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Department of Electrical & Electronics Engineering, Galgotias College of Engineering and Technology, Gr. Noida, India

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HOME SECURITY SYSTEM USING RASPBERRY PI WITH IOT

P.Amith Teja[1], A. Anne Frank Joe[2], V. Kalist[3]

1- Department of Electronics and Communication, Sathyabama Institute of Science and Technology
2- Assistant Professor, Department of Electronics and Instrumentation, Sathyabama Institute of Science and Technology
3- Assistant Professor, Department of Electronics and Control, Sathyabama Institute of Science and Technology

***Abstract*- Westernization of today's society has led to the increase in the number of small families while the gradual spread of living into the suburban areas has raised a significant concern in the security of the individuals. Although there are many security systems available in the market today, they are mostly expensive. The objective of the model described in this paper is to present a simple and low-cost design to make our homes smarter and safer. The Raspberry pi based framework built in this project comprises of PIR sensor, IR sensor, Piezoelectric sensor and Sound sensor which not only alerts an intruder action but also captures the images and recordings through a camera from the scene. An intrusion can be identified with the help of the above mentioned sensors that can detect the presence of a person, temperature variations and sound at the location. In case of a deviant output from the above measurements, the owner of the house is immediately alerted through IoT. The rightful person receives a message on his phone immediately followed by images of the person causing the sceptical situation along with a captured video that gives a detailed picture of the happenings and will also serve as an evidence for further investigations.**

Key words—Internet of things (IOT), Raspberry Pi, PIR sensor, IR sensor, Home security.

I. INTRODUCTION

Home security system is the most sort after mechanism to ensure the safety of valuables and to safeguard personal security as well. The development of burglar alert gadgets can limit the event of theft, while it can also identify and record suspicious trespassing. In places with high density like railroad stations and schools we can install face acknowledgment innovation which can identify hoodlums and suspicious people. This is a proactive technique that can control the event of the criminal occurrences and ensure the security of individuals and the property. To defeat the disadvantages of conventional burglar alarms, like infrared microwave indicators, glass break finder, microwave target movement locator, we propose the model presented int his paper. The infrared microwave finder is a crisis caution gadget dependent on the working standard of infrared and microwave. Compared with other conventional burglar alert products, infrared microwave indicators possibly create alert signs when it detects a difference between the microwave signals sent which have been split into two different and equal halves. If the difference is not zero, it indicates that there exist a movement. The glass break identifier is for the most part used to identify the sound of glass breakage. The glass-pounding identifier has a restricted location run, it can just identify the recurrence sounds that originate from the wrecked glass and cannot be utilized for identifying normal glass vibration. The microwave target movement finder is a locator for recognizing the Doppler move of high recurrence radio waves and it is fundamentally utilized in open spaces, most commonly, square space. Compared to infrared wave indicator, microwave target movement identifier examines the comparative very high recurrence radio waves with extremely short frequencies, which implies that microwaves are easily reflected by other objects. The movement of reflected waves can be utilized to distinguish interruptions.

II. IMPACT OF IOT ON ANTI THEFT TECHNOLOGY

The widespread adoption of Internet of things (IOT) technologies has resulted in a smartly connected world to live in [1,2]. It has gone into a brilliant time with a quickly developing innovation in the field of home security. The key idea of Internet of Things is tointegrate each gadget/framework, for example, television, home appliances, advanced mobile phones and sensors associated with the Internet to be observed and controlled from anywhere [3]. The primary targets of IoT are to manufacture exceptionally interconnected framework where gadgets will be the clients of the web [4]. The Internet of Things (IoT) is a novel system administration worldview which permits the correspondence among a wide range of physical framework with the plenty of uses in the fields of agriculture, medicine, home security to name a few.

The objective and scope of the design built in this paper is to develop an efficient and low-cost system that constantly screens the region where it is installed to recognize any suspicious activities or trespassers. IOT based system is superior to other methods that are used for home security purposes, for example, Micro controller-based wired and remote security frameworks, CCTV framework, and so forth. IoT based system is quite costly and have a few disadvantages in effectiveness and availability to the client. IoT based anti theft systems are implemented on vehicles successfully [5]. So, we propose this system consisting of PIR, IR, Piezoelectric and Sound sensors. A camera and Raspberry pi circuit is employed with a USB drive to enable storage. When a movement is detected in the secured zone, the system with the assistance of a camera captures the pictures and video to recognize the zone of movement. The raspberry controller presently transmits the pictures and video over IOT to be seen by the client on the web. Likewise, it stores the information in

USB for further reference. The client would now be able to interpret the information sent on the web through IoT to see the pictures of the incident remotely and the Raspberry Pi to start the signal alert.

III. RELATED WORK

The home security systems today has transformed from a straightforward lock and key security idea to executing refined security systems utilizing cameras, amplifiers, contact sensors, closeness sensors, cautions, quiet alerts, and so on [6, 7]. The majority of the wrongdoings comes to light after it has occurred and is further investigated using the CCTV footages. Also, the task of CCTV observation is round the clock inspection with the involvement of human labour. Considering the above said downside of the current surveillance systems and to curtail the intruder activity or trespassing, efficient monitoring and immediate signalling is required. The best component about the present current security system is that, one can control their home gadgets just by utilizing Internet. In some security systems, IR sensors are utilized to detect the nearness of a burglar. At that point it advises the owner about the criminal behavior or burglary and alarm begins ringing. The warning to client is sent through Bluetooth or SMS. The client gets mindful of the interruption on accepting the warning. Likewise, neighbors will be alerted of the incident on account of the alert. In the context of reducing the delay and initiating an instant response we propose a system with PIR, IR, Piezoelectric and sound sensors which bridges the gap for error and the message will be transferred by using API.

The system can be used as surveillance or security system that can capture both video and image unlike other devices in the market.

IV. PROPOSED SOLUTION

The primary point is to ensure the safety of our friends and family and our valuables at home. Today number of IoT based home security systems are accessible in the market. Based on the literature survey and current market study, the technical advancements of IoT in the application of home security system have been a happening area of research. The primary concern is if the intruder posses quite some knowledge about a security system, the sensor can be de routed, hence employing additional sensors are required to record various other sensory captures [8, 9]. To monitor and safeguard our home in our absence we propose four sensors in the proposed system. Figure 1 displays the overall architecture of the IoT based home security system. The system screens the whole floor for movement. This system is controlled by Raspberry pi incorporated with Piezo sensor, IR sensor, PIR sensor, Sound sensor, camera, Wi-Fi modem. At whatever point the intruder goes into the house, and steps in promptly it is detected by the sensor which gives the sign to raspberry pi controller. The controller transmits the captured image and video over the Internet for the client to check the recordings. Here we use IOT Cloud for the electronic GUI of IoT framework which sounds a caution and demonstrates the caught information to the client.

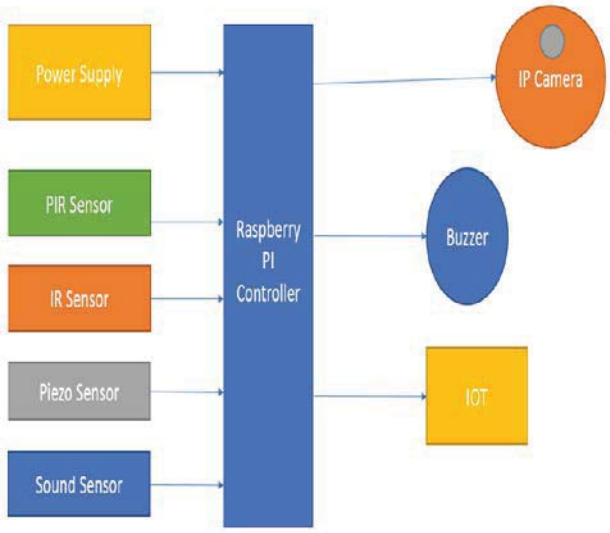

Fig. 1. Block Diagram of the IoT based Home security system

V. HARDWARE COMPONENTS DESCRIPTION

- IR sensor
- PIR sensor
- Sound sensor
- Piezo sensor
- Raspberry pi
- Power supply

A. SENSORS

The PIR Sensor helps to detect movement within the sensor's range. The sensor emits radiation which is split into two halves. The two parts are wired up with the goal that they counterbalance one another. In the event that one half observes an increased IR radiation than the other, the yield will swing to high [10]. A change in energy observed in the monitored area due to an intervention is recorded, '1' is sent to Raspberry Pi, else '0' is sent. PIR requires 5 Volts and 50 mA current and it detects the movement up to 12ft, i.e., about 4 meters in a semi circular edge.

An IR sensor is an electronic gadget that produces infrared radiation to detect the objects in the surrounding. An IR sensor basically detects the warmth as well as the motion of an object. The IR sensor module comprises of the IR Transmitter and Receiver, Operational speaker, Variable Resistor (Trimmer pot). IR LED radiates light, in scope of Infrared recurrence. IR light is imperceptible to human vision as its frequency (700nm – 1mm) is a lot higher than the VIBGYOR range. These kinds of radiations are not visible to human eyes and can be identified only by an infrared sensor.

The motion of an object generates a deformation that is measured using a piezoelectric pressure sensor. A Piezoelectric sensor delivers a voltage in response to some kind of physical pressure, for example, a thump or vibration. An LED will glow when a thump or vibration is identified. However, in fact, a vibration sensor is helpful when we need a circuit to be sensitive to delicate movements. The sound sensor is generally used to detect the intensity of sound. The

applications of this module mainly include home automation systems, consumer electronics, security systems and sound recognition systems. Comprising of a microphone and a processing circuitry this sensor is capable to determine noise levels or decibels at 3 kHz to 6 kHz frequencies approximately wherever the human ear is sensitive. Figure 4 shows the Sound sensor used in the developed model.

Fig. 2. Sound Sensor

B. *RASPBERRY PI CONTROLLER*

The Raspberry Pi 2: Model B+ is a miniature sized single-board computer with a fast 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor. It can control input gadget and it can interface sensor to get sensor information. It has 40 GPIO pin (General Purpose Input Output) to interface sensors. Model B is the higher specific variation of the Raspberry Pi, with 512 MB of RAM, two USB ports, and a 100mb Ethernet port. It also has a slot for USB storage to save the proofs and data. The processor collects the data from the PIR sensor, IR sensor, Piezoelectric sensor and the sound sensor. Figure 3 shows GPIO pins that connects the various sensors with the Raspberry Pi2 module. The Raspberry pi connected with all the sensors and as a prototype of the IoT based home security system is depicted in the figure 4.

Fig. 3. Connection diagram of Raspberry Pi 2 module

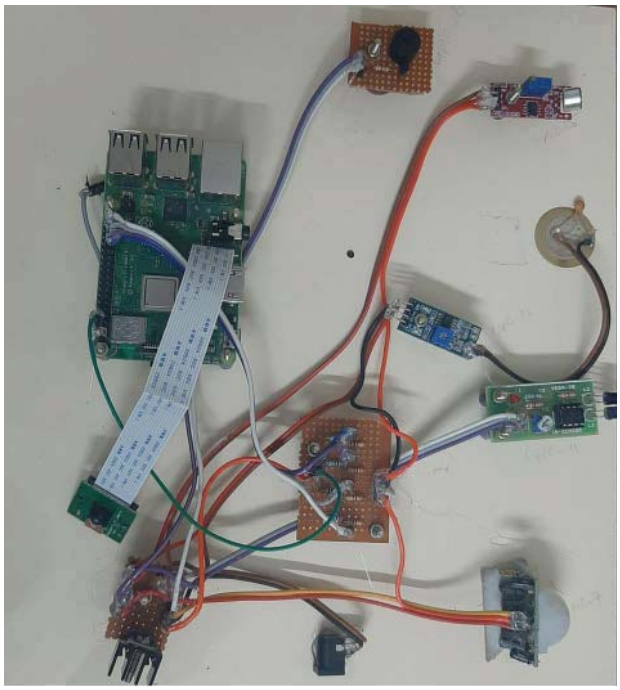

Fig. 4. Prototype of the Home security system

V. RESULT AND ANALYSIS

An intruder activity is sensed based on the information received from the installed sensors in terms of motion, sound detection and observation through energy variation in the area monitored. The Processor uses this information to alert the home owner through SMS. It captures images and videos from the scene which is sent to the home owner through the IoT connected device and is also stored through the USB port for further processing/ evidence. The Alarm connected to the circuit will buzz after the detection. Figure 5 shows an example picture of intruder. This image will be stored in USB storage provided and user can view it over IoT. While figure 6 is a sample video taken by 5 MP camera connected to the system. This video is of duration 7 seconds. It can be viewed through IoT. This video is stored in USB storage. This will be used as evidence. Alarm will be activated after the capture of image and video.

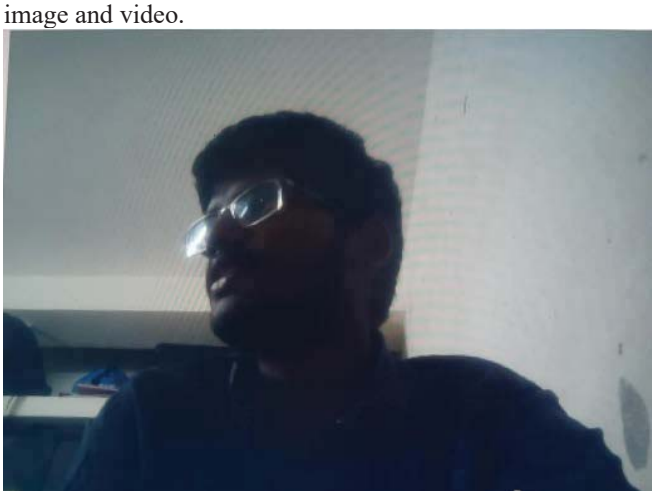

Fig. 5. Image captured by the Home security system

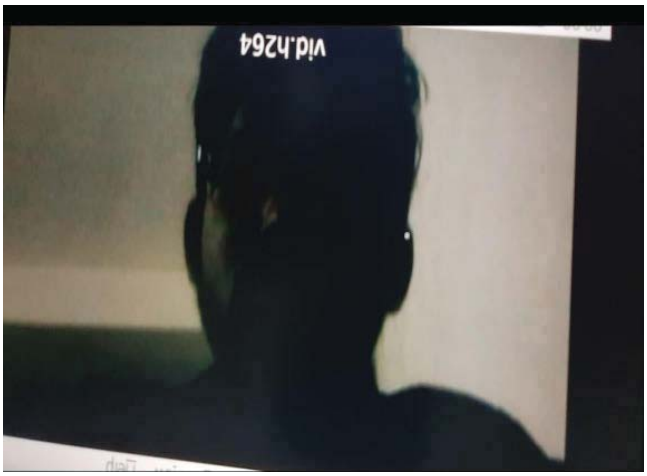

Fig. 6. A 7 second video captured by the Home security system

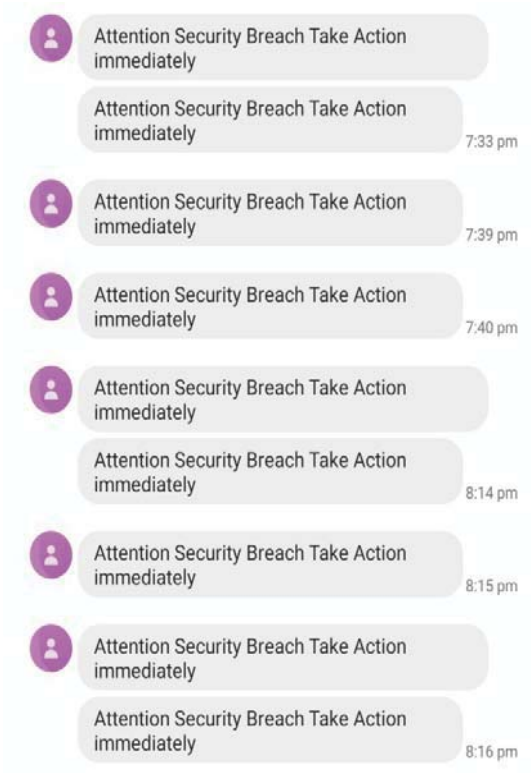

Fig. 7. Screenshot of SMS alert of Intruder activity

VI. CONCLUSSION & FUTURE SCOPE

The project "IOT Based Raspberry Pi Home Security System Using Motion Detector" has demonstrated how to get a fully functional embedded product developed from scratch. This incorporated the cross aggregation and organization of fundamental libraries, the arrangement of implanted Linux and distributed computing innovation. This system is highly recommended to home territory observation for example individual office lodge, bank storage space, stopping passage. At whatever point the movement is distinguished through. The fundamental Advantage of the undertaking is Easy to actualize, Minimal effort with High quality.

From improvement point of view we can add new features to existing system such as delay alarm to the system so that owner can switch off the system if anyone enters by mistake into the secured zone and we can add a photo recognition technology and have some pictures of the authorized users if they unknowingly steps into the zone.This is proposed further to reduce the possibility of the unwanted or false burglary alarm which in turn reduces the sensitivity of the system.

VII. REFERENCES

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