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Home automation using Raspberry Pi

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ABSTRACT:
Today we are living in 21 st century. It is necessary to control the home from desire location. Home automation is the control of any electrically and electronics device in our home and office, whether we are there or away. There are hundreds of products available that allow us to control over the devices automatically with using raspberry pi model either by remote control or even by webpage. This Home automation system provide the user with remote control of various lights and appliances within their home. This system is designed to be low cost and expandable allowing a variety of devices to be controlled. Home automation and benefits will be focus on and how this can be achieved through the use of the raspberry pi.

Keywords: Raspberry pi, Home appliances, IP camera, Relay, Webpage

I. INTRODUCTION

Home automation is the control of any or all electrical devices in our home or office. [1] There are many different types of home automation system available. These systems are typically designed and purchased for different purposes. In fact, one of the major problems in the area is that these different systems are neither interoperable nor interconnected. [2] There are number of issues involve when designing a home automation system. It should also provide a user friendly interface on the host side, so that the devices can be easily setup, monitored and controlled. [3] In smart home systems, the internet is also use to ensure remote control. For years, the internet has been widely use for the processes such as surfing on the pages, searching information, chatting, downloading and installation. By the rapid developments of new technologies, monitoring, controlling services have been started to be served along with internet as an instrument providing interaction with machinery and devices. [4] The system can be use in several places like banks, hospital, labs and other sophisticated automated system, which dramatically reduced the hazards of unauthorized entry.[3] The main reason to develop this system is to save time and man power along with maintaining security and convenience.[1]

There are many method by which we can implement home automation system .Some of the method are listed below:

- Home Appliances Control Using A Remote Control
- Home Appliances Control Using DTMF
- Home Appliance Control Using Free Hand Gesture
- Home Appliance Control Using Internet And Radio Connection
- Wireless Browser Based Device Control Using Raspberry Pi

Home Appliances Control using a Remote Control:

The lights, fans can be automatically turned on/off with the help of a remote where there will be a sensor instead of going near to a switch board and putting on/off the switch. Companies like Legrand and Gold Medal already started these kinds of control system and they are at present available in the market.

Home Appliances Control using DTMF:

In this method, the control of home appliances can be done even though when we are elsewhere just by using the DTMF tone generated when the user pushes mobile phone keypad buttons or when connected to a remote mobile.

Home Appliance Control Using Free Hand Gesture:

This is a type of home appliance control system where the person must be present in sight to the appliance that is needed to be controlled and a predefined gesture must be used to turn on the device and another gesture must be used by us to turn off the device. The performance of the proposed system is done with a hardware embedded in that particular device.

Home Appliance Control Using Internet and Radio Connection:

In this system, the control of home appliances can be done from a remote are with an option from a local server, using the Internet and radio connection. This system is accomplished by personal computers, interface cards, radio

transmitters and receivers, microprocessors, ac phase control circuits, along with window-type software and microprocessor control software.

Wireless Browser Based Device Control Using Raspberry Pi:

We can observe this research paper that the appliances controlling through the web browser Integrated with the ARM11 microcontroller. The **Raspberry Pi** is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi has a Broadcom BCM2835 system on a chip, which includes an ARM1176JZF-S 700 MHz , Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long term storage.

In this system, we use the raspberry Pi model as a controller. The Raspberry is a credit card sized minicomputer. There are different types of raspberry pi model available in the market, Such as Model A, Model B, Model B+ out of which we uses Model B+.

II. RELATED LITERATURE

Smart home is not a new term for science society, it is been used from decades. As electronic technologies are advancing, the field of home automation is expanding fastly. There were various smart systems have been proposed where the control is via Bluetooth [7], internet etc. Bluetooth capabilities are good and most of current laptop/desktops, tablets, notebooks and cell phones have built-in adaptor that will indirectly reduce the cost of the system. But it limits the control to within the Bluetooth range of the environment while most other systems are not so feasible to be implemented as low cost solution. In Wi-Fi based home automation system is presented. It uses a PC (with built in Wi-Fi card) based web server that manages the connected home devices. The system supports a wide range of home automation devices like fans, lights, other home appliances. A similar architecture is proposed in where the actions are coordinated by the home agent running on a PC. Other papers such as also presented internet controlled systems consisting of a web server, database and a web page of websites for interconnecting and handling the devices.

III. BLOCK DIAGRAM

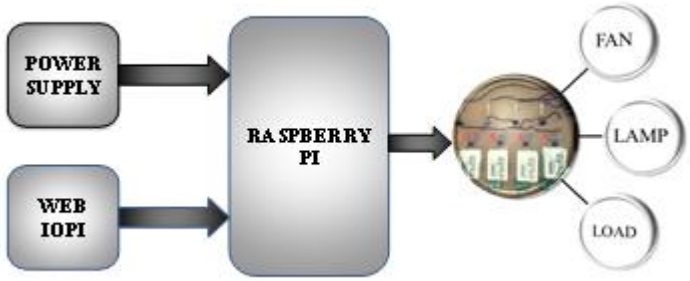

Figure 1. Block Diagram

IV. WORKING

Figure 1. Shows the basic block diagram of the system. With the help of this system we can monitored and controlled the various equipment that are connected to the relay circuit via the input from raspberry pi model as well as from the WEBIOPI. Whenever the system is turned on, the current lighting data of the home are read and written to the data base and then transferred to the user interface. So, one can easily know the current situation of rooms and change in the state of the lights.

V. HARDWARE COMPONENT

1. Raspberry pi
2. Relay circuit

1. Raspberry pi:

For this paper, of course you will need a Raspberry Pi board. The version of the board or the model (A or B) doesn't really matter, but keep in mind that you will have to connect it to your local network, so you will need a Wi-Fi dongle if you are using the A model which doesn't have an Ethernet port. In this paper, we used a Raspberry Pi model B with the Wi-Fi dongle.

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage. [1].

Now also to check that your Raspberry Pi is connected to the Internet. Again, this will depend on your configuration (Ethernet or Wi-Fi) and your router, but is usually really easy. If you are using the Ethernet connection, simply connect a cable to your router and it should work automatically. If you're using a Wi-Fi dongle, the easiest solution is to use the GUI that comes with Raspbian to find your wireless network and enter your WEP/WPA password.

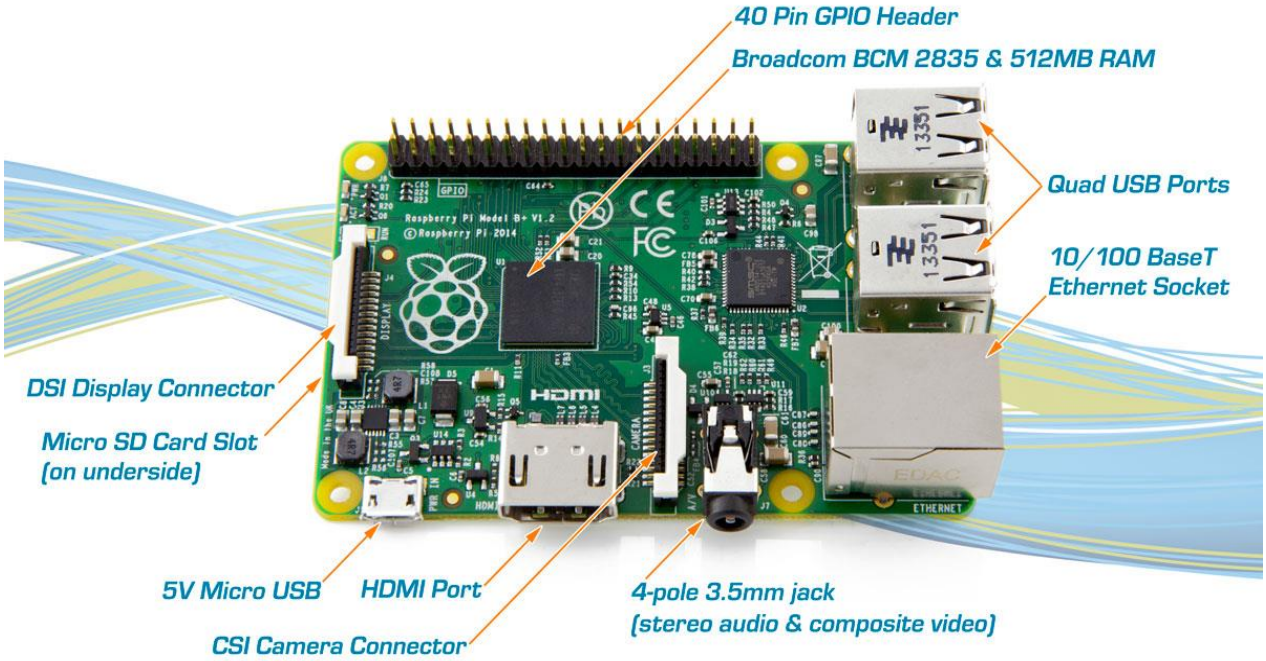

Figure 2. Raspberry pi

1. Realy circuit:

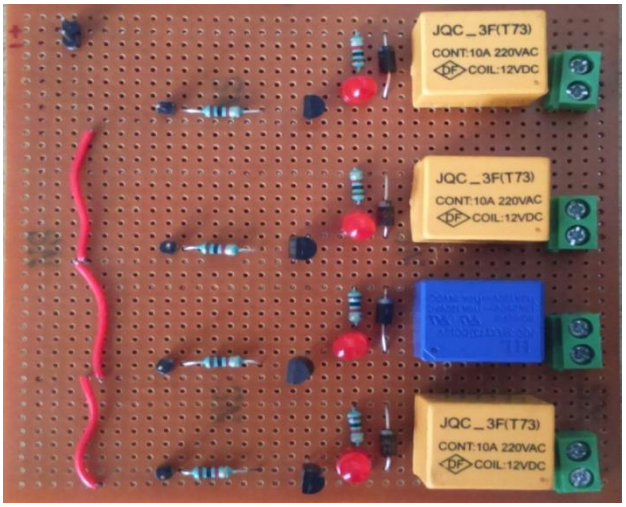

Figure 3. Relay circuit

A Relay is electrically operated switches, which allow low power circuits to switch a relatively high voltage or current on/off. For a relay to operate a suitable pull in and holding current should be passed through its coil. Relay coils are designed to operate from a particular voltage often its 5V or 12V. The function of relay driver circuit is to provide the necessary current energize the relay coil, when a LOGIC 1 is written on the PORT PIN thus turning on the relay. The relay is turn off by writing LOGIC 0 on the port pin. In our system four relays are used for device control. [5]

VI. ADVANTAGES

- Low cost and expandable allowing a variety of devices to be controlled
- Saves money and energy
- All in one user friendly system
- This system contain Raspberry pi as a controller so the system contain all the advantages of it.
- This is noise free system.

VII. LIMITATION

- Human error
- Reliability

VIII. CONCLUSIONS

These kinds of home automation systems are required because human can make mistakes and forgot to switch off the appliances when there is no use and in this case, they are useful in order to utilize the power effectively and also in a secured manner.

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