ADVANCE HOME SECURITY SYSTEM USING IOT

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Abstract—: **Home security has become a most important responsibility in recent year. As the technology is expanding day by day, ample home-based security system has been developing with the latest technology to keep the home safe. This paper represent the prototype and design of a home security system that helps to make home more secure, advanced, and economical. The Internet of Things has become one of the most important exposure for the future of wireless sensor technology. Wi-Fi is one of the most important wireless communication protocols for connecting various devices to exchange data over the Internet. IOT is implemented in smart home security for embedded modules for devices for the independent operation of collecting and monitoring various sensor data for home security and embedded with android application. This system consists of alarm system so client get the notification through the android application on the client's mobile via SMS.**

Keywords--- *Internet of things (IOT), PIR Sensor, Microcontroller, Intrusion Detection*

I. INTRODUCTION

Internet of Things are the connected physical objects that can transfer the data from one to another without the help of humans. It allows to gather the data from all type of mediums like as kitchen appliances, humans, animals and all type of physical object in which IP address can be enable data transmission over the network by which IOT is embedded with electronics devices such as software, sensor, network in gear.

The term IOT and its conception can be traced back to 1985, when Peter T. Lewis spoke about the concept during his speech to the Federal Communications Commission (FCC). The scope of IOT has grown very fast in comparison of other technology. By the help of IOT we can collect real time data and information and also analysis using accurate sensor and internet connectivity that will help in making a beneficial in taking decisions.

In recent years, home security has become one of the most important part of life concern. It is necessary to make secure home from the intruders. By the help of sensors (like PIR sensor) intrusion detection and surveillance we can easily detect intrusion and raise alert. Smart home security system having the potential that can easily detect the intrusion and having a strong connectivity with the secure environment that contain PIR sensor, buzzer to alert , camera for clicking picture, GSM module that help in sending messages via SMS.

II. LITERATURE REVIEW

Cameras need to be of good Design and Implementation of Security for Smart Home based on GSM technology was discussed by Govinda et al. (2014) that provides two methods to implement home security using IOT [1]. One is using web cameras such that whenever there is any motion detected by the camera, it sounds an alarm and sends a mail to the owner. This method of detecting intrusion is quite good, albeit somewhat expensive due to the cost of the cameras involved in the process. The quality which means it should have a wide range and

the picture quality should be high enough to detect movement. Also if you go for movable cameras such as dome cameras, they will cost even more than the fixed ones.

SMS based system using GSM was proposed by Karri and Daniel (2005) propose to use internet services to send messages or alert to the house owner instead of the conventional SMS.[2] Jayashri and Arvind (2013) have implemented a fingerprint-based authentication system to unlock a door [3]. This system helps users by only allowing the users whose fingerprint are authorized by the owner of the house. This system can also be used to monitor who all have used the sensor to gained entry into the house. The system is coupled with a few more home protection features such as gas leakage and fire accidents. Although a good system, fingerprint sensors are expensive and complex (as they need increased sensor resolution) to integrate into an IoT setup. Some experts also argue that only relying on a fingerprint sensor is not wise as it is relatively easy to lift someone's fingerprints and replicate them, which is why it is always advised to use fingerprint scanners in two factor authentication systems where an additional layer of security is available in the form of PIN,passcode, voice recognition, etc.

Some researchers proposed an idea of robust IOT home security system where a fault in of one component in the system does not lead to the failure of the whole system [4]. The idea of using multiple devices which may or may not be directly compatible with each other but can be made to work in such a way that they can replace an existing component of the system in case of a fault. In tandem to this, the model has the ability to use overlap between various devices which would result in preserving energy thus making the model more efficient. An example provided of the said model would use temperature sensor, Wi- Fi module and a door sensor to replace a faulty camera. The authors are successful in an effort to demonstrate the given example. However such systems are useful for people with energy efficiency in mind and for those who need a high degree of robustness with their security systems and are willing to expend more money than usual. Laser rays and LDR sensor are used to detect intrusion using their movement was proposed in 2016 [5]. The way the system works is that a laser is focused towards a LDR sensor and the moment that the contact of laser to LDR sensor breaks, the alarm connected to the sensor goes off alerting the neighbours and sends a SMS to the owner. This system solve the problem of covering the places which are out of range from the fixed cameras but faces the same difficulties which are faced with systems consisting of GSM modules to send text messages, which is that the delivery of message is dependent on network coverage. Also due to the nature of lasers being a straight beam, it can be avoided by intruders who know about the system and are capable of dodging the lasers, rendering the whole system useless.

A novel way to design an electronic lock using Morse code and IOT technology [6]. The authors claim that this as an original idea which have not been tried before and is the first of its kind "optical Morse code-based electronic locking system". This system uses LED's (Light emitting diodes) as an encrypting medium to send signals. To make it more accessible to general public, the LED in smart phones has been used. On the receiver's side is a photosensitive resistor as well as a microcontroller such as Arduino processor which has the ability to decrypt the optical signal after receiving them from the LED. Upon decoding the signal it can than upload the current condition of the lock to a cloud from where the owner can monitor the system. The authors have experimented the system in real time and it has proved to work under different illumination environments with all the functions working as they were intended to. The authors also claim to have an easy and user-friendly interface. The IOT system developed here works very well and can be used by anyone and is very convenient due to the use of mobile phones as LED, which also makes it a cost expensive alternative [7]. Anitha et al (2016) proposed a home automation system using artificial intelligence and also proposed a model for cyber security systems [8,9].

Ravi Kishore Kodali, Vishal Jain, Suvadeep Bose and Lakshmi Boppana explained the model for IOT project which focuses on building a smart wireless home security system which sends alerts to the owner by using Internet in case of any trespass and raises an alarm optionally. The microcontroller used in the current prototype is the TICC3200 Launchpad board. This system can send alerts and the status sent by the Wi-Fi connected microcontroller managed system can be received by the user on his phone from any distance irrespective of whether his mobile phone is connected to the internet [10].

Vamsikrishna Patchava, Hari Babu Kandala, P Ravi Babu proposed the system for Smart Home Automation technique with Raspberry Pi using IOT and it is done by integrating cameras and motion sensors into a web application. Raspberry Pi

operates and controls motion sensors and video cameras for sensing and surveillance. For instance, it captures intruder's identity and detects its presence using simple Computer Vision Technique (CVT) [11]. The main advantage of IOT based Home Automation is user can remotely control or integrated with the electric appliance and devices. Most of the Home Automation Systems are relatively high cost comparing to Bangladesh. Most of the home automation is android or IOS based, not platform independent. The security is a great concern for IOT based home automation system. The paper -"Internet of Things Business Models, Users, and Networks" describes various wireless IOT protocols used in smart home. It also describes the application protocols used for IoT. It is useful to recommend the best security features of different protocols and helps choose which protocol to use [12]

III.   PROBLEM STATEMENT

In most of the home security system those are developed earlier are affected by power failure and breaking of security, So Security monitoring system requires data transmission system fast receiving data and having a good range, So the client can fixed the devices freely at important locations for detecting the intrusion. The internal configuration of security system must be safe and secure so it is not hacked by anyone no matter in various ways including power supply to the system, on receiving the data and during their transmission. Atmospheric condition is not always same so the security system must be temperature resistant, water resistant and robust so the data transmission process and data receiving process must not be affected. Some of the security system having the limitation over the usage of sensor devices that's why system cannot cover the complete area of intrusion that is reason security system requires extensive use of sensor for the system to cover every part of the house. Therefore, we propose to design an internet based home automation system which will enable one to remotely manage his/her appliances from anywhere, anytime and also safeguard his smart home against fire accidents or theft [13].

IV.   PROPOSED SOLUTION

Incidents like thefts, fire and LPG gas leakage are very common these days. What is uncommon, is people's awareness about different systems like a smoke detector, gas leakage detectors, etc. Installing all these different detectors in order to keep the house secured is also something that is difficult to maintain. Here, we have designed an integrated home security system that would help people secure their houses from such incident.

IOT and Arduino based Home Security System project is designed to help an individual secure his/her house from theft, fire and LPG gas leakage – all in one. This project uses four different sensors, from which data is sent over a website through IOT. Internet of Things (IOT) is basically, the network of 'things' by which physical things can exchange data with the help of sensors, electronics, software, and connectivity. These systems do not require any human interaction [14].

V.   BLOCK DIAGRAM

Block diagram of system consist of peripheral sensors for motion detection, gas leakage detector, fire detector, exhaust fan, buzzer, camera and the main platform of the system e.g. Arduino Uno, ESP-32.
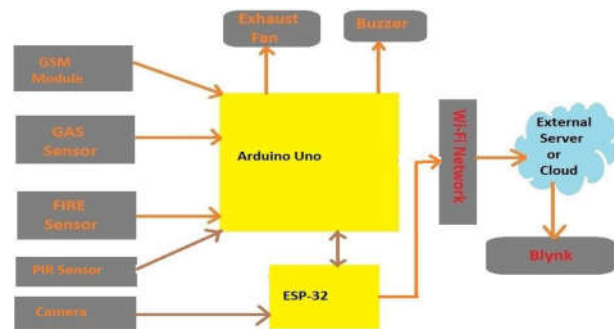

Fig.1 Flow Diagram

➤ Arduino Uno

An Arduino Uno is a platform with a microcontroller, some memory, a bunch of interface & I / O adaptation circuitry, and a bunch of circuitries to handle voltage / power distribution to the platform. In addition, it has a software development environment and an ecosystem with lots of software and hardware pieces you can add to your application with it. At a high level, this gets you a single board platform you can use to interface with lots things in the outside world. You can write software for your microcontroller - have it twiddle these pins high and low or read voltages from them and make software decisions to twiddle other pins high and low or set other voltages based on whatever algorithm you decide is best. You can send instructions to devices / sensors that respond to I2C / SPI messages & collect data from the same. You can repurpose the pins to allow you to stack other boards containing logic

devices on top of the Arduino - so at the end of the day, it is very scalable and flexible (and cheap) way to build an embedded controlling platform [15].

Fig.2 Arduino Uno

➢ *PIR Sensor*

Passive Infrared Sensor is an electronics device that can measure the transmitted infrared light. In PIR sensor 'P' stand for 'Passive' that's mean device does not emit infrared rays, it only receive infrared rays. 'I' stand for 'Infra' that tells the ability to detect the radiation. 'R' Stand for 'Red' because it having high wavelength. PIR has two slots and each slot is made of IR sensitive materials. Under normal circumstances, both slots detect a similar amount of IR, the precise amount of ambient radiation emitted from the walls of the room and outside. When there is any movement of a subject, such as an animal or a human, it passes the detection area, it first intercepts the half of the PIR sensor that produces the positive differential change between two halves. When the subject leaves the detection area, the differential change is reversed. This change activates the sensor and returns the value. The value delivered by a PIR sensor is digital in nature.[16]

Fig.3 PIR Sensor

➢ *Gas Sensor*

A gas sensor is a device that detects the presence or Concentration of gases in the atmosphere. Depending On the gas concentration, the sensor produces a corresponding potential difference as the resistance

the material in the sensor changes, which can be measured as an output voltage.
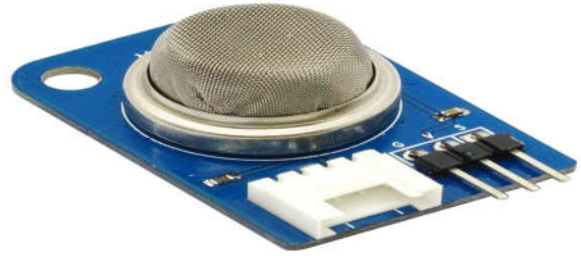

Fig.4 Gas sensor

➢ Camera

The camera is used to get the live update of the house. If the sensors find unusual activity in the house, the user will receive the notification in the app and the owner can get the live monitoring.

Fig.5 Camera Module

➢ *Flame Detector*

The flame is caused by heat. Furthermore, these sensors can only be used for short-range fire detection and can be used as a home security measure. It is basically an infrared sensor and is very sensitive to infrared wavelengths between 760nm and 1100nm of light. It can provide both analog and digital output and the device is accurate within a 1 meter range. [17].
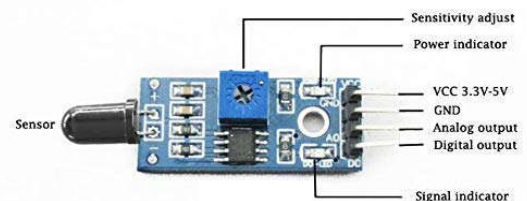

Fig.6 Flame Detector

➢ *GSM Module*

A GSM modem or GSM module is a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network. From the view of the mobile phone network, they are essentially identical to an ordinary mobile phone, including the need for a SIM to identify themselves to the network .GSM is a mobile communication modem; it stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is a widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operate at the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands. GSM technology was developed as a digital system using the time division multiple access (TDMA) technique for communication purposes. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has the ability to carry 64 kbps to 120 Mbps of data rates.

There are various cell sizes in a GSM system such as macro, micro, and umbrella cells. Each cell varies as per the implementation domain. There are five different cell sized a GSM network macro, micro, Pico, and umbrella cells. The coverage area of each cell varies according to the implementation environment.

The time division multiple access (TDMA) technique relies on assigning different time slots to each user on the same frequency. It can easily adapt to data transmission and voice communication and can carry 64kbps to 120Mbps of data rate.

Fig.7 GSM Module

➢ ESP-32 CAM Module
The camera is used to get the live update of the home. If the sensors find any unusual activity in the home, the user will receive the notification in the app and the owner can get the live monitoring. ESP-32 is a

low cost and low power system on chip (SOC). It consists of integrated Wi-Fi and dual mode Bluetooth. This is Tensilica Xtensa LX6 microprocessor. It is created and developed by Espressif System and manufactured by TSMC. ESP32 is a single board. It has multiple GPIO for the interfacing with external I/O devices. It is also used in the form of a module like as cam module or Node MCU. ESP32 has a frequency of 160-240MHz. It is basically made up for the wireless connectivity like as Wi-Fi and Bluetooth. It is available in both single and dual core variation. ESP32 has also built-in analog to digital converter, which is very helpful in interfacing. The ESP32-CAM is a development board with an ESP32-S chip, an OV2640 camera, micro SD card slot and several GPIOs to connect peripherals. In this guide, we'll take a look at the ESP32-CAM GPIOs and how to use them.

Fig.8 ESP-32 CAM Module

VI   RESULT

The implementation is the process of carrying out, execution, or practice of the method, design or model according to the specification given by the user requirement. To get main objective of the system, few testing approaches have been done. System testing and result are discussed. All tests and result performed on a system are reported clearly in this chapter.

➢ Facial Detection Using ESP-32 CAM Module
   The results obtained from the final prototype board could be clearly observed over the Blynk dashboard. For this the Blynk application was downloaded and installed into the user's smartphone and an account was created there by entering the required user credentials. The user was assigned an authorization token ID over the

e-mail which was entered in the firmware itself before uploading it to the ESP32-CAM. A new project was created in the graphical-user-interface window of the Blynk App by selecting some widgets from its wide library and configured those widgets as per the system hardware and firmware. The ESP32-CAM based hardware and the Blynk over the smartphone got connected with the help of Wi-Fi hotspot network. Any interruption detected by the proximity sensor triggered the whole process and the visitor could be monitored on the Blynk project dashboard screen along with an alert notification and that too in real-time.[18]

➢ Motion Detection Alert

When motion sensors find that anyone try to enter your room then it shows that motion detected and send notification over the Blynk dashboard.

➢ Fire and Gas Detection SMS Alert
These sensors detect the concentration of gas and fire and send the SMS alert to the owner phone through the GSM module.

VII   CONCLUSION

The 'THE IOT BASED HOME SECURITY SYSTEM' is the effective safety and security system which is made by the advancement in wireless and embedded technology. It is completely integrated so that it is possible to track anytime from anywhere. It can be concluded that all part of this project has been successfully done although still consist of some imperfection, but like a quote say that imperfection is perfection to a beautiful perspective.

This Home security System is cheaply made from low-cost available components and can be used to control the sensors and get updated about them to the user. To develop a smart home system can update the information get from all the sensor or device to user in anytime. This system is easily adjustable at any home or office space. The designed home security system was tested a number of times and successfully control different sensors used in home security. Finally, this home security system can be also implemented over Bluetooth, Infrared and WIFI connectivity without much change to the design and yet still be able to control a variety of home appliances. Hence, this system is scalable and flexible. To develop a smart home system which can bring safer, comfort and convenient life to user. With integrating the three main function which are security and monitoring in one system, the smart home system definitely can bring a safe, comfort and convenient life to user. Furthermore, after go through the process of this project two, there are some issues and challenges arise. The first issues are the proper connection of all the wires. Due to the big number of sensors or devices which require wires connection, all the wires connection become so messy which led to increase the difficulty of troubleshooting.[19]

VIII   FUTURE SCOPE

There are some future works can be done by adding some of the artificial intelligence technique into the smart home system such as the system can automatically deal with the cases happening in the home. For instance, the system can determine the seriousness of some cases such as thieve intrusion by automatically report to the police station and notify the user. Moreover, the system also can be added with CCTV to strengthen the security part of this project. In this project we have a large scope to develop and working with this project. We try to listed some tasks which would be added in future

- Add a special camera and using image processing try to find out known and unknown face. If detect known face system can send SMS and email with picture and information about this face which is store in previous.
- We can make the web application more users friendly. Can be added voice commands technology

- Adding some safety issues like when gas leakage or smoke found the system automatically takes necessary steps to reduce the losses.

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