IoT based Smart Home Security System and Door Alert using Smart Phone

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Abstract -- The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure. With the advent of technology there are a variety of options available in the market for the security of our houses. The cost of such security systems is also very high. In order to secure our houses at a reasonable price, we can use the help of Raspberry Pi which is nothing but a mini computer.

We integrate the Raspberry Pi with Web Camera and PIR Motion sensor which captures the image of the intruder who enters our door step. In addition to the image capture, there is also a buzzer which alerts the neighbors about the intruder. The WIFI present in the Raspberry Pi sends the image captured by Web Camera to our Email. The house owner can then access the image of the person standing at the door using the Email. As a result, we can ensure that, our houses are safe and secure in our absence and can thus prevent our homes from burglary attacks using the smart phone. Hence we can control the restrict unauthorized access to our doors using Raspberry Pi.

Index Terms- Electromagnetic Door Lock, Internet of Things (IoT), Pi Camera Module, PIR Motion Sensor.

I. INTRODUCTION

Technology is the collection of techniques skills, methods, and processes used in the accomplishment of objectives. Technology can be the knowledge of techniques, processes, and the like, or it can be embedded in machines to allow for operation without detailed knowledge of their workings. This technology can be used in various dimensions such as security, medicine, etc. In the context of security, we can use it to protect almost anything in the world from a nation to small toys. Now, coming to the security of houses and offices, there have been many a thefts and burglaries due to inefficient protective devices. A security alarm is a system designed to detect intrusion, unauthorized entry into a building or other area. Security alarms are used in residential, commercial, industrial, and military properties for protection against burglary (theft) or property damage, as well as personal protection against intruders.

In the past the security to homes was locks, later technology started its role and there came pin access door lock. After that, image processing was brought into picture and this concept was used to secure our houses i.e, Door access using Facial recognition. This facial recognition and database concept is not contemporary. Whenever there is a new person who has to access the door, it cannot be opened since his face is not in the data base. We need to update the database with new pictures every time. In order to avoid all this database problems, we have introduced Internet of things into the security of homes. The user can access his door through his phone either with the help of Internet of Things (IoT). The aim of this paper is to provide the door access control and security by using IoT Server. The system identifies the visitor's presence, capture and transfers the image through email automatically to house owner to recognize the person at door. The user can directly login and interact with the embedded device in real time without the need to maintain an additional server. This proposed system has a lot of features such as energy efficiency, intelligence, low cost, high performance and portability. The buzzer at the door makes sound until the image is captured and reaches the owner's email.

II. PROPOSED SYSTEM

This application involves the design and development of a home security system, based on human motion detection and remotely monitoring technology, to confirm visitor identity and to control Door accessibility. It describes about the implementation and deployment of wireless control system and accessibility in to a home environment for authenticated people only. A PIR motion sensor and Web camera are used to detect motion and capture images respectively are dedicatedly make the security system alive as per the request. Electromagnetic door lock module operates the door accessibility. Buzzer ensures that neighbors are alerted whenever an intruder stands in front of our door step. The buzzer makes noise till the image is captured by the web camera and the image is sent to the house owner's email Id. Even if the magnetic sensor of the Electromagnetic Door lock is tried to access, the buzzer gives us an alert. It makes noise even if someone tries to open our door i.e., if a person tries to open the door forcefully, then the buzzer makes noise thus alerting the surrounding people. If any person stands infront of the PIR sensor, then it will click the picture and send that to the email of the house owner
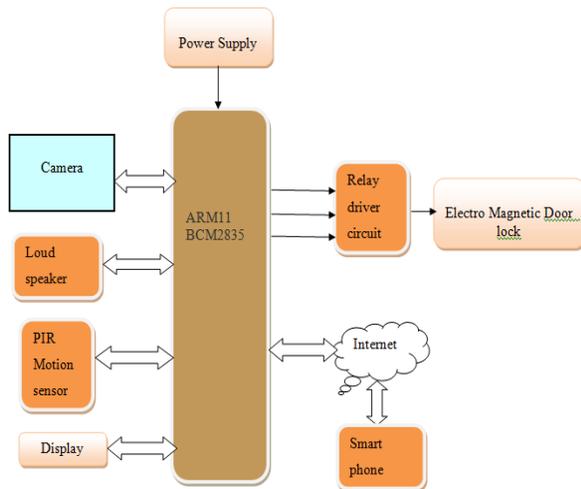

Fig.1. Block Diagram of Proposed System

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III. IMPLEMENTATION

A. RASPBERRY PI

A Raspberry Pi is a credit card-sized computer originally designed for education, inspired by the 1981 BBC Micro. Because of it's small size and accessible price, electronics enthusiasts quickly adapted to this microcontroller than the already available Arduino. The Raspberry Pi is slower than a modern laptop or desktop but is still a complete Linux computer and can provide all the expected abilities that implies, at a low-power consumption level. There are a two Raspberry Pi models, the A and the B, named after the aforementioned BBC Micro, which was also released in a Model A and a Model B. The A comes with 256MB of RAM and one USB port. It is cheaper and uses less power than the B. The current model B comes with a second USB port, an ethernet port for connection to a network, and 512MB of RAM. The Raspberry Pi A and B boards been upgraded to the A+ and B+ respectively.

Fig.2. Raspberry Pi 3

These upgrades make minor improvements, such as an increased number of USB ports and improved power consumption, particularly in the B+.

B. WEB CAMERA

A camera module is an image sensor integrated with a lens, control electronics, and an interface like CSI, Ethernet or plain raw low-voltage differential signaling. The Web Camera used is a high quality 3

megapixel image sensor featuring a fixed focus lens.

Fig.3. Web Camera

It has wonderful features such as Fixed focus lens on-board, 3 megapixel native resolution sensor-capable of 1280 x 960 pixel static images, size 25mm x 23mm x 9mm.

C. PIR MOTION SENSOR

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose.

Fig.4. PIR Motion Sensor

D. MAGNETIC SENSOR

Magnetic proximity sensors are actuated by the presence of a permanent magnet.

EXAMPLE OF FUNCTIONING

D: Max switching distance in relation to the magnet used.
C: Differential stroke.
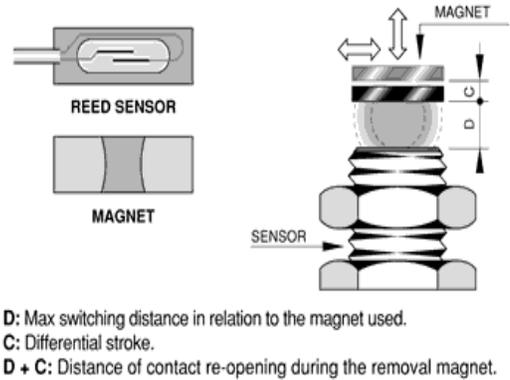D + C: Distance of contact re-opening during the removal magnet.

Fig.5. Magnetic Sensor

Their operating principle is based on the use of reed contacts, whose thin plates are hermetically sealed in a glass bulb with inert gas. The presences of a magnetic field makes the thin plates flex and touch each other causing an electrical contact. The plate's surface has been treated with a special material particularly suitable for low current or high inductive circuits. Magnetic sensors compared to traditional mechanical switches are advantageous.

IV. RESULT

We dump the required software in the Raspberry Pi and interface the Web camera, Buzzer, PIR sensor and Magnetic Sensor with the Raspberry Pi using required code. Power to Buzzer, Magnetic Sensor and PIR motion sensor is made through external power supply. We are using a Full wave rectifier inorder to convert AC to DC as shown below:
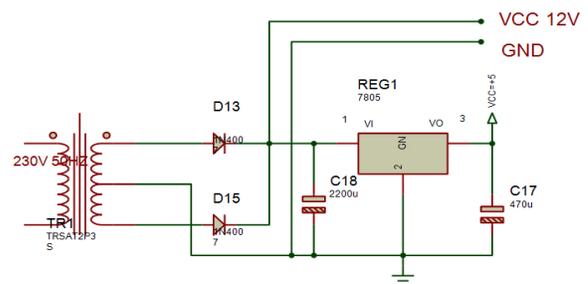

Fig.6. Power Supply

Now, we open the Raspberry Pi using VNC Viewer software and upload the code. We have written the code for capturing of image, alerting the buzzer, and activation of the PIR Motion Sensor. Once the code is uploaded, we can start working with our project. Whenever a person comes in front of the PIR sensor, it detects the motion of the person and immediately activates the sensor.

Fig. 7. Email received by the owner

The Web camera then captures the image of the person and sends it to the email of the house owner. The Email contains a header indicating an alert that someone just stood infront of your door along with the image of that person. Magnetic Sensor is placed at the door hinge. Whenever a person tries to open the door, the buzzer makes noise and web camera captures the image of that person. This image is then sent to the Email of the owner. The buzzer makes the noise until the captured image is sent to that person. The sound of the buzzer alerts all the neighbours and can thus prevent the unauthorized entry of that person into the house. The image captured by the Logitech Webcamera C270 is as shown below:
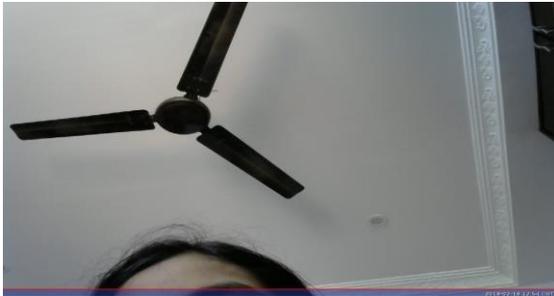

Fig. 8. Image sent to Email

V. CONCLUSION

Hence, the Raspberry Pi interfaced with Web Camera and PIR motion sensor is used to prevent the unauthorized access to homes and offices thus preventing thefts and burglaries of valuable property. The buzzer alerts the nearby persons about the theft and thus secures the house.

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