Internal Home Automation Using Raspberry PI without Internet

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Abstract: *As we are living in 21st century, internet has played an important role in our daily life. Internet is very important to fulfill our needs. Now a day technology becoming smart and advanced as every device is working with the use of internet. Home automation is defined as automatic and electronic control of household features, activity and appliances. This paper deals with the design and implementation of Bluetooth based home automation using Raspberry pi 3 model B. The main objective of this work is to help physically handicapped persons in their daily work and to help aged persons. There is much advancement in home automation but this can be installed in every home as raspberry pi is cheaper and we can use it without internet connectivity. As Raspberry pi is powerful and inexpensive, this work is to provide improved convenience, comfort, and energy efficiency.*

Keywords: Raspberry pi, Bluetooth, Home automation

1. Introduction

Home automation is building automation for a home, called a smart home or smart house. A home automation system will control lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things. A home automation system typically connects controlled devices to a central hub or "gateway". The user interface for control of the system uses wall-mounted terminals, tablet or desktop computers, a mobile phone application, or a Web interface, that may also be accessible off-site through the Internet. Home automation is automatic and electronic control of household features, activity and appliances using internet. In today's world every people wishes to have everything to be automated and inexpensive. There are many types of home automation like automatic controlling of lighting, fan, temperature and other home appliances. This project gives explanation about the Bluetooth based switch on and switch off of an electric bulb. As we know Raspberry pi is tiny credit card sized minicomputer which is powerful and inexpensive. Instead of using raspberry pi and Arduino, using of the latest raspberry pi 3 is better. Because usage of raspberry pi and Arduino you should provide external Bluetooth and Wi-Fi connectivity but whereas in the latest version of raspberry pi module it has inbuilt Bluetooth and Wi-Fi.

2. Literature Survey

Smart home is not a recent technology in today's world. It has been used from decades. As our technologies are advancing, the field of home automation is expanding in wide range. In [1] author presented "Brand-free" gateway and "plug-n-play brand-free". This methodology can be applied to other technologies with simple modifications concerning only low-level communication of the technology itself. In [2] author presented home automation system of controlling multiple appliances which can be monitored and accessed from anywhere in the world with very low cost. In

[3] author presented home automation is done using Bluetooth technology where Arduino and raspberry pi is used as hardware components. In [4] author presented home automation using IOT is realized using 10w cost micro-controller based Arduino board and an Android mobile phone. As the above mentioned reviews represents the home security system and they used both Arduino and raspberry pi as hardware component. Instead of using both Arduino and raspberry pi we can control our home appliances using only raspberry pi 3 model B which is cheaper and provide comfort for the user.

In this paper, the main objective is to provide improved convenience, comfort, and energy efficiency for the use. Also to help physically disabled persons in doing their daily routine and also to help aged persons. Through the commands given through the smart phone one can control their home appliance which is energy efficient, cheaper to use and this can be implemented in every ones house. From this work, time can be maintained which takes less time to operate the home appliances.

3. Proposed System

The main aim of this project is to control the switch on and switch off of the electric bulb through the Smartphone using Bluetooth module. For this purpose python programming is used. Raspberry pi is used to do the automation. The raspberry pi is connected by using the Bluetooth technology. The relay module and Bluetooth module is powered by using Raspberry pi board and power supply.

3.1 System architecture

The system architecture consists of a Power supply, Bluetooth module, Raspberry pi module, relay, and electric bulb. The raspberry pi board is connected to the Bluetooth module and the relay to provide the power supply. GPIO (general purpose input output) of the raspberry pi is connected to the relay channel in order to do the automation. And relay is connected to the electric bulb in order to

provide low or high voltage depending upon the electrical appliances.
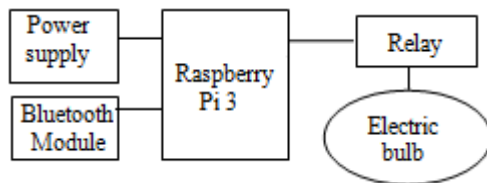
3.2 Block Diagram

Figure 1: Block diagram of system model

Above figure 1 shows the block diagram of proposed model. The components required is power supply, Bluetooth module, Raspberry pi 3model B and relay which is connected to light, fan and other electronic appliances. In this project, a home automation system is designed which can be controlled by any smart phone. The automation system connects with the smart phone through Bluetooth. The smart phone sends control signals to switch home appliances ON or OFF by an android app through Bluetooth interface. This project is built on raspberry pi 3 model B using Bluetooth module and a bulb is connected through relay. In this project Bluetooth module used is HC-05.

3.3 Raspberry Pi

The Raspberry Pi is a small, cheap, tiny computer on a single circuit board, and has been designed in such a way that it consumes less power than the regular computer. The raspberry pi consist of the micro USB power, display port, micro SD slot, HDMI, port, audio video jack, CPU, GPIO pins. Through the micro USB power the power supply for the raspberry pi is provided. With the help of the SD card it can store mass storage. The SD card of the smart phone that is used for the automation can be inserted. The GPIO pins are used to turn on the relay. When the user wants to switch on or off the particular home appliances, the command to do it is done through the Bluetooth module. The command given by the user is taken as the input by the software app i.e., Bluetooth terminal app. Once the raspberry pi receives the command, the GPIO of the raspberry pi does the switching of the relay. Depending upon command the electrical appliances will be switched on or off.
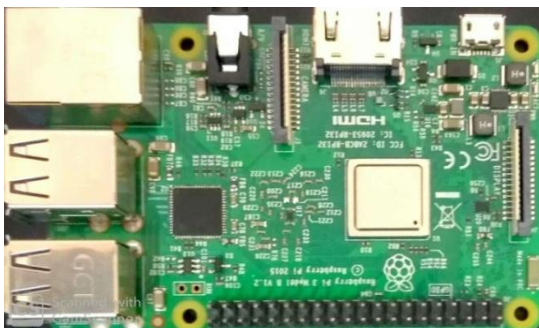

Figure 2: Raspberry pi 3 model B

3.4 Bluetooth Module

In this project HC-05 is used as Bluetooth module, designed for transparent wireless serial connection setup. HC-05 module is easy to use for Bluetooth connection setup. Bluetooth module supports the mode of communication. The master and slave model of communication is a type of communication where one's device will be the master and it controls other devices which are the slaves of the master one device acts as controller and other devices that are being controlled.
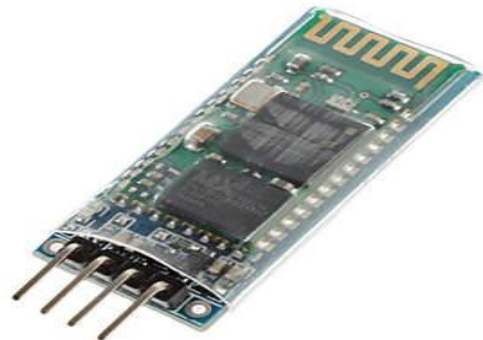

Figure 3: Bluetooth module

3.5 Relay module

The relay module does the coupling between the input and output circuits. A relay allows the circuit to turn on or turn of providing complete isolation between the low and the high-voltage and controls the load. In this project relay module acts as a switch.

5. Working

The prototype of Bluetooth based automatic control of home appliance control using raspberry pi consist of the raspberry pi board, relay module, Bluetooth module and electric bulb. A smart raspberry pi is powered by using micro USB charger. Power supply of 12v is provided to raspberry pi and it is connected to the relay channel.
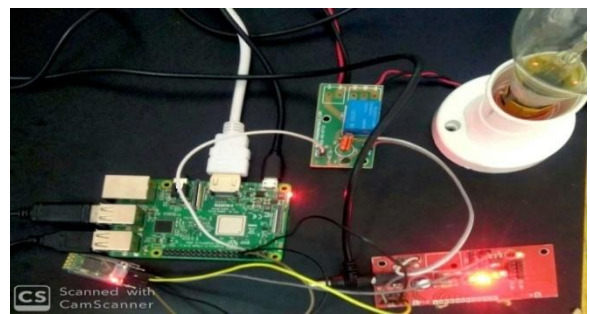

Figure 4: Prototype model of the Bluetooth based home automation

Bluetooth module is used to pair the smart phone using Bluetooth app. And the relay channel is connected to the electric bulb. The Bluetooth terminal app is installed in the phone. Coupling between the input and output circuit to switches on the light. After setting up the circuit the main supply will be switched on. Then the smart phone is connected to the Bluetooth module HC-05 .Once it is done the user can give command in the app to switch on the light. The app takes the command of user and provides the information to the raspberry pi. The GPIO of the raspberry pi switches the relay. Switch on or off the light depending upon the users command.

6. Results & Discussion

Figure 5: Bluetooth terminal

Above figure 5 represents the commands given in the Bluetooth terminal app to switch on and switch off the electric bulb. By giving command A@ electric bulb will switch on and B@ is used to switch off the bulb. Just by paring the device with the Bluetooth module it controlled efficiently according to the users wish, hence it helps in saving time, money, and it is much secured to use.

7. Conclusion

In future this kind of home automation using raspberry pi can be implemented in every home, as it low cost to install and makes life easier and safer. Without any internet connection the user can automate and manage their home more efficiently. This system is well secured as it involves password for paring of device, and hence it prevents access of unauthorized users. The device like the raspberry pi plays a big role as it helps to implement all the automation at a very low cost.

8. Future Work

This project can be further developed by replacing Bluetooth connection by the Wi-Fi introducing GSM in this model alert message can be sent to the user regarding the condition of their and depending upon that they can be done by introducing webcam in this project we can use it as security system. The user can monitor their home even when they are away from home. By placing an alarm system in case of theft it becomes more secured. This type of automation can not only be used in home but also in bank, shops, office etc.

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