SMART HOME

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Abstract: Smart security system will protect your house,valuables and to keep your family safe. A smart doormat and a smart door is developed to ensure a Smart home.The doormat containing sensors.The camera which is placed in the door will capture the image and send this image as a message to the user.The door will open by scanning face. The face recognition system will store the faces of all the members in the family.If the person is not a member then the door will not be opened and an alert message will send to the users phone that message will contain an OTP number.After entering the OTP the door will be opened .In case if a thief is trying to break the door or trying to enter into the house then a doormat containing sensors is provided along with this.When a person steps into the mat an alert message will be sent to the owner and make an alarm.

Index Terms **- IoT, Servomotor, Local Binary pattern(LBP),Rasbperry pi 3**

I. INTRODUCTION

A home security system means protect your home and keep safe valuables, and to keep your family safe from potential break-ins by burglars and thief. In the United States, there is a home related burglary that takes place every 13 seconds, 4 burglaries a minute, 240 an hour and nearly 6,000 a day! some of the statistics are 88% of all burglaries are 77% of all crimes are property crimes, 38% of all robberies are committed with guns, identity theft is the fastest growing crime everywhere . 3 out of 4 homes in the U.S. Will be broken within the next 20 years. By using IoT and face recognition, the proposed system delivers a cost and energy efficient solution for home security. IoT will enable sensing and triggers system on motion detection using sensors such as Pir(Passive Infrared) for motion detection and to calculate position of person in front of camera for distance measurement Ultrasonic is used because face detection module has good performance in some conditions which specifies the distance between the person and the camera should be less than 240 cm, person doesn't use accessories that cover part of face. When in case of testing using real time images, LBP based Face recognition system is used which provides 80% of accuracy. Person should stand in front of the camera and then the camera will recognize the face which is then compared with the faces stored in the home member database stored in raspberry pi. If the face found the matches, the door will be automatically unlock else it will remains locked.

II. THEORY

I. Internet of things

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The definition of the Internet of Things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of Things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", covering devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smart phones and smart speakers.

II.Servomotor

The **servo motor** is a closed-loop mechanism that incorporates positional feedback in order to control the rotational or linear speed and position. The **motor** is controlled with an electric signal, either analog or digital, which determines the amount of movement which represents the final command position for the shaft.

III. Local Binary pattern(LBP)

The captured image will undergo image processing for face recognition, Local Binary Pattern(LBP) has been implemented using Python and OpenCV. face recognition considers both shape and texture information to represent face images based on Local Binary Patterns.

IV. Raspberry pi 3 model B

The Raspberry Pi 3 Model B is the earliest model of the third-generation Raspberry Pi. It replaced the Raspberry Pi 2 Model B in February 2016. See also the Raspberry Pi 3 Model B+, the latest product in the Raspberry Pi 3 range.It has Quad Core 1.2GHz Broadcom BCM2837 64bit CPU,1GB RAM,BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board,100 Base Ethernet,40-pin extended GPIO,4 USB 2 ports,4 Pole stereo output and composite video port,Full size HDMI,CSI camera port for connecting a Raspberry Pi camera,DSI display port for connecting a Raspberry Pi touchscreen display,Micro SD port for loading your operating system and storing data,Upgraded switched Micro USB power source up to 2.5A.

III. RELATED WORK

The aim of this paper [1]most physical exercises done on the grounds using mats which involves coordinated motions of different body parts and are difficult to recognize with a single body worn motion sensors.The focus is monitoring the latter. A characteristic spatio temporal contact and pressure pattern can be identified for each exercise . For tracking exercises such as push-ups, abdominal crunches and squats a sensor matrix is used. A resistive pressure mat as a new sensing modality for ubiquitously recognizing and counting exercises is introduced . The mat is thin, soft and low-cost and can easily replace traditional gym mats. The evaluation is split into two main parts. Firstly, we evaluate calculating rotation and translation from the pressure data for the exercises by using a kNN-classifer for classification. As a next part we describe how the exercises can be robustly detected and counted by utilizing dynamic time warping.To evaluate the counting algorithm templates for each exercise and each subject are calculated.The main advantage of this paper is More accuracy.

This work [2] targets people identification in video based on the way they walk .For learning high-level descriptors from low-level motion features CNN is explored. CNN allows to obtain state-of-the-art results using Spatio-temporal cuboid of optical flow as input data. Gait recognition is used in the context of video surveillance, ranging from control access in restricted areas to early detection of persons of interest. Here an end-to-end approach based on convolutional neural networks maps low-level optical flow, directly extracted from video frames, to learn and extract higher-level features suitable for representing human gait: gait signature. Firstly a preprocessing stage extract, organize and normalize low-level motion features for defining the input data and then a convolutional neural network architecture to extract discriminative gait signatures and after that validate the proposed framework on the standard TUM-GAID dataset for gait identification. Thus the framework address the problem of gait recognition using CNN. So computes optical flow (OF) along the whole sequence, so that build up a data cuboid from consecutive OF maps, then feed the CNN with OF cuboid to extract the gait signature, to decide the subject identity a classifier is applied.Compartively easier to use is the one of the advantage of this paper.

This paper[3] refers to the infrastructure of connected physical devices which is growing at a rapid rate. The system will inform the owner about an unauthorized entry so whenever the door is opened by sending a notification to the user.Then the user gets the notification,so that he can take the necessary actions. In this uses a microcontroller known as Arduino Uno to interface between the components, a magnetic Reed sensor to monitor the status, a buzzer for sounding the alarm, and a WiFi module, ESP8266 to connect and communicate using the Internet. Home security is a very important feature of home automation. Therefore the main objective of our work is to alert the owner and others of an intruder break-in by sending a notification to their smart phones. The owner will also have the ability to stop or start the alarm using the smart phone. This system will help the users to safeguard their homes by placing the system on the doors or windows.The designed system informs the user as there is a break-in so that the user can take necessary actions.The sensors placed on the door informs the home owner as soon as the door is opened by sending a Push notification. The user will get this notification whether the phone is locked or unlocked or even if any other app is opened at the moment. This was the main objective in which is the user feels safe and not need to worry about any intrusions. The main advantages of such a system includes the ease of setting up, lower costs and low maintenance.it is Less expensive

In recent years, it is important to own a reliable security system [4] that can secure our assets and protect our privacy.The system primarily used openCV based face recognition system using Haar classifiers for face. The main processing element is Raspberry pi. The pi camera is employed to capture the image and send it to the authorized person for security purposes. The Telegram android application is used to control lock and unlock mechanism.The entry log every person thus captured using pi camera and picture is sent to the email address of the prescribed user.When a human is detected, the Pi camera captures the image of the person and sends the image to the remote user through mail. Haar face recognition algorithm is run on the captured image using OpenCV in the Raspbian on the basis of the images saved in the system. If the face is recognized then an authorized person is trying for the door access and hence, the door lock is opened. If the face is not recognized,then the user can check the mail for the image of the person trying to access the door and allow or deny the access of the door. If the user sends "allow" from the Telegram app, the door is opened and if the user sends "deny" from the Telegram app, the person trying to access the door is denied from accessing it.As a result if a face is recognized the door lock will get open. If any other person comes to the home whose image is not stored in the data base that time the image of the person will get captured and sends the image to the authorized email. If the other person known to the owner then the owner will send a command like "on" through telegram app to unlock the door.One of the advantage is the software is quickly verify a customer 's image.

In this paper[5] The Internet of Things(IoT) has made it possible to set up a smart home security through which you can decide who can enter your home using your smartphone and web application.The web camera is used to connect to the raspberry pi

accompanied by sensors such as Passive Infrared(Pir) and Ultrasonic sensor. On motion detection camera captures an image of the person in front of the door then real-time face recognition is done using local binary pattern (LBP). If person's image matches with one of the home members then the door will unlock, else doorbell will ring. if an intruder tries to break door then an alarm will be raised at the same time SMS and Email containing image of the intruder will be sent to the homeowner. Using Android application owner can also add new person's faces into the databases. Person should stand in front of the camera. a camera will recognize the face and compares with the faces stored in the home member database stored in raspberry pi. If the face matches found, the door will be automatically unlock else it will remains lock.After detecting motion, the system will check for the position of person ie., the distance between person and camera. Here ultrasonic sensor will be used. Image will be captured and face recognition will be performed. If face match found door will open else red color bulb will light up, if the owner is at home then bell will ring else notification will be sent when someone is waiting outside your home. All these activities are stored in the database which is in microSD card in Raspberry.the main advntages are Cheaper and flexible.

V. IMPLEMENTATION

A home security system means to protect your home and keep safe valuables, and to keep your family safe from potential break-ins by burglars and thief. In the United States, there is a home related burglary that takes place every 13 seconds, 4 burglaries a minute, 240 an hour and nearly 6,000 a day! some of the statistics are 88% of all burglaries are 77% of all crimes are property crimes, 38% of all robberies are committed with guns, identity theft is the fastest growing crime in the U.S.,Canada and UK. 3 out of 4 homes in the U.S. Will be broken within the next 20 years.Proposed system deliver a cost and energy efficient solution for home security by using IoT and face recognition. IoT will enable sensing and triggers system on motion detection using sensors such as Pir(Passive Infrared) for motion detection and Ultrasonic for distance measurement used to calculate position of person in front of camera because face detection module has good performance in some conditions such as distance between the person and the camera should be less than 240 cm, person doesn't use accessories that cover part of face. LBP based Face recognition system has 80% of accuracy when it is tested using real time images. Person should stand in front of the camera. a camera will recognize the face and compares with the faces stored in the home member database stored in raspberry pi. If the face matches found, the door will be automatically unlock else it will remains lock.

5.1 Local Binary pattern(LBP)

The captured image will undergo image processing for face recognition, Local Binary Pattern(LBP) has been implemented using Python and OpenCV. face recognition considers both shape and texture information to represent face images based on Local Binary Patterns, steps involved in LBP algorithm are as follow:
A. Crop face(using face detector) and align the face images in order.
B. Convert all images into the same size.
C. fix the dimension of the cell size where the LBP will be calculated.
D. Run an LBP algorithm on the face images. Concatenate LBPs extracted from the image to form a unique face feature vector.
E. The feature vector for each face image can be used to recognize the person in the face image. This feature vector forms an efficient representation of the face and is used to estimate similarities between images.

5.2 Server

All these activities and images of home members are stores into the database and can be accessible by the homeowner using Android and web application. Urgent notification of intruder alert can be view on a smartphone. In case of power failure system will make use of the cellular network to communicate with a smartphone using GSM module. the smartphone can be used to remove, update or add a new face to the database quickly. Android Application will auto refresh in 15 min time interval. use of android application makes our system more flexible.

5.3 Design specification

The camera place in the door will capture his image and send this image and a message to the user.The door will open by scanning face.The face of all members in the family is stored in the face recognition system.If the person is not a member then the door will not open and an alert message will send in to the users phone that message will contain an OTP number.After entering the OTP door will open.If the thief trying to break the door or trying to enter in to the house then provide a doormat containing sensors.when a person step into the mat alert message sent to the owner and make an alarm.

5.4 Embedded System

Embedded systems are systems which perform a specific or a pre-defined task. It is the combinations of hardware and software. It is nothing but a computer inside a product. It is a programmable hardware design nothing but an electronic chip. A general-purpose definition of embedded systems is that they are devices used to control, monitor or assist the operation of equipment, machinery or plant."Embedded" reflects the fact that they are an integral part of the system. In many cases their embeddedness may be such that their presence is far from obvious to the casual observer and even the equipment for sometime before being able to conclude that an embedded control system was involved in its functioning. At the other extreme a general-purpose computer may be used to control the operation of a large complex processing plant, and its presence will be obvious. All embedded systems are or include computers or microprocessors. Some of these computers are however very simple systems as compared with a personal computer. The very simplest embedded systems are capable of performing only single functions to meet single functions to meet a single predetermined purpose. In more complex systems an application program that enables the embedded system to be used for a particular purpose in a specific application determines the functioning of the embedded systems. The ability to have programs means that the same embedded system can be used for a variety of different purpose. In some cases a microprocessor may be

designed in such way that application software for a particular purpose can be added to the basic software in a second process, after which it is not possible to make further changes. The applications software on such processors is sometimes referred to as firmware. The simplest devices consist of a single microprocessor (often called a "chip"), which may itself be packaged with other chips in a hybrid systems or Application Specific Integrated Circuit (ASIC). Its input comes from a detector or sensor and its output goes to a switch or an activator which (for example) may start or stop the operation of a machine or, operating a value, may control the flow of fuel to an engine.

5.5 CIRCUIT
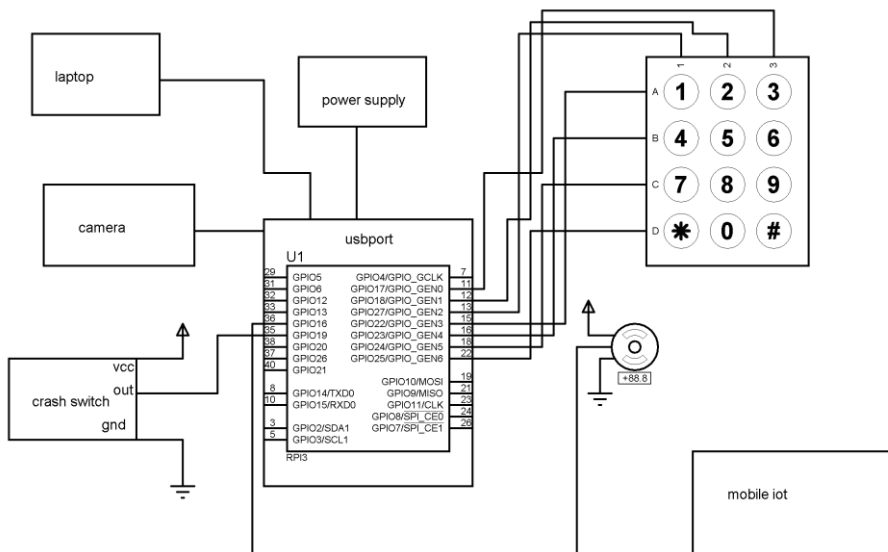
VI. CONCLUSION

In this paper, we have proposed and demonstrated an optimal smart home security approach with less cost and increased security. Advanced level of security is provided with help of IoT and Face Recognition. The real-time face recognition and face detection used for stranger identification and gives a warning using a LED display and send notification via SMS and email to the homeowner. Both IoT and face recognition are growing rapidly, so much advancement in this field is possible in future. Experimental results, in reality, show that system satisfies requirements of the current smart home security system. Use of android application makes it remotely accessible; a user can keep track of activities happening in the home using a Smartphone

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