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Smart Office Security System Using Face Recognition

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ABSTRACT

Nowadays, the security is the most important part of organized every day activities. There is an advanced awareness in the automated home technique by using internet of things. One of the major qualities in the automated home technique is the security. At present, in the prominent places like offices, banks, malls etc. the people are facing lot of security complications. To overcome this and to get needed security, especially trained laborers are required. The level of security is affected by the mistakes made by human beings as a laborer. So, these mistakes can be reduced by using face recognition security system, which can notice the robber to confined areas. There are two type of components are involved in this system. The hardware components consist of Arduino microcontroller, webcam, PIR sensor and LCD display. The face detection and face recognition algorithm are involved in the software component. In the face recognition system, webcam is used to capture the images rapidly, if any motion is noticed by PIR sensor in a specific area. After that in the capture image, the face is detected and recognized. At the end of the process, the images and notifications are sent to the smart phone of an authorized person by using IoT based application. On the other hand, the temperature sensor is used to measure the present temperature and the gas sensor is used to measure the present gas in the office. Finally, all the results are displayed on the LCD display.

Keywords - Face recognition, Security, IoT, webcam, LCD.

I. INTRODUCTION

Nowadays, the home security is the important thing in human life. At present, the security elements are needed in various regions. The privacy factor also influences the importance of security system. The important link in security chain is the detection of the client who will enter the office. One of the most advantageous electronic technologies is the IoT which enhance the security of the people. So, this technique is used in the smart offices, homes etc. The computer vision provides further security system in the IoT platform. Many years ago, the people were using traditional security system for the security of their homes. The traditional method includes the use of nonliving things such as ID card, password etc. The actual face recognition is included in the department of biometrics as a part. Biometrics is the capability of the computer to identify the human face by using particular features in the face. At present, biometrics is the rapidly evolving and most leading technique which is very useful to the people. The advanced improvements in the face recognition system is

used in many places for the confirmation of user for the security. Such a places are ATM security, attendance system, automated home security etc.

II. RELATED WORKS

In (1) N A Othman and I Aydin presented "A New IoT combined Face Detection of people by using computer vision for security application". The Raspberry PI3 together with PICAMERA are used in the operation of this system. Particularly in this method, the detection of face is carried out by using Haar cascade algorithm and Adaboost algorithm. In

(2) N A Othman and I Aydin presented "A New IoT combined Body Detection of people by using computer vision for security application". PIR sensor setup with the Raspberry PI is used in the implementation of this technique. The body detection is the chief target of this system and is achieved by using HOG algorithm and SVM algorithm. In (3) Amritha Nag et al. presented "IoT based door access control using Face recognition". The OpenCV based face recognition technique is used in the development of the system and the face recognition is carried out by using Haar classifier algorithm. In

(4) Moulik upala presented "IoT solution for smart library using facial recognition". The internet of things is improved by this method and reduction in the manual effort is the main aim of this system.

III. DESIGN OF OFFICE SECURITY SYSTEM

A. Hardware Design:

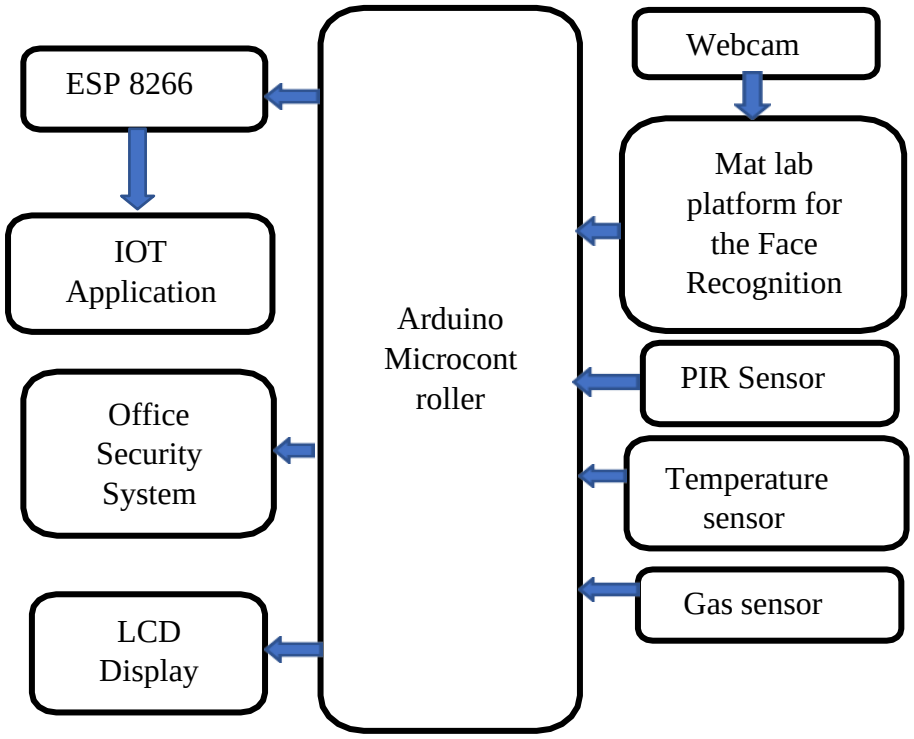

Fig.1: Proposed block diagram of office security system using face recognition.

Fig 1 shows the proposed block diagram of office security system. One of the major parts of this system is the Arduino microcontroller which is connected to the webcam. The Arduino microcontroller has the capacity to control the movement of the webcam. The images are captured by the webcam after any movement is noticed by the PIR sensor. Afterwards, the captured image is applied by the computer vision module, because it has the capability to recognize the face. If the detected face is recognized the door lock in the office is opened. Afterwards, by using IoT based application, the notification and images are sent to the authorized person's smart phone. If the detected face is not recognized the lock of the door in the office is not opened, but then also the images and notifications are sent to the smart phone. The temperature sensor is used to measure the present temperature of the office and gas sensor is used to measure the amount of gas present in the office. Finally, all the results are displayed on the LCD display.

B. Software Design:

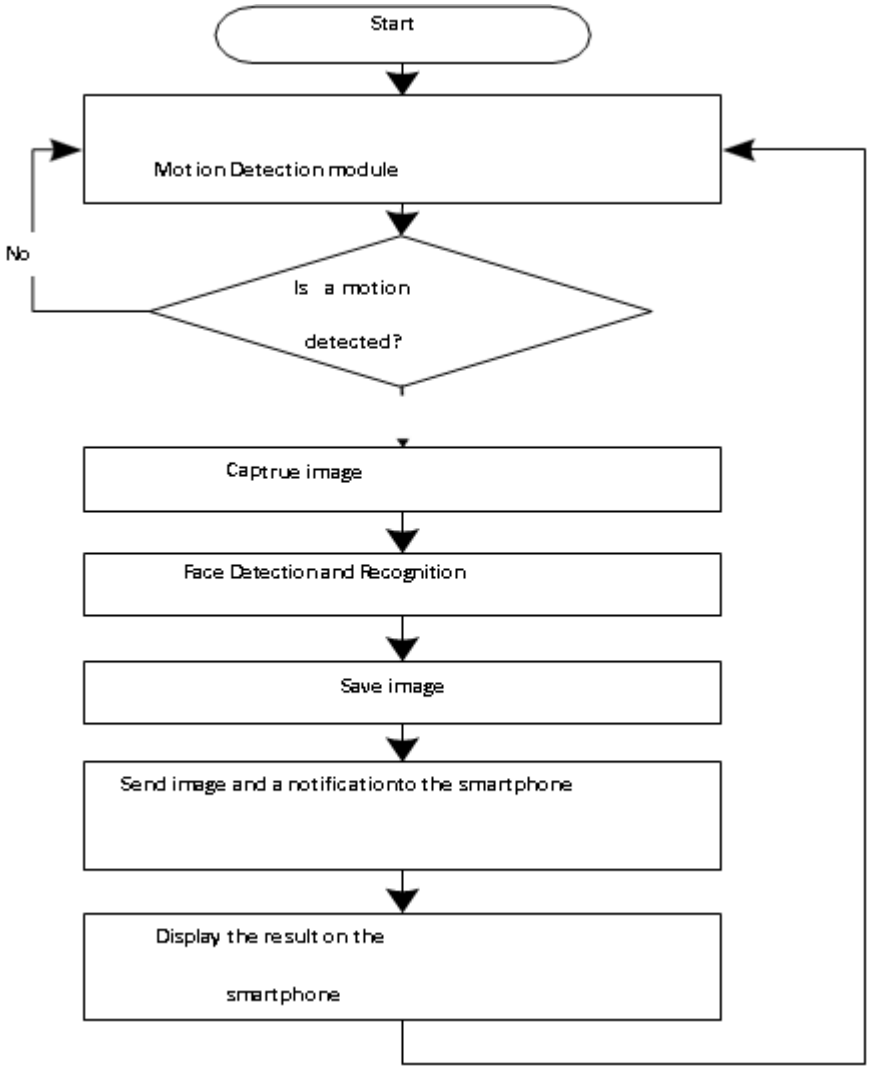

Fig.2: Flowchart for office security system using face recognition

Fig 2 shows the flow chart of the presented office security system using face recognition. If the PIR sensor does not detect any motion, the entire process which start from beginning. If PIR sensor detects any motion, then images are captured by webcam. After that many procedures are applied to the captured image. Whether the face is detected and recognized, the office door lock is opened. Then by using IoT application the notification

and images are sent to the authorized person's smart phone. Whether the face is not detected and recognized, the office door lock is not opened and the entire procedure will start from beginning. At the end of the process whatever the results are displayed on the LCD display.

IV. SYSTEM REQUIREMENTS

A. Hardware requirements:

1) **Arduino Nano:** Arduino Nano is a small microcontroller board based on the ATmega328p and it is bread board friendly. The length of the Arduino nano is 45mm and width is 18mm. The operating voltage of the Arduino nano is 5volt and input voltage is 6 to 20 volts. There are 14 digital Input/Output pins, 8 analog input pins in the Arduino nano and it has the clock speed of 16 MHz, flash memory of 32Kb. Out of the 32kb flash memory, 0.5 kb is used by bootloader.
2) **PIR sensor:** The commonly used PIR sensor in the face recognition system is HCSR-501. The main aims of utilizing this sensor are the detection of human being and movements. PIR sensor is one of the electronic sensors, so the presence of human is recognized by this sensor. The 10 to 15cm is the range of this sensor. Human body emit some high temperature radiations of the range 0.8 to 0.14nm, are captured by PIR sensor and provides 1or 0 for presence or absence of the human.
3) **Webcam:** Webcam is a small camera. In the face recognition system, the webcam is used to capture the images after any movement is noticed by PIR sensor. The Arduino microcontroller is connected to the webcam, because it controls the movement of the webcam.
4) **LCD display:** It is an electronic visual and flat paneled display developed from liquid crystal technology. The alphanumeric displays are used in extensive range of implementations. No light is emitted by liquid crystal immediately, so modulating techniques are used instead of this. The LCD display has the operating voltage of 4.7 to 5.3 volts and it has the 16x2 sharp alphanumeric dot matrix display. So, 224 numerous characteristics with their symbols are displaying on this display. There are two rows in this display and by each row 16 character are printed.

B. Software requirements:

1) **Arduino IDE:** For beginners the use of Arduino IDE is very easy and it is so flexible sufficient for modern users. A message area, a toolbar with button, text editor for writing code and a text consoles are some of the parts of Arduino IDE. It is linked to the Arduino and Genuino hardware to mail the scheme and circulate with them.
2) **IoT application:** IoT application is an android application which can be installed by using any android gadgets. The exchange of video files, photos, messages, audio files are takes place by this application. The complete conversion between convey of user with each other is contented by this application.

V. ADVANTAGES

1. To give high security using the images.
2. To improve public security.
3. More user friendly.

VI. APPLICATIONS

1. Identification of Face: It is used in the identification of people by their face images.
2. Access Control: It is used to get entry in the office and get login in the computer.
3. Security: Security is most important responsibility at airports for office of the airline employees and passengers.
4. General identity verification: Registration of Electoral, e-commerce, new-born identification, passports, worker IDs, banking, national IDs, Conformation of document, etc.

VII. RESULT

Our project result is that detection and recognition of face comparing with images which are stored in data collection. Whether the detected face is recognized then it is found to be known face. So, the image and notification are sent to the authorized person's smart phone by using IoT application and the office door lock is opened. Whether the detected face is not recognized, it is found to be unknown face. So, the image and notifications are sent to the authorized person's smart phone by using IoT application but the office door lock is not opened. On the other hand, the temperature sensor is used to measure the present temperature and the gas sensor is used to measure the present gas in the office. Ultimately, whatever the results are displaying on the LCD display.

VIII. CONCLUSION

The face recognition security system is a very easy and less expensive process. When compared with the other security systems, the face recognition security system provides better security. The homes and office security can be increased by using this system. Other security systems take lot of time and they use lot of features in the human body to identify a person But the proposed security system identifies a person by using only face in a very short time. So, the face recognition security system is user friendly and very useful process for the security.

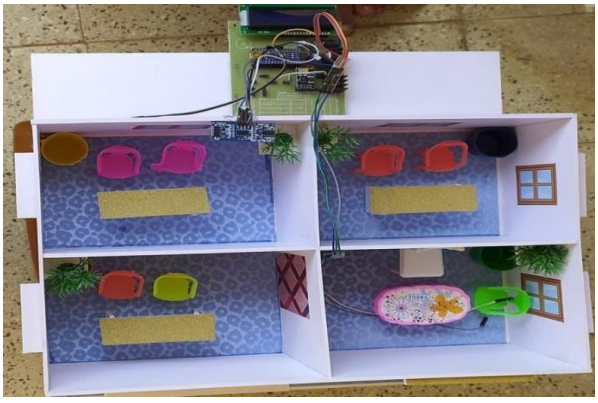

Fig.3: Prototype of office security system

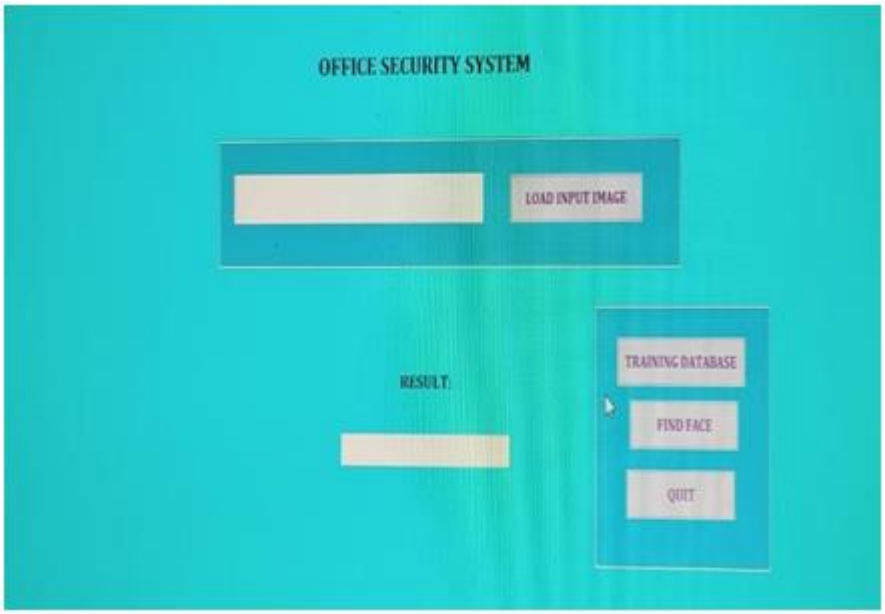

Fig.5: Created database

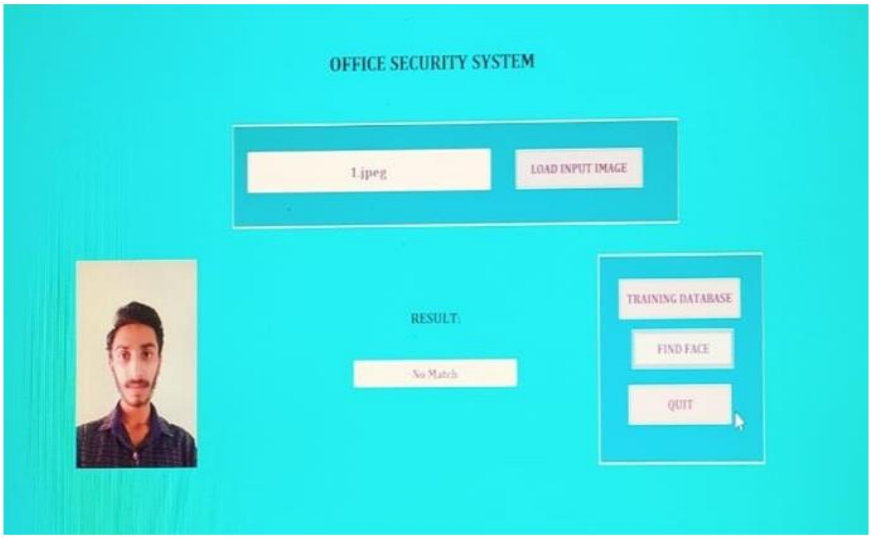

Fig.6: Unknown person captured image

Fig.7: Known person captured image

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