

Smart Home Automation Controlled by Robot using Matlab and Arduino

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Abstract— With the development of technology that made home automation a much easy and affordable. The significant enhancement in the quality of life can be improved by having a control directly or seamlessly with the home system every moment via a mobile device. Here, we present an embedded system with some electronic devices to enhance the security and the need to depend on other people is reduced so, that you need not to worry what's going at the home and you can concentrate on your work. In the case of emergency you will be informed wherever you are through the IoT and by a text message. The system takes help of the MATLAB for the processing the information. The system can also help you to prevent disaster like gas leakage. They can also do some small works which should be done in time.

Keywords—Image Processing, MATLAB, GSM, Sensors, IoT.

I. INTRODUCTION

In the present world trusting another person is not easy. Sometimes we feel like we need security but not a human something which is not capable by a human that is an advanced security system to keep you protected and enhance your way of living Here, in this paper, we present a security system that can be able to satisfy your need up to some extent.

In the present system, we have CCTV and security guards. The CCTV's can just stream and record only but they don't process that data. The data obtained by the CCTV is processed by the humans but it is after the damage has been made. In this paper, we mainly concentrated to present a system with very less human interference The person will be at the end of the system. An embedded system which is controlled by and two Arduino's and with the help of image processing and few sensors made enhanced security. The system takes very less power to operate but produce much better results when compared to a security guard. The system can detect the gas leakages and also alert you and prevent from a disaster The system has a fingerprint

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sensor after the successful verification the Arduino opens the door automatically and the system has the automatic light and fan control which helps in saving the energy.

The system has a robot which will be able to cover a wide range by moving in all directions and the robot has a camera by scanning the person the robot opens the main gate automatically and has light with the IR sensors The light has no purpose in the daylight but at night the light has a unique purpose it provides lighting and also helps the camera to have a good capture of image here we can also go with the night vision camera but the cost of the system increases so by using the IR sensor and the light bulb we made our system with low cost and better efficient.

II.METHODOLOGY

In flourishing countries like India the transformation of cities into smart cities is implemented as result of digital program. The main factors which should be taken into consideration for building smart cities is security and control. Smart city comprises of smart home as the component. This paper proposes a smart home system that can be implemented to transform the cities into smart cities [5].

III.FUNCTIONS OF SMART HOME

IOT infrastructure forms the nitty -gritty for the applications of smart home system. The most significant smart home applications having the preminent functions are

A. Alert

The sensors help in sensing the environmental information in smart home system. The environmental parameters sensed are send to a registered device or account. The environmental parameters are the percentage of gases present around the atmosphere surrounding the home, temperature, number of persons entering home. These alert information can be provided to the user at a regular basis or for a specified time interval . The alert information can be sent over as a mail or text message according to the requirement of the user.

B. Security through image processing

The system consists of a database in which a list of authorized user facial data is stored. The MATLAB software which runs the face ID of the person through the database and opens the gate.

C. Monitor

Smart home not only helps in knowing about the environmental parameters but also helps in monitoring the home using the assistance of multiple sensors and camera feed. It is one of the most important function of the smart home. Monitoring keeps track of every activity of the home. Monitored information leads to decision making . Based on the monitored information the user take an action. For example if there is any gas leakage it is monitored and the information is sent to the user to take an action on it.

D. Direct Ordering system

The system can order things like medicine and gas. There will be a threshold value will be set by the user. When it reaches the threshold value the system automatically books the gas and medicines through the gsm module included in it

IV.WORKING OF THE INDOOR SYSTEM

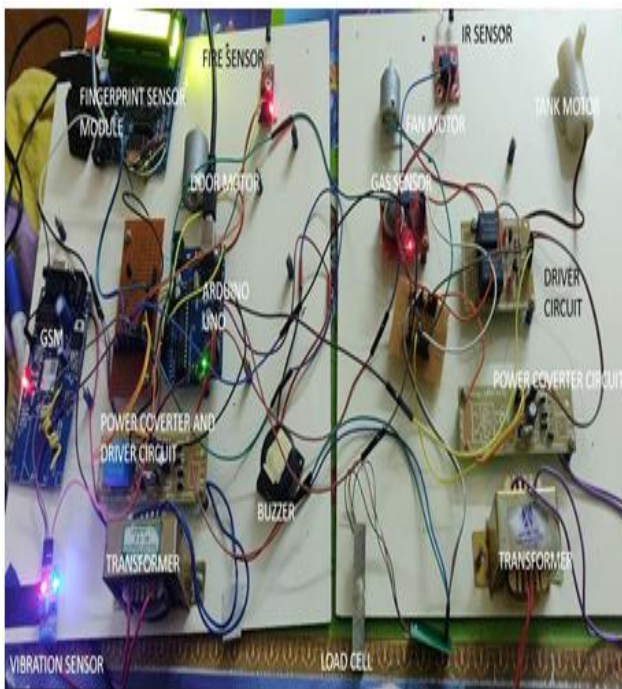


Fig.1. Hardware of Indoor System

The Arduino Uno is used as the main controller. The system also has a Load cell on the decrease of the weight it automatically books the gas and medicines. With the help of GSM module, the things can be ordered straight away. The alarm helps to indicate any breakage and potential damage to the system with the help of vibration sensors. The fingerprint sensor is also used to unlock the door of the home. We can store various fingerprints in it which can be more secure. A fire sensor is used to indicate when the fire occurs inside the home and that fire sensor detects any spike in the temperature and that will be monitored by Arduino and runs the water sprinkler motor so that fire is extinguished. The system contains the IR sensor when a person enters into the arc then it automatically turns the light and fans motor on and continues to be on until the person leaves. The simulation consist of the PIR sensor and the vibration sensor with some switches which actually shows the real time working of the indoor system. When the switch is toggled the motor starts working in the simulation.

V.OUTDOOR ROBOT

A. Image Processing :Flow chart for image capturing and facial confirmation

Entire programming for the image processing is done using MATLAB The program is broken down into two main programs that are (i) image capturing and (ii) face compare.

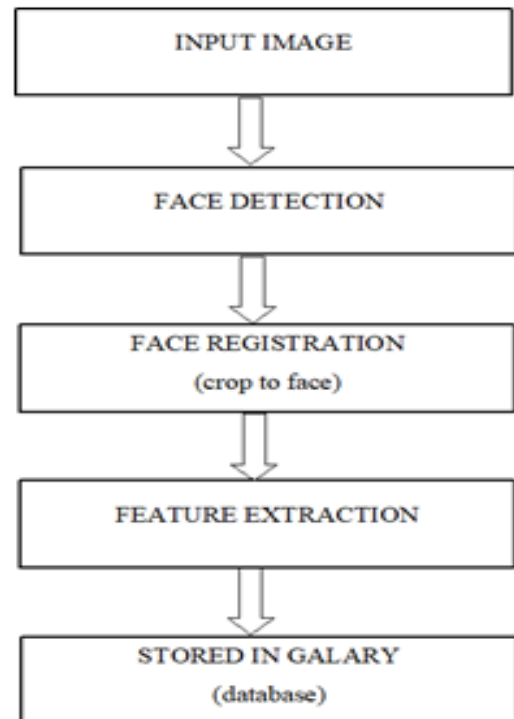


Fig.2. Block diagram for Image capture

Face recognition is the method by evaluating and comparing trends to identify one or more individuals in pictures or videos. In order to find the best match from the data base the algorithm for face recognition need to extract typical facial features and compare. Face recognition, as well as picture and video indexing system, is an significant component of many biometric, safety and surveillance system.

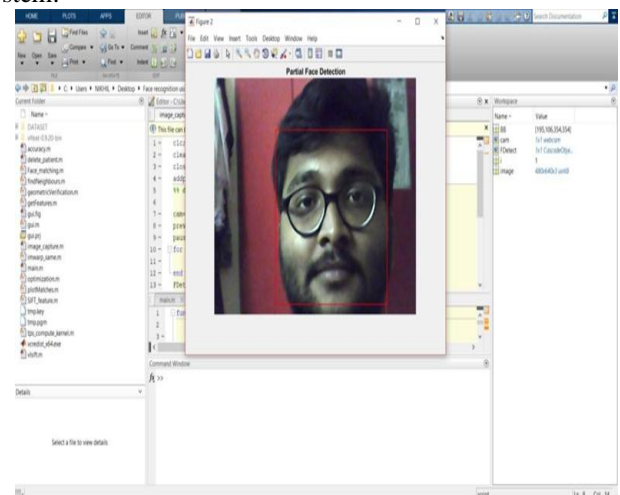


Fig.3. MATLAB simulation for image capture

The image is captured by the webcam and sent to data sheet folder in the system. The MATLAB makes some key points and store. Firstly, The image captured and sent to the system through USB port 2.0. The image is pixeled step by step in rows and column. After successful capturing the MATLAB will display the — Partial face detectedl.

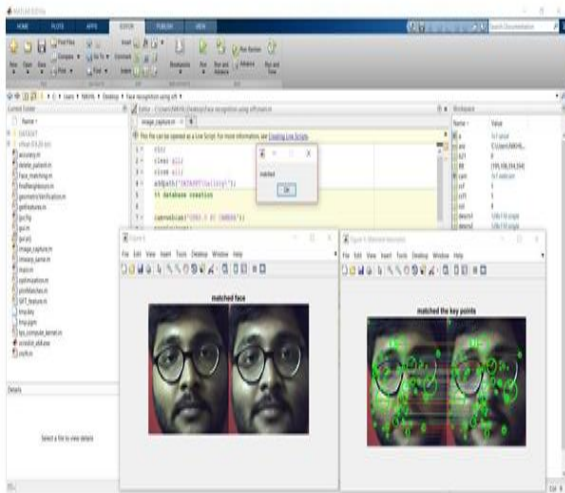


Fig.4. MATLAB Simulation for image matching

The computer vision helps in face recognition. The discriminative data is obtained from the facial pictures using face recognition. The appearance of the faces can be modelled and classified by pattern recognition or machine learning. The image will be captured again and sent to MATLAB and it compares with the Set of images in the Datasheet. We can have as many as pictures in the data sheet It makes the key points again if it don't match then it displays —unmatchedl. If the image is matched then it displays —matchedl.

The block diagram shows that the MATLAB processes the information that captured by the camera and with the help of max-232 or usually called as RS232 used to communicate with the Arduino and in parallelly to the driver circuit for the operation to perform and the MATLAB coding is made to capture the face and check with the data base The hardware in good lighting hardly takes 6 seconds to process the information and run the motor by 5 revolutions. The system has a light with the IR sensor at night times it activate the light so that the camera can capture the image. The IoT module is used it uploads the data to the cloud and we can monitor the data The robot can be controlled manually or else can be moved in a specified path by changing the program. If the robot is moving in different directions it can save the cost of Surveillance because it covers wide angles and larger distance.

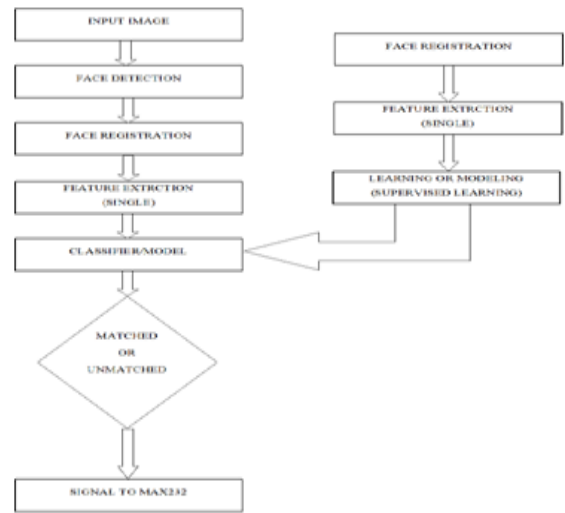


Fig.5. Facial recognition flow chart& Results

Programming in an easy approach when the person at main gate who wants to enter inside there was a camera to detect the person. Before that we have to store the captured images in the cloud itself to compare the person [12-14]. If the person compared and matched the gate will open if not gate won't open and the unknown person image will be stored in the cloud. The data from the temperature sensor and person known and person entering time is uploaded to the cloud.

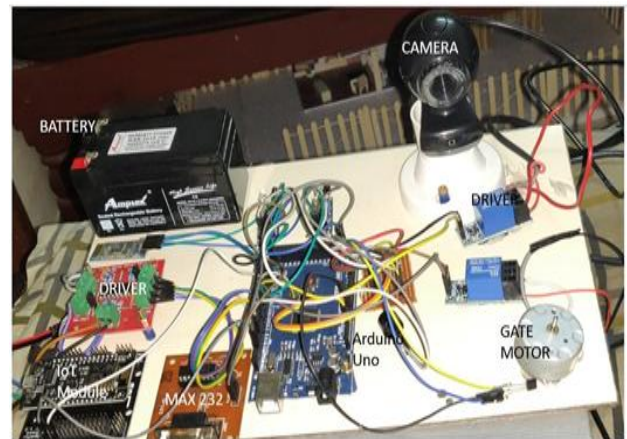


Fig.6. Outdoor unit robot



Fig.7 Smart Home Module

VI.CONCLUSION

By integrating IOT and cloud computing an efficient approach of smart home is proposed and implemented in this paper using the wireless communication, sensors, monitoring devices. The smart home not only provides security and control but also improve the living standard by implementing the technology. Smart home automation apart from providing security and control helps in energy saving. Technology transforming homes to smart home makes smart cities .Thus smart cities playing a vital role in the development of the society.

VII.FUTURE SCOPE

By using high end processors and a secured communication network these processing techniques can be used for object tracking and facial detection the defence system can build robots to track and eliminate treats. With high end processors the MATLAB can processes improper image also with an unique algorithm. The CCTV will not just monitor these can also be used to track the treats by using the Dina-Jones algorithm and also the home security can be increased.

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