Advanced Globally Accessible Machine Automation Using Raspberry PI

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Abstract:
In the present world, there are many high tech appliances in our homes that make our lives easier. It is necessary to control these appliances remotely. To automate a machine, a secondary brain (another machine) is required to ‘Think’ and control machines to do tasks as per the convenience of the user from long distances. An automation system is proposed for the users to control home electronic appliances with high mobility and security. In today’s world automation is necessary in our lives. Because in our life there is a rapid growth in electronics appliances day by day at home or living place or business place. Every person has to travel away for a business purpose from his place of living or business. So all these appliances are necessary to control remotely by the user. Therefore automation is very important in our lives. So we need to think how to control these appliances or machines from long distances. In this paper, appliances can be controlled by internet with the use of a Raspberry pi micro-controller board. A Raspberry pi micro-controller board obtains user input from a website that is accessed through a user id and password. A Raspberry pi will be located in a room and will be connected to all electronic appliances in the home with the help of electromagnetic relays. The Raspberry pi can be controlled from any distant place with the help of weaved cloud service.

Key Words: weaved cloud service, Raspberry Pi

I. Introduction
To automate objects refers to the idea of devices and appliances working by themselves acting upon the command of the owner or user. In the present age, technology has become an integral part of everyone's lives to such an extent that smart phones and internet are a common necessity for many. Home automation is the control of any or all electrical devices in our home or office. There are many different types of home automation system available. Technology has enabled us to perform tasks that we could not do otherwise. The idea of controlling objects remotely is very interesting and advantageous. The motivation behind the goal is very simple, always it is not possible to be near to the home physically but it’s very important to control the appliances for many purposes. So the remote controlling takes the control of the home. It would serve mankind well and make lives more safe and comfortable. Therefore, in this paper, automation of electronic appliances is implemented with the help of the internet, a raspberry pi micro-controller board and relay board. 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. The idea behind controlling the machine with the help of internet is very advantageous and useful because every time physically we are not able to be at home, at office or at business place, but controlling of home appliances is very important in today’s world. Therefore in this paper with the help of raspberry and electromagnetic relay automation of machine is implemented based on internet of things.

II. Related Work
1. Raspberry Pi based Interactive Home Automation System through E-mail
[1]Sarthak Jain in this paper presents a basic application of Raspberry Pi in home automation control through internet that is through Email. Where subject of the received e-mail is read by the developed algorithm fed into raspberry Pi and system responds to the corresponding instructions. If number of devices increases user become very difficult to remember the code otherwise have a catalogue of all code of appliances.

2. Android Based Home Automation Using Raspberry Pi
[2]Shaiju Paul in this home automation through the use of a raspberry pi controller via an android interface. It employs the use of a Wi-Fi Local Area Network to connect the controller to the android interface. Thus by connecting any mobile phone to a Wi-Fi network setup at our home, office or any other locality, it is possible to control electrical appliances or machines connected to the processor board. The mobile phone is interfaced to the Raspberry pi with the use of an android application using control buttons. They interfaced the Raspberry pi with the switches by using relay. The control can only be achieved with Wi-Fi and hence is not applicable at large distances but it gives sufficient control from nearby places.

III. System Analysis
Problem Definition
Many people are always on the move from place to place due to business demands. Some people can spend a couple of days away from their home leaving all their household appliances without any kind of monitoring and control. Some devices are left plugged into power sockets whereas others are supposed to be plugged into and out of power sockets at different intervals depending on the time of the day. All this requires an individual to manually attend to each of the devices independently from time to time. All such monitoring and control can be done without necessarily being around or inside the home. Some devices if not controlled properly consume a lot of energy which leads to extra expenditure on electricity.
Therefore we propose to design an internet based home automation system which will enable one to remotely manage his/her appliances from anywhere, anytime.

**Proposed System Feature**

Our project tries to derive solution providing better control on home appliance with help of internet. The Existing System consists of physical appliances in our home that are been controlled through switches. These devices can be switched ON & OFF manually whenever needed. This system is less secured and prone to electrical hazards. Also the wastage of electricity tends to be a major factor of concern. Status of all home appliances could be controlled by user from remote location with help of weaved cloud service.

**Hardware Prototype**

Automated devices would require the use of a processor that processes the input supplied by the user and interfacing mechanisms to connect the processor with the input and output. The input interfacing is done with the use of Weaved services which enables a user to access the processor from anywhere in the world. The processing function is performed by the Raspberry pi and the output interface is the Relay system which used to control the appliance. Specifications of the Raspberry Pi, Weaved services and electromagnetic relays will be described next.

**Raspberry Pi Micro-Controller**

The Raspberry Pi is a series of credit card-sized single-board computers developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in Schools. The board is shown in Fig 1. Raspberry Pi is a processor that uses a different kind of processor on which we can install several versions of the Linux operating system. The Raspberry Pi is based on the Broadcom BCM2835 System on a Chip (SoC), which includes an ARM1176JFZFS 700 MHz processor, Video Core IV GPU and has 512 megabytes of RAM. The system is a Micro SD model and has sockets for boot media and persistent storage. The GPU (Graphics Processor Unit) is capable of Blu-ray quality playback, using H.264 at 40MBits/s. It has a fast 3D core accessed using the supplied Open GLES 2.0 (A graphics rendering application programming interface) and Open VG (Virtual Graphics) libraries. Operating system of raspberry pi is Raspbian. The most distinctive feature of the Raspberry Pi is the GPIO (General Purpose Input Output) module, which allows interfacing with general purpose electronics. Each pin gives 3.3 volts of voltage. 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.

**Electromagnetic Relay**

Electromagnetic relay switches are those switches which are operated by electromagnetic action. Relay uses an electromagnet to operate a switch mechanically. A relay is an electrically operated switch. Relays are used where it is necessary to control several circuits are must be controlled by one signal. A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core and a metallic switch. When current passes through the coil, a magnetic field is induced by the coil, hence closing the metallic switch. When no current is present, the switch is opened and circuit is disconnected. Fig shows the electromagnetic relay switch. The home automation system ends up with the working of relay circuit. In this home automation system we can add devices very easily into system. Also it can be configured with more security and functional services. The raspberry pi minicomputer can be making use better to incorporate variety of applications to our home automation system. Since our system makes running in low power compared to other system, it is having a tremendous application view.

![Fig. 2. Electromagnetic Relay Board](image)

**Weaved Services**

Weaved is an online cloud server that has been used to transfer data from the user to the Raspberry pi. The website has been given user access through a simple user id and password criteria. Thus service has been interfaced with the Raspberry pi. Based on commands bulb was lit. We can defined weaved as a software that you can install on your raspberry pi that let you connect from anywhere to raspberry pi over the internet. Weaved acts as your private firewall/VPN connection service to all your devices and desktops. Weaved creates secure connections on-demand, over the Internet.
Proposed System And Hardware Implementation

The main aim of the proposed system is to control appliances remotely. This is an application of Internet of Things. As the Raspberry pi runs on a Linux Operating System, Raspbian which is a Linux based Operating System was installed. WebioPi was the framework used to interface the Raspberry pi with user input and which was installed and updated. This framework allows a very user friendly mechanism to control the GPIO pins of the Raspberry pi. To interface raspberry-pi with the external world we can use WebIOpi. WebIOPi is a web application which allows to control Raspberry Pi’s GPIO. webIOPi interface allows better control of raspberry pi. Using WebIOPi, you can transform a humble Raspberry Pi into a powerful and versatile web-connected device.

Fig. 4. Block Diagram of Proposed System

Fig 4 shows the block diagram of globally accessible machine automation using raspberry pi. The main goal of our system is to automate appliances remotely. In the first step, a LAN cable of a modem was connected to the Ethernet module of the raspberry pi to gain access to the internet. Then connect power supply to the raspberry pi. Then login to the weaved cloud service using id and password. Thereby obtain host id and port number. Using this host id and port number open Putty. Next step is typing commands based on our needs. Thus bulb gets on/off. We know that processor is the small chip that processes the input given by the user. Every Self-running or automated device requires the processor to process the input signals given by the user and interfaced with input and output to connect that processor. The interfacing of this input is done by using weaved cloud services. By using this service user can access the raspberry pi processor from anywhere in the world. The raspberry pi processor is used for monitoring and processing purpose and relay system is the output interface.

Performance Comparison With Existing Systems

Sarthak Jain et al [2] have designed a basic home automation application on Raspberry Pi through reading the subject of E-mail. The system described in [2] allows for a user to control appliances by sending appropriate codes to the system. This would be very difficult if the number of devices increases as the user must either remember or have a catalogue of all the codes for each appliance on him/her at all times. The proposed system effectively removes this obstacle with the help of internet to control the appliance. Home automation system designed in [4] uses the raspberry pi controller via an android interface. It employs the use of a Wi-Fi Local Area Network to connect the controller to the android interface. This system provides a way to control appliance with the use of a Local Area Network. The limitation of this system would be that, any Local Area Network is limited within the range of the WiFi. The proposed system deals with this limitation by the control of appliances through the internet. Our proposed wireless based home automation system decreases installation cost and effort, and enhance system flexibility and scalability.

V. Conclusion

In this highly developing era, everything is dependent on information technology and internet. Raspberry Pi proves to be a smart, economic and efficient platform for implementing the home automation by using internet. By using Raspberry Pi micro-controller board, an internet connection and relay board; a novel architecture for a home automation system is implemented. Here we have successfully controlled the switches with the help of Raspberry pi microcontroller board through internet. By login to the weaved cloud service using id and password. We get host id and port number. By using this host id and port number we can open Putty and thereby we can type Linux based commands according to our needs on putty. Thus the GPIO pin of the Raspberry pi pin is activated; relay closes the switch which controls the appliance. The implemented automation system provides an efficient, comfortable and flexible user interface for controlling electric appliances.

Discussions

Advantages

- Low installation cost
- Less effort
- Highly efficient
- High mobility and security
- Saves money and energy

IV. Result

Globally accessible machine automation using raspberry pi. The main goal of our system is to automate appliances remotely. In the first step, a LAN cable of a modem was connected to the Ethernet module of the raspberry pi to gain access to the internet. Then connect power supply to the raspberry pi. Then login to the weaved cloud service using id and password. Thereby obtain host id and port number. Using this host id and port number open Putty. Next step is typing commands based on our needs. Thus bulb gets on/off. We know that processor is the small chip that processes the input given by the user. Every Self-running or automated device requires the processor to process the input signals given by the user and interfaced with input and output to connect that processor. The interfacing of this input is done by using weaved cloud services. By using this service user can access the raspberry pi processor from anywhere in the world. The raspberry pi processor is used for monitoring and processing purpose and relay system is the output interface.

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VII. References


