Design and Development of dynamic Home Security Surveillance System by means of IOT

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Abstract : Internet of Things (IoT) conceptualizes the consideration of tenuously linking and monitoring live world stuff through the web. Recent advances in smart phones and affordable open-source hardware platforms have hearten the development of low-cost architectures for Internet-of-Things (IoT).As fruitful outcome of IOT and automation we have come with the emerging and new aspect of technology-IOT based home security surveillance system. This paper presents an IoT based security surveillance system in buildings using smoke senor, PIR sensor and Node-MCU (WiFi/IoT module). The system comprises
of wireless sensor nodes and a controller section for inspection. Intrusion detection with face detection and recognition, fire detection, remote user alerts, live video streaming and portability are the key features of the proposed work. The use of face recognition feature in intrusion detection makes the system more resourceful by identifying the known and unknown person in restricted areas. WiFi module processes the sensor based events and sends the sensor status to controller section. Upon receiving the episode notification, the controller alerts the user via Short Message Service (SMS).The upshot of this system will defiantly fetch the revolt in home security system.

Index Terms - IOT, PIR Sensor, Smoke Sensor, Ultrasonic Sensor, GSM Module

I. INTRODUCTION

The demands on video surveillance systems are rapidly increasing in the present day. One of the first things people will want to know about their surveillance system is whether or not they have the ability to connect to it over the internet for remote viewing. In the past, security systems had to be monitored by a guard who was locked away in a room all day watching the monitors to make sure that nothing would happen. The other option was to come back and review the footage but damage could have happened. Therefore, researchers and scientists had to come up with ways of overcoming that and thus improving security at large. Commercial spaces, universities, hospitals, casinos and warehouses require video capturing systems that have the ability to alert and record beside live video streaming of the intruder. The advancements in video surveillance technology have made it possible to view your remote security camera from any internet-enabled PC or smart phone from anywhere in the word. This encompasses the use of CCTV (DVRs) systems and IP cameras. This technology is awesome but its cost of implementation has proven to be an impediment especially for a small home application. The present scenario ensures the safety and security has become an inevitably essential. There is a regressive progress in the security system as the influence of modern technology is reaching its peak. When there is a modern home with minimum human effort, it's well known as modern home. Since there is an advent of wireless and digital technologies, all together it introduces a automated intelligent security system. The automated home security system can be designed with the surveillance camera and multiple sensors, and the use of these sensors will be defining the features of these sensors. Faster data transmission is taking place using the Wi-Fi to security systems which helps the user to control and monitor the system globally. Smart home is a section of the IoT paradigm that aims to integrate home automation and security. Enabling objects in a typical household to be connected to the Internet allows home-owners to remotely monitor and control them. From lamps that are set on timers to turn off at a specific time of the day, to smart thermostats that will regulate the temperatures in a house and generate detailed reports about energy usage, smart homes have found its niche in the consumer market. The availability of affordable smart phones, micro-controllers and other open-source hardware along with the increasing use of cloud services, has made it possible to develop low-cost smart home security systems. With families having busier lives than ever, smart home automation and security systems can also cater to household members with limited mobility such as the handicapped and the old.

II. IOT AND HOME SURVEILLANCE SYSTEM

Internet of Things (IoT) is one of the most upcoming technologies which can be used for managing and controlling any object by connecting it to the internet. IoT can be used in various applications of automation where automation is the process of operating or controlling various applications or equipment with less or no human intervention. Automation can be categorized depending on their application such as industrial automation, building automation, home automation, etc. The complexity of life

has significantly reduced with the advancement in automation technology. Everyday, manual systems are being replaced by automatic systems. With the ever increasing internet users over the past few years, it has become a part of everyone's life. IoT is the latest emerging internet technology. The new IoT based products and services will grow exponentially in next few years predicted by the analysts. The IoT involves different link layer technologies and a huge range of devices. IoT provides open access to particular set of data. Raspberry Pi is a compact minicomputer which is smart enough to give the good connectivity to the internet as well as boost up the signals. This frame work mainly envelopes the home security system from the sensor, networking, integrates real-time data and data management.

An important factor to consider when we talk about home automation is Security. Home security is a very important feature of home automation and maybe the most crucial one. Home security made drastic changes in the past few decades and continue to advance much more in the coming years. Previously home security systems meant having an alarm that would go off when somebody would break in but a smart secure home can do much more than that. Therefore the main objective of our work is to design a system which can 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 remotely using just his smart phone. This system will help the users to safeguard their homes by placing the system on the doors or windows and monitoring the activity through their smart phones.

There has been an unprecedented growth in the number of devices being connected to the Internet since past few years. All these devices connected to the internet are part of the IoT infrastructure which can that allows these devices to send and receive data among each other. This is why it is beneficial to use such an existing infrastructure for designing the proposed security system. An alarm system that sounds the buzzer is of no use when a user is not present in the home to take action. When the owner is away communicate with each other. The IoT network consists of embedded electronics, sensors and software from their home, they want to be assured that their home is protected by intruders and thieves while they are gone. This is why the proposed system keeps the owner informed in the real time about the security status of their home. The designed system informs the user as there is a break-in so that the user can take necessary actions.

III. PROPOSED METHODOLOGY

We understand the importance of security concerns for our house and we made each and every possible steps to improve its performance by means of adding various security features at our house surrounding either by installing special security gates, by maintaining electric compound to avoid trespassing and installing CCTV cameras for securing specific location. But out of the above features there might be the case of interruption and the proposed methodology helps to overcome following disadvantages by implementing the IoT based home security system. Taking a few simple steps to make your property seem like an unappealing target is quite often enough to make sure a criminal who happens to be eyeing your home decide it's not worth the effort. The very real threat of getting caught sneaking around on property that is under surveillance can go a long way towards protecting your home, your valuables, and your family. But of course, a home security system is so much more than just a scare tactic.

In our system we tried to make use of information over internet by making use of some devices which will help us to notify such threats in our mobile phone so that we can take immediate action in that regards. There are two basic types of alarm systems available; monitored and non-monitored. Monitored systems are the type of security solution most people picture when they think about home security. These are the systems that are provided by a security company that employs a team of people whose job is to keep tabs on your property and contact both you and the proper authorities when an alarm is triggered. Whereas non-monitored system only records the consequences happens and doesn't provide any alarm system though it. Many of these systems have two-way communication built into the security wall panel or other devices, allowing you to speak directly to are preventative who can help you handle the situation quickly. In the interest of prioritizing your personal safety, some security companies will contact you through text message or email to alert you to a suspected security breach. Depending on the type of system you choose, your security solution will have a battery backup in place which will allow the system to alert the company's monitoring station in the event of a power outage. That way, you'll never have to worry about your system failing you when you need it most. Although previous systems involves a single sensor and allows us to notify any changes occurs through its triggering point. The problem associated with previous system was removed in the proposed system we make the use of three sensor that are PIR , Smoke and ultrasonic sensor which protects your area , determine any fire alarm and detection of any trespassing near to your house respectively. Whenever any signal generated from any of this sensor further with the help of IoT device it will immediately inform and notify the owner of the house about its change and with due respect the owner of the house can inform to nearby police station about the theft. Since sensors are work independently so the fault triggered in one sensor can be rectified by another two and that's the benefit of this system.

Program Flow

Once the system is Intiated

Intially in Ideal condition, once motion or Fire is detected through sensors

It will intiate the the command and forward to the IOT device

It enable the system and scan the present databased kin the system.

If Known then terminate

If Unknown or smoke is detected it will forward the message to the owner to take necessary actions.

Figure:1 Structural Diagram of System
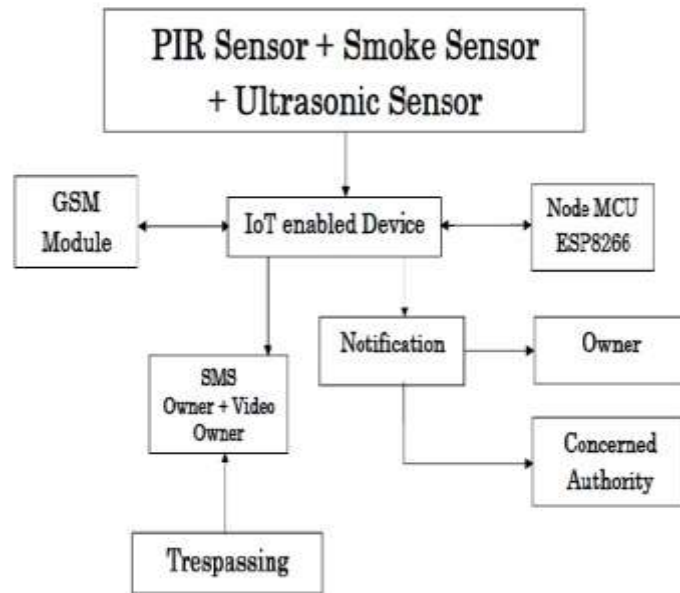
IV. DETAILED SYSTEM DESIGN

4.1 Hardware Implementation of PIR Sensor

An individual PIR sensor detects changes in the amount of infrared radiation impinging upon it, which varies depending on the temperature and surface characteristics of the objects in front of the sensor. When an object, such as a human, passes in front of the background, such as a wall, the temperature at that point in the sensor's field of view will rise from room temperature to body temperature, and then back again. The sensor converts the resulting change in the incoming infrared radiation into a change in the output voltage, and this triggers the detection. Objects of similar temperature but different surface characteristics may also have a different infrared emission pattern, and thus moving them with respect to the background may trigger the detector as well.PIRs come in many configurations for a wide variety of applications.

The most common models have numerous Fresnel lenses or mirror segments, an effective range of about ten meters (thirty feet), and a field of view less than 180 degrees. Models with wider fields of view, including 360 degrees, are available-typically designed to mount on a ceiling. Some layer PIRs are made with single segment mirrors and can sense changes in infrared energy over one hundred feet away from the PIR. There are also PIRs designed with reversible orientation mirrors which allow either broad coverage

Figure:2 Operation of a PIR sensor
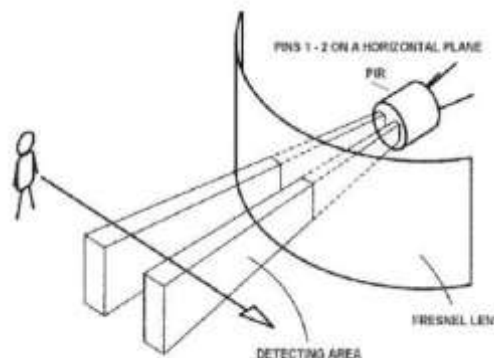
4.2 GSM Module

Global System for Mobile Communications, is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones, first deployed in Finland in July 1991.2G networks developed as a replacement for first generation (1G) analog cellular networks, and the GSM standard originally described a digital, circuit-switched network optimized for full duplex voice telephony. This expanded over time to include data communications, first by circuit-switched transport, then by packet data transport via GPRS and EDGE .Subsequently, the 3GPP developed third-generation (3G) UMTS standards followed by fourth-generation (4G) LTE Advanced standards, which do not form part of the ETSI GSM standard.

GSM is a cellular network, which means that cell phones connect to it by searching forG cells in the immediate vicinity. There are five different cell sizes in a GSM network—macro, micro, and umbrella cells. The coverage area of each cell varies according to the implementation environment. Macro cells can be regarded as cells where the base station antenna is installed on a mast or a building above average rooftop level. Micro cells are cells whose antenna height is under average rooftop level; they are typically used in urban areas. Pico cells are small cells whose coverage diameter is a few dozen meters; they are mainly used indoors. Femto cells are cells designed for use in residential or small business environments and connect to the service provider's network via a broadband internet connection. Umbrella cells are used to cover shadowed regions of smaller cells and fill in gaps in coverage between those cells. Cell horizontal radius varies depending on antenna height, antenna gain, and propagation conditions from a couple of hundred meters to several tens of kilometers. The longest distance the GSM specification supports in practical

use is 35 kilometers (22 mi). There are also several implementations of the concept of an extended cell, where the cell radius could be double or even more, depending on the antenna system, the type of terrain, and the timing advance .Indoor coverage is also supported by GSM and may be achieved by using an indoor base station, or an indoor repeater with distributed indoor antennas fed through power splitters, to deliver the radio signals from an antenna outdoors to the separate indoor distributed antenna system.

4.3Raspberry PI

Raspberry Pi board [13] is a miniature marvel, packing considerable computing power into a footprint no larger than a credit card. The processor at the heart of the Raspberry Pi system is a Broadcom BCM2835 system-on-chip (SoC) multimedia processor. This means that the vast majority of the system's components, including its central and graphics processing units along with the audio and communications hardware, are built onto that single component hidden beneath the 512 MB memory chip at the centre of the board. It's not just this SoC design that makes the BCM2835 different to the processor found in your desktop or laptop, however. It also uses a different instruction set architecture (ISA), known as ARM. The Raspberry Pi, by contrast, is designed to run an operating system called GNU/Linux Raspbian. Hereafter referred to simply as Linux. Unlike Windows or OS X, Linux is open source: it's possible to download the source code for the entire operating system and make whatever changes you desire.

Figure:3 Raspberry Pi 3 Model B
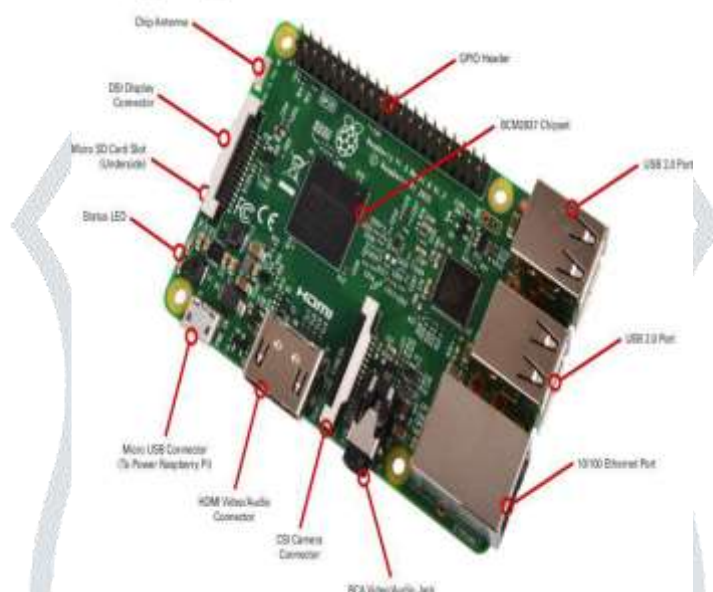
V. RESULT AND IMPLEMENTATION OF SYSTEM

The Below figure shows the implementation results of face recognition. Once the face recognition is carried out, systemchecks for known and unknown people. If there is a match, it will show the known person's name else, it will show unknown. Once the unknown face is detected or Trojan is detected system will text the owner regarding the event occurrence.
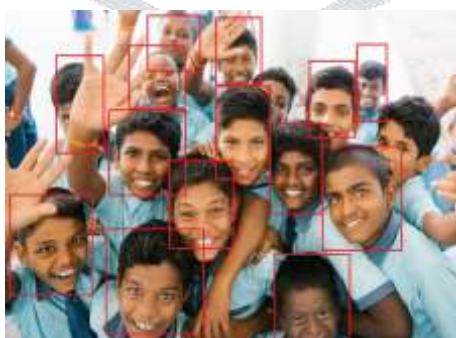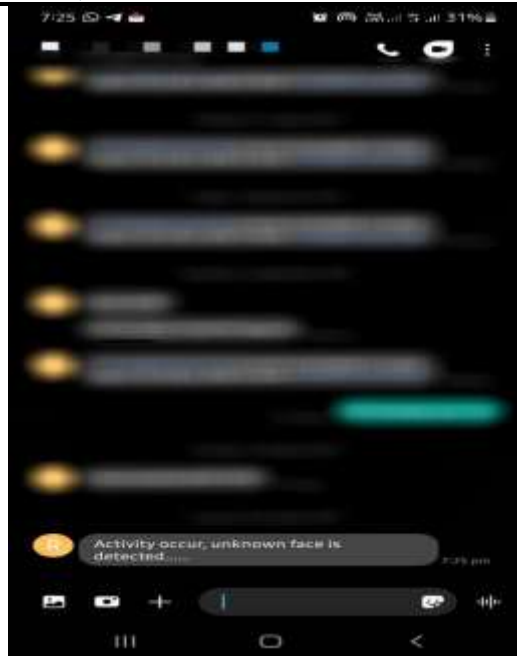
Figure:4 Face reorganization system

Figure: 5 GSM based SMS text system

VI. CONCLUSION

In this paper, we have deliberate and developed a real time surveillance system using IoT module and Raspberry Pi. It is an lively surveillance system which will alert the user when the event happens. Intruder exposure with face recognition and fire detection is the key features of the system. Even though face recognition was a challenging task, we were able to categorize the person with better accuracy. Live video streaming is an additional advantage of the system. We have created web servers which help the user to view the sensor status and the live video. This system also sends SMS to owner providing information of Intrunder. The use of NodeMCU makes the system cost effective, portable and compact. Most of the existing surveillance systems are costly and common people may not spend a lot for such systems.This system is designed with an aim that it can be used for all kind of people since security of every one's home should notbe left behind.

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