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Secured Smart Home Monitoring System Using Raspberry-PI

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Abstract:
This paper deals with the design and implementation of Secure Home Automation using Raspberry Pi for mobile devices that leverage mobile technology to provide essential security to our homes and associated control operations. The proposed home security solution hinges on our novel integration of cameras and motion detectors into web application. Raspberry Pi operates and controls motion detectors and video cameras for remote sensing and surveillance captures the image of the intruder and sends it to the email of the owner and streams live video and finally alerts the home owner about the fire threats through buzzer and automatic supply of water. Home gardening is done by automated water supply if soil gets dried up. Depending on room temperature, automatic opening and closing of curtains take place. For instance, when motion is detected, the cameras automatically initiate recording and the Raspberry Pi device alerts the homeowner of the possible intrusion. Raspberry Pi has two main components interacting with each other: the Web application that executes on the mobile device's browser which will be operated by the Raspberry Pi hardware tool component.

Keywords: *PIR sensors, raspberry pi, soil moisture sensor, fire detection sensor, temperature sensor, relay*

1. Introduction

Security over household is always high which a common man cannot afford nowadays. Hence this paper leverages a security progression over a household in a very cheap cost and which he can itself provide a security which could also be said that he can be the ironman of his house. Our Project provides a greater benefit to any person who can afford a cheap product which could provide home automation features to any device carrying a browser. The home automation system works by using the internet and the Raspberry pi as a hardware tool. One has to initialize the required settings at the time of the setting up of the system. After that the system will be individual and self sustained. The custom Raspberry pi has relays fixed on, which will control all the operations of sensors. The Internet will be connected via LAN or Wi-Fi (Depends upon the choice of the user).As mentioned earlier the internet acts as a master since the entire control process is taken care of by an online server-side program(PHP module). The user just has to login in to the specified web page during the time of the initialization and in case there is a need to change the automation settings. The web-page will be coded in such a way that it provides complete control to the user over the automation process such as timings and conditions for the automation process.

2. Related Work

2.1. SMS-Based Home Automation System

The proposed system detects illegal intrusions at home and allows legitimate users to change the passkey for the door and control lights at home. The illegal intrusion is identified by monitoring the state of the home door which is done using LED and infrared sensors. The passkey can be any four digits, which can be set either by using keypad or by SMS from their registered mobile number; by turning the lights on in different rooms at random intervals of time, one can give the impression that the home is occupied, even when it is not. In case of an intrusion, the appliance control and security subsystem informs the owner through SMS.

2.2. Bluetooth-based Home Automation System
The proposed system uses Bluetooth that can be accessed remotely through GPRS. The researchers used Cell Phone equipped with Bluetooth connectivity as a host controller and a GSM Modem that provides Internet connectivity. Home devices are fitted with Bluetooth communication adapters so that they can communicate with the host controller Phone via Bluetooth. The paper discusses remotely in controlling and updating home devices along with fault diagnostics and detection.

2.3. GSM or Mobile-based Home Automation System
The system converts the machine functions into electrical signals to a transducer, which goes into a microcontroller. A Transducer converts physical quantities like sound, temperature and humidity into some other quantity like voltage; here a sensor does that function. For electronic devices, their reading goes directly into the microcontroller, which analyses these signals and converts them into commands that can be understood by the GSM module. Based on the received commands, the GSM module selects the appropriate communication method.

2.4. Android-Based Appliances Control System
In this paper, controlling fan speed and light intensity is a specialty of the project. This paper holds two parts, Hardware part called process unit and Software part called monitoring unit. Process unit contains Bluetooth module, LCD, Dimmer Circuit and microcontroller. Monitoring unit contains only smart phone. For better efficiency Dimmer Circuit is designed using SCR. Home appliances can be controlled using Android phone which has Bluetooth application. It is a wireless technology. Dimmer Circuit is used for controlling fan speed and light intensity.

3. Proposed System and Methodology
In the proposed system we achieve home automation using Raspberry-Pi 2 Model B microcomputer. We connect the variety of sensors such as fire sensor, PIR sensor, soil moisture sensor and temperature sensor as well as relay board to the general purpose input/output pins of the Raspberry-Pi kit and we use wireless network to connect the Web-interface to Raspberry-Pi hardware.
Thus the user who has access to the web connected to Raspberry-Pi can access the home automation system when intrusionis detected by the PIR sensor, the camera captures an image of the intruder and sends it to the user's E-mail and he can monitor the live streaming by logging into the web page.
When fire threats at home are detected, the fire sensor senses the fire and alerts the people at home through buzzer and also automatic supply of water is done to put off fire using water pump. Automated home gardening system is introduced in our project by automatic supply of water to the plants when the soil gets dried up and supply is stopped when the moisture content in the soil is detected.
When the temperature inside the room rises, the curtain is automatically drawn so that fresh air comes in and the room gets cooled.

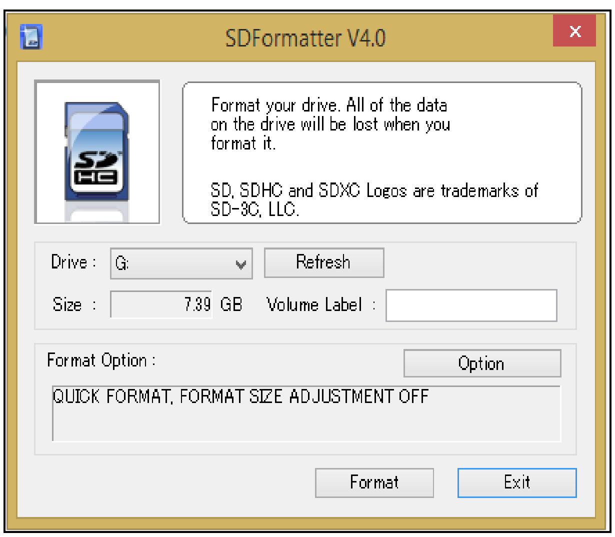

Figure 1: SD card is formatter software is used to eliminate all the junk files from a new memory card

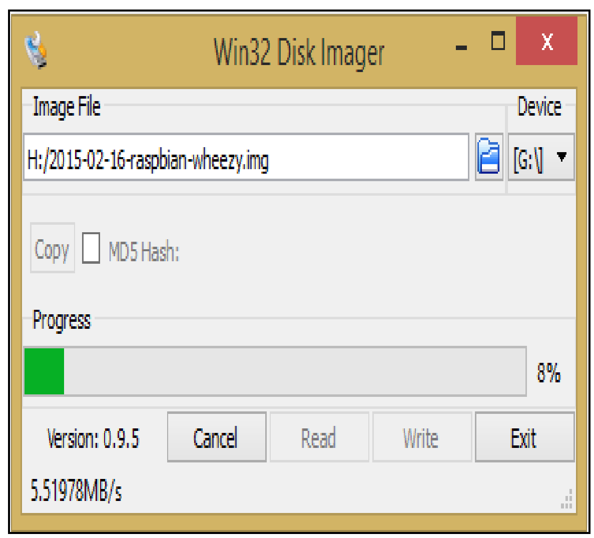

Figure 2: To copy OS to SD card, Win32 Disk Imager is used

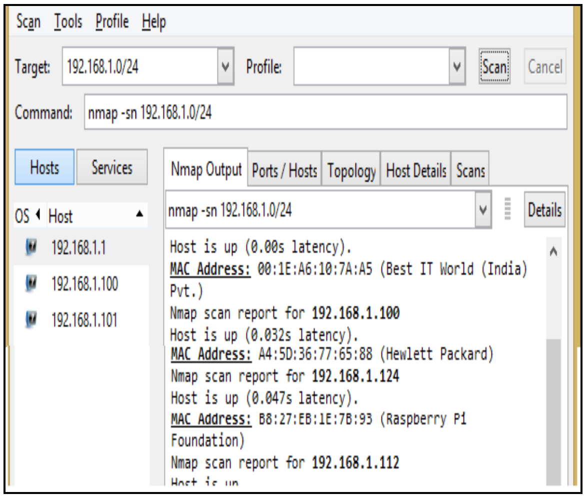

Figure 3: Nmap to find the IP address of Raspberry-Pi

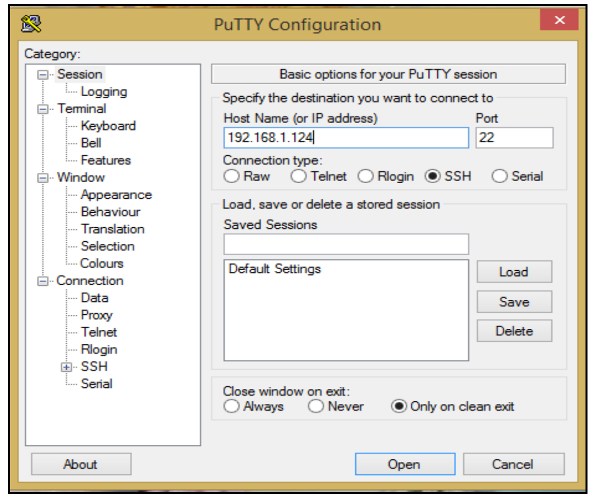

Figure 4: PuTTY configuration is used to enter IP address

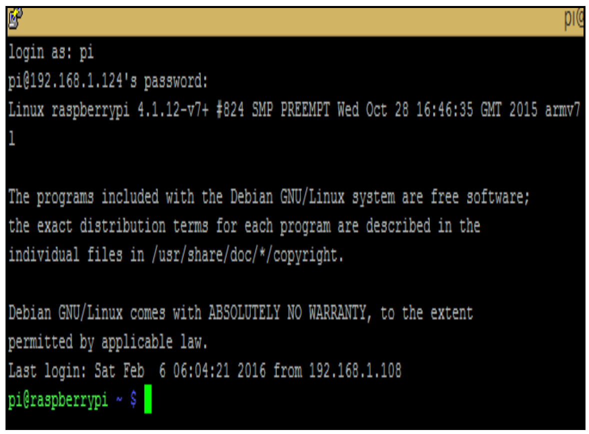

Figure 5: Logging into putty configuration with pi as username and raspberry as password.

4. System Design

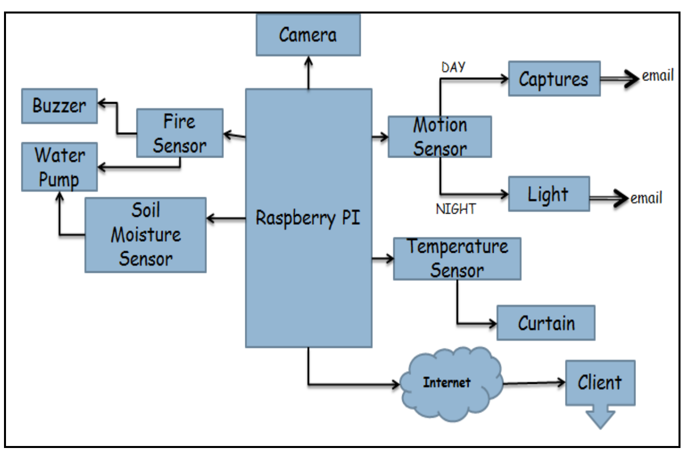

Figure 6: Block Diagram of the system

Figure 6 explains the overall connection of the hardware. Raspberry-Pi is connected to various sensors such as fire sensor, soil moisture sensor, temperature sensor and PIR sensor. Fire sensor is in turn connected to buzzer and water pump. Soil moisture sensor is also connected to the water pump. Motion sensor is connected to camera to capture image and live video streaming. Light is connected to capture the clear image at night. Temperature sensor is connected to Raspberry-Pi which in turn is connected to the motor to draw the curtain. Raspberry-Pi is connected to the Internet via Wi-Fi or LAN which can be accessed by the user through web interface.

4.1. Raspberry-Pi

Raspberry-Pi 2 Model B is the 2nd generation Raspberry-Pi. Compared to the Raspberry-Pi 1, it has: A 900 MHz quad-core ARM Cortex-A7 CPU and a 1GB RAM. Like the model B+ it has 4 USB ports, 40 GPIO pins, Full HDMI port, Ethernet port, Combined 3.5mm audio jack and composite video and camera interface(CSI), display interface(DSI), micro SD card slot and video core IV 3D graphics score.

4.2. Sensors

4.2.1. PIR Sensor

PIR sensor detects the human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection ranges between 5m and 12m. PIR arte fundamentally made of a Pyro electric sensor which can detect levels of infrared radiations.

4.2.2. Soil Moisture Sensor

Soil moisture sensor measure the volumetric water content in soil. Relatively cheap and simple devices that do not require a power source are available for checking whether plants have sufficient moisture to thrive.

4.2.3. Fire Sensor

Fire sensor is used as a simple and compact device for protection against fire. The device, weighing about 5g, can be easily mounted on the device body. It gives a high output on detecting fire. An on-board LED is also provided for visual indication.

4.2.4. Temperature Sensor

Temperature sensor measure the amount of heat energy or even coldness that is generated by an object or system, allowing us to sense or detect any physical change to that temperature producing either an analogue or digital output.

4.3. Buzzer

A buzzer or beeper is an audio signaling device. An electric signaling device, such as doorbell, that makes a buzzing sound.

5. Advantages

It provides easy and efficient interface that enables user to control various electrical appliances. The user can detect such as fire threats and also detect any obstacle. It is an interface that helps busy people save time and save power. The user can easily monitor his home at arm’s length.

6. Results

The system consists of mainly 3 components is a Wi-Fi module, raspberry pi board and relay circuits. Wi-Fi is used a communication channel between web interface and raspberry pi board. This provides a full security support for homes. This system is more flexible and provides attractive user interface compared to other home automation systems.

7. Conclusion and Future Work

We developed a comprehensive solution that provides a user friendly home automation and security application for homes at a reasonable price. We accomplished this through the integration of cheap, commonly available devices, interfaces and software coupled with a user friendly interface. This work provides users with an easy to use web interface for which they can remotely access and control their home appliances and security. In future we wish to provide a wireless relay connection and wireless sensors which can be movable and can be operated and which can be used in company and houses for Security to the whole building with one single system. This provides a full security support for homes and offices.

8. References

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