A COMPETENT IOT BASED SECURITY MODEL FOR SMART ABODE

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Abstract : Today, the wireless technology has blown the space for abode security system wide open. From connected cameras to smart sensors, and the whole abode security systems have been bundled in simple, affordable, all-in-one gadgets. This system's Access Control is an Automatic Monitoring System that recognizes any harmful activities, making safety stringent around the clock. One of the major changes that the Internet of Things (IoT) has brought to abode is the capability to control your abode while you are away. The data from Surveillance camera and sensors like smoke detection sensor, fire sensor and motion sensors will frequently be stored in the cloud storage and enables to send this data to mobile and E_mail service. This allows the homeowner to have an advantage to monitor any potential destructive activity that might occur within the abode in real-time. Also provide security to the cameras itself by altering the user.

IndexTerms **- Cloud Storage, IoT, Photoelectric Sensor, PIR sensor ,Wireless Sensor, Thermistor.**

I. INTRODUCTION

"You depart your abode to seek destiny and when you get it, you go abode and contribute to it with your folks". An abode is the biggest fortune a man makes in his life time. Keeping it safe and sound is the top priority of all abode owners. In spite of informing neighbors and nearby police station in the traditional way while away from the abode, still the rate of burglaries is increasing steadily and constantly.With the novelty in IoT, move a step closer to make dreams into reality, anything-anywhere-anytime. The Internet of Things has made it easier to set up a smart abode in which tenuously controls the door locks, lawnmowers, lights, thermostats, vacuums, and even pet feeders, using the Smartphone and an app. It also makes it effortless (and comparatively affordable) to keep an eye on an abode from just about anywhere with a smart security system. The Raspberry Pi is a chain of small single-board computers. Presently Raspberry Pi 3 Model B is being used, which comprises of an on-board Wi-Fi, Bluetooth and USB boot features. A PIR Sensor is used to activate the camera, which measures Infrared (IR) light radiating from objects in its field of view.

An Intelligent Camera observes, generate images and videos to provide the information, like appearances and locations of the targets, so cameras are required in IoT [8]. The captured data from camera is stored in cloud storage, using data virtualization technique. Wireless Sensor Networks (WSN) is a main element in IoT. It will dynamically collaborate different services in a structured pattern [1]. Wireless sensors are fixed to the surveillance camera to detect destructive action on camera. Additional Battery backup is attached to the surveillance camera for uninterrupted power supply during power failure.

To detect smoke in case of an emergency, use photoelectric sensor to determine the presence of smoke and a Thermistor to provide a signal when there is a variation in the temperature level [5].

II. RELATED WORK

A recent work related to Home Automation system was proposed [7]. It integrated mobile devices, cloud networking, wireless communication, and power-line communication to provide the user with remote control of various lights and appliances within their home. This system used a mobile phone application, handheld wireless remote, and PC based program to provide a means of user interface to the consumer.

A module that integrated the networking capabilities of Wireless Sensor Networks and Smart phones, to achieve a monitoring and tracking mobility of objects using IoT services was designed [1].

A Wireless Home Automation using IoT that employed computers, mobile devices to control basic home functions was developed [8]. It can be operated through the internet from anywhere around the world. This system saves electric energy and human energy, also is low cost and expandable to a variety of devices.

An effort was made in capturing information and transmitting it through a 3G Dongle to smart phone using web application

was done [6]. The Raspberry Pi operates and controls the motion detectors and video cameras for remote sensing and surveillance. This system also finds the number of people with the help of Infrared sensor. When motion is detected the camera automatically starts live streaming of the video and alerts the owner through smart phone which is recorded for future playback.

Another work related to Automatic System was framed [5]. This was a Home Automation System using IoT, which used computer or mobile devices to control basic home functions through internet from anywhere around the world. The system saves electricity and human energy.

III. SYSTEM ANALYSIS

3.1 Problem Definition

Security Model for Smart Abode face many challenges like diverse security equipment, partial abode coverage, false alarms and no proper maintenance. The key objectives of this research is to design and implement a competent IoT Based Security Model for Smart Abode that is capable of controlling and monitoring the abode security through an easy, manageable, secured wireless sensor network and surveillance camera. The proposed system captures images, stores in cloud, compares with data stored in cloud and includes security to the camera. It also detects fire and smoke, sends this message to owner and also the fire station. This will decrease the operational cost, increase system scalability, reduces data storage and integration of mobile devices.

3.2 Proposed System Feature

The proposed system is an abode security system that consists of Raspberry Pi, Passive Infrared Sensor (PIR), Photo electric sensor, Thermistor, Picamera, python, Wi-Fi and cloud storage. The Raspberry Pi controls and monitors the Passive Infrared Sensor, which will send a beam across the front door. If the beam is broken, it detects alteration in quantity of radiation nearby and sends the signal to Raspberry Pi, which triggers the camera to take picture and immediately start recording for the next 10 seconds. Then the Raspberry Pi sends mobile and E_mail notifications (text message, picture and video) and stores these data in cloud for future use. The camera is monitored continuously by sending the command **vcgencmd**, which serves for detecting if the camera is connected or not.

Thermistor resistance depends on the temperature and a photoelectric sensor is used for determining the presence of smoke. When the resistance of the Thermistor changes and photoelectric sensor detects a change in a predictable way, then it notifies the user through mobile and E_mail. The benefit of using a these components is accuracy and stability. Wi-Fi technology is preferred to be the network infrastructure that connects Raspberry Pi, sensors and camera. Wi-Fi is chosen to improve system security and to increase system mobility and scalability.

IV. SYSTEM DESIGN AND IMPLEMENTATION

4.1 Proposed Security Model for Smart Abode

The proposed model of the Smart Abode is as shown in the Figure1.

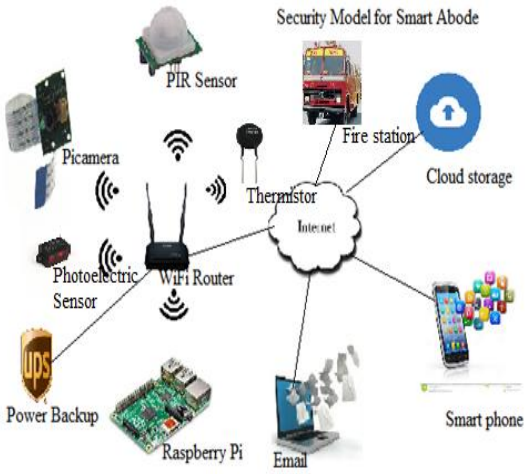

Figure 1: Architecture for Smart Abode

All objects with a temperature above absolute zero produce heat energy in the form of radiation. Usually this Passive Infrared

(PIR) Sensor [10] senses this radiation from the object in its field of view. It is mainly used in motion detection. When there is a change in Infrared radiation, the PIR Sensor is activated and sends signal to the Raspberry Pi through WI-FI Router, consecutively Raspberry Pi triggers the Picamera to take picture and at once starts recording video for the next 10 seconds. Then these images and taped videos are multicast to the owner's E_mail, smart phones along with text message. It is also sent to the cloud storage for future reference.

For uninterrupted services the Raspberry Pi and Wi-Fi Router are connected to the power backup (UPS). This model is continuously monitoring the camera [6] by sending the command vcgencmd from the Raspberry Pi, which serves for detecting if the camera is connected or not. In case of failure in detecting the camera, the alert message is sent to the owner's smart phone. When an object crosses a beam of light, it will block the light. The photoelectric sensor senses the lack of light; this is the same situation when a room becomes smoky. Thermistor checks for temperature variation and sends an alert message to both the user and the fire station. The risk of dying in a abode fire is cut in half in homes working with smoke alarms.

4.2 Proposed Security Model for Smart Abode Functions

The proposed Security Model for Smart Abode has the capability to supervise the components in users home and sends alert message to user :-

- Motion detection
- Fire and Smoke detection
- Photo capturing
- Video recording
- E_mail and mobile notification with text message
- Power backup
- Security for camera

4.3 Hardware Implementation

- The entire system is implemented using Raspberry Pi, the picture of which is shown in Figure 2.

Figure 2: Raspberry Pi

The technical specifications of the Raspberry Pi are listed below [11]

- BCM2387 chipset
- 1.2GHz Quad-Core ARM Cortex-A53
- 802.11 Wireless LAN and Bluetooth 4.1 (Bluetooth Classic and LED)
- 1GB RAM
- 64 Bit CPU
- 4 x USB ports
- 4 pole Stereo output and Composite video port
- Full size HDMI
- 10/100 Base T Ethernet socket
- Port for connecting the Raspberry Pi camera
- DSI display port for connecting the Raspberry Pi
- Micro SD port for loading the os and storing data
- Micro USB power source

4.4 Software Implementation

Step 1:Inorder to build an abode safety system, connect Raspberry Pi, Picamera, PIR, Photoelectric sensor, Thermistor and UPS to the Wi-Fi network internally.

Step 2: Raspberry Pi sends information to the cloud for future use and alterts the user through SMS and E_mail Message.

Step 3:Security for the camera

```
if ( camera_connection==0 )
        sms(GSM_msg,"camera not connected")
        e_mail(mail_msg," camera not connected")
```

Step 4: Smoke detection

```
if ((PE_sensor==1) and (Thermistor==1))
        cloud(c_store,"Fire detected")
        sms(GSM_msg,"Fire detected")
        e_mail(mail_msg,"Fire detected")
        fire_station(station_msg,"Fire detected", address,  "   XXX", contact,"999XXX234")
```

Step 5:Intruder Detection:

```
if (PIR==1)
        camera_on=1
        timer=1
        if (camera_on==1)
                while(timer<=10)
                        record_msg
                        timer++
                cloud(c_store , "record_msg")
                sms(GSM_msg,"Intruder Detected",video_msg,      "record_msg")
                e_mail(mail_msg,,"Intruder Detected",video_mail,    "record_msg")
        camera_on=0
```

V. RESULT

The results obtained after successful implementation of the proposed system is detailed in this section.After the successful installation of the Abode Security System, the data from the various sensors are sent to the Raspberry Pi for monitoring the abode system. A human walking within the range of PIR sensor is detected, which triggers the Picamera to capture image is shown in Figure 3.

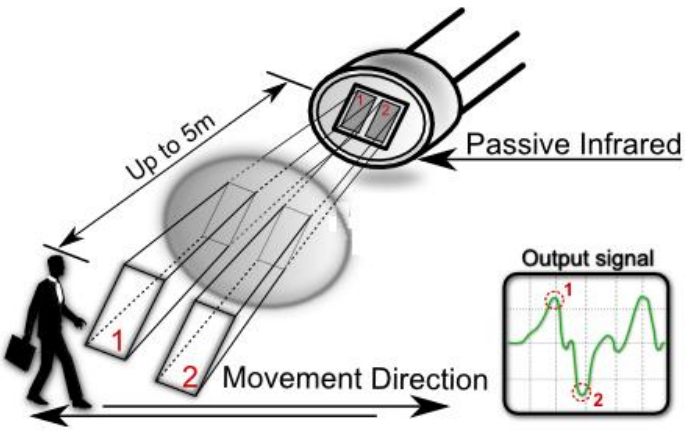

Figure 3: Human Intervention

The Raspberry Pi alters the user by sending SMS and E-mail. The Raspberry Pi also alters the user and the fire station, in case of fire by continuously monitoring the Thermistor and Photoelectric sensor.All these alerts are also stored in the cloud. The stored

data can be analyzed from any place at any time. The graph in Figure 4 shows the temperature of the room in degree centigrade (Celsius) stored at different time intervals. And it also shows the percentage of Opacity in the room with the same interval of time. This graph gives the analysis that as the temperature raises; the Opacity of room also increases (vice versa) from which it is deduced that fire has broken–out at abode.

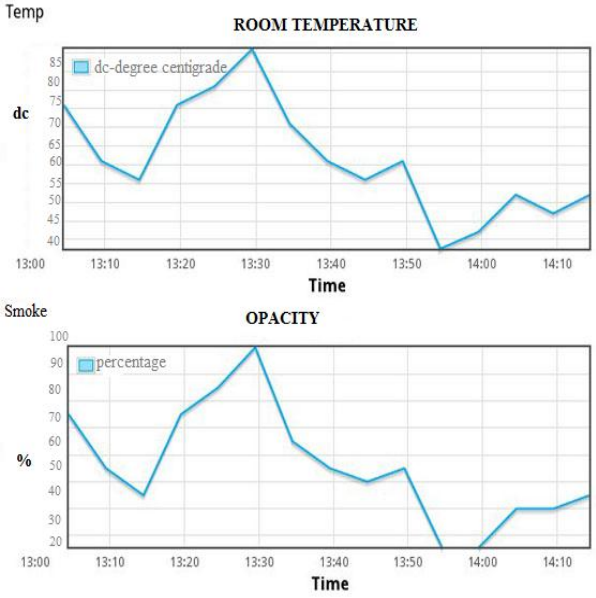

Figure 4: Temperature and Opacity

VI. CONCLUSION AND FUTURE WORK

6.1 Conclusion

When there is a change in Infrared radiation, the PIR Sensor is activated and sends signal to the Raspberry Pi through WI-FI Router, consecutively Raspberry Pi triggers the Picamera to take picture and at once starts recording video for the next 10 seconds. This model is continuously monitoring the camera by sending the command vcgencmd from the Raspberry Pi, which serves for detecting if the camera is connected or not. In case of failure in detecting the camera, the alert message is sent to the owner's smart phone. Usually this Passive Infrared (PIR) Sensor senses this radiation from the object

The photoelectric sensor senses the lack of light; this is the same situation when a room becomes smoky. Thermistor checks for temperature variation and sends an alert message to both the user and the fire station.

6.2 Future Work

Abode Security System is one of the most significant building blocks for a smart home. The present system has provided security from intruders and fire using intruder detection and smoke detection system. Abode can be made a smarter home by including as many sensors as possible in future.

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