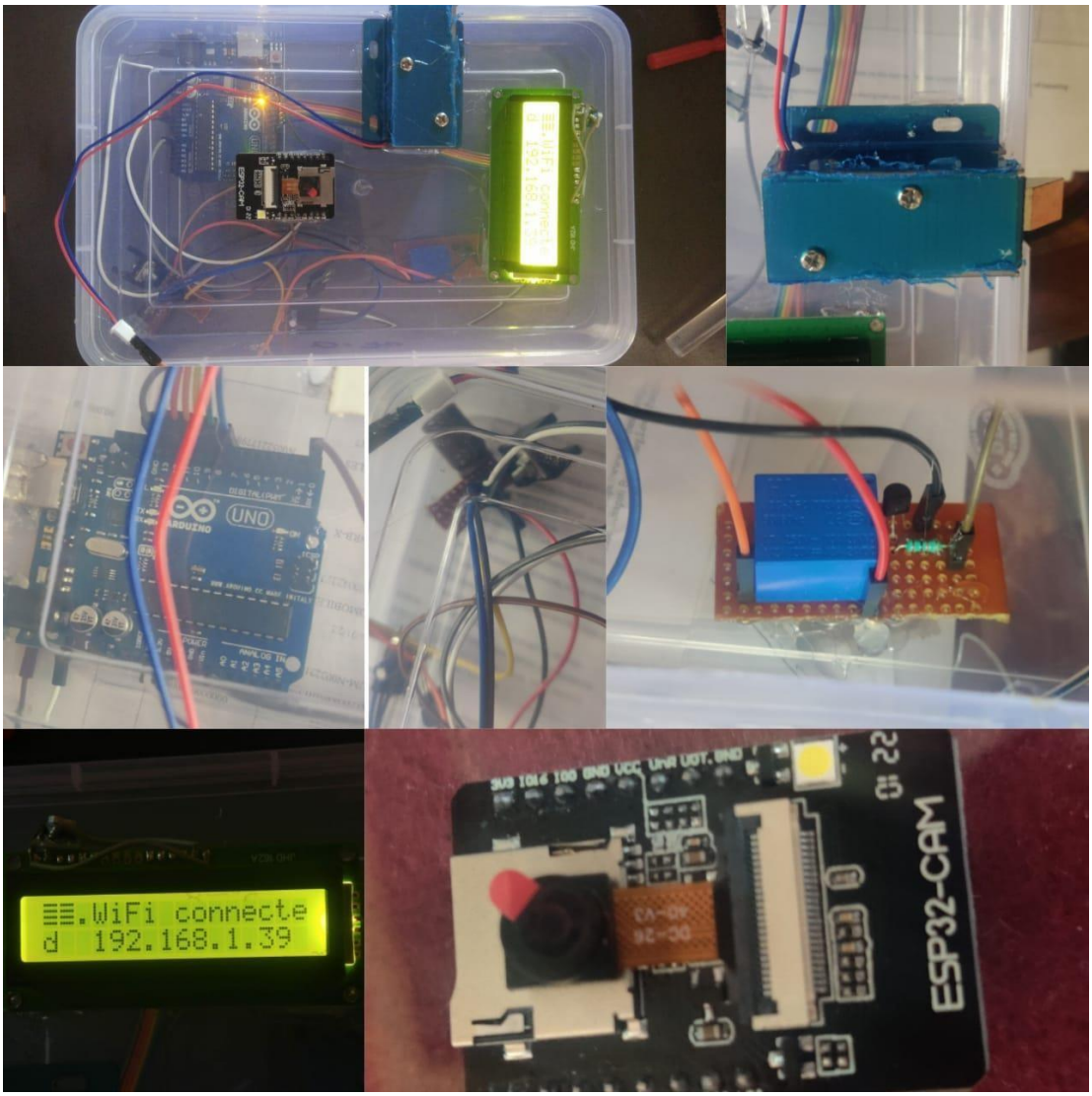


Fig.5. Experimental Setup Result

7. CONCLUSION

It was determined by the successful completion of this work that IOT allows us to connect numerous input/output devices, sensors, and actuators in a network so that they can communicate with one another, and that data obtained from these things can be used to keep a log, monitor, or control the other things without the need for human intervention, among other things.

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