

Automation of Home (IoT) using Raspberry Pi

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ABSTRACT

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Internet of things is the present technology that permits us to control hardware via the internet. Using IOT system, we can link the physical devices and possess the ability to send or transfer data over a network with either human-to-human or human-to-system interaction. This paper explains how to control home appliances using Internet of Things. The microcontroller we are using for this project is Raspberry Pi. The Raspberry Pi is interfaced with Wi-Fi modem for transmitting and receiving commands over the internet. To switch loads, we are using relays. Once the user passes instructions over the internet to switch on the appliance, the raspberry pi processes these commands and operates accordingly. Liquid Crystal Display is used to display the status of the system. Hence, IOT based home automation setup allows us to control home appliances over the internet.

Keywords: Home automation, IOT, Raspberry Pi, and Wi-Fi.

I. INTRODUCTION

We are presenting a system for Automation of home with Raspberry Pi using IOT (Internet of Things). In the field of home automation, appliances were controlled using technologies such as Wi-Fi connected automation system and ZigBee based home automation system, GPRS based home automation system. But these technologies were limited to the device range (which was within a home). Internet (IOT) based home automation is the present mechanization with the help of which we can control almost every home appliance from any place remotely using Internet Connectivity. In this project we have created a model that monitors and controls devices via web interface, when connected to the internet

that can be accessed through tablets, smartphones and computers. To attain this, we are using Raspberry Pi, which reduces the complexity of design and is economical in cost. The main merit of having such a technology is that we can control our devices and home appliances throughout the globe. For example, one morning you are rushing to your work place and forget to switch off fans and lights, then you can go to our device control interface and select the appliances to be switched off and complete the task from your workplace. Also, on a sunny day you can switch ON the Air conditioner in your room while driving back home, so that you don't have to wait for it to cool the room after getting home. Internet of Things is a technology which can be used at home, business or industrial environment based upon your requirement.

II. INTERNET OF THINGS

Internet of Things (IOT) can be applied in home automation setup to link appliances such as microwave, fans, lights, air conditioner, television, washing machine, fridge, computer, printer etc. The IoT is a catch-all term for the expanding number of electronics that are not traditional computing devices, but are linked to the internet to transmit data, receive commands or both. As the Internet of Things grew in the previous years, more devices will join the list. It can be implemented in various fields such as home, schools, work places and other fields based upon your needs. Internet connected devices can be controlled from a remote location where internet is available. Both the ends need internet connection for receiving and transmitting data. The web interface from which we give input and the Raspberry Pi are connected to the appliances such as fans, lights etc. The appliances make use of embedded technology to communicate with the external environment via the internet.

Internet of Things system has three major layers which are-

1. Perception layer
2. Network layer
3. Application layer

Perception layer has real-time appliances such as Camera, pen drive, sensors etc. Data is sent to the next layer from the perception layer. Network layer is the middle layer that acts as a connection between physical world and virtual world. Application layer is the application developed for smart homes, cities, smart agriculture and e-Health. This layer is the client end layer where the user gets information according to which the user can control the appliances.



Figure 1: Internet of Things

III.RASPBERRY PI

Raspberry pi is a small microcontroller almost a size of a credit card. In other words, it is a tiny computer on a single board. It is especially designed for students interested in electronics and programming. It is a very cheap computer, but it also provides a set of General-Purpose Input Output pins that allow use to control electronic components for physical computing and explore the Internet of Things. The power consumption by raspberry pi is very less compared to that of a regular computer. It can be effortlessly linked to other peripherals and other circuit boards. It operates on open-source software and gives students the potential to try any software according to their application. It is a single circuit board and has different ports for USB, HDMI, analog audio, power composite video, internet, SD Card. There are many generations of Raspberry Pi: - Pi 1, Pi 2, Pi 3 and Pi4, and there have in general been a Model A and a Model B for most generations. We, in this project have used Raspberry Pi 3 model B+

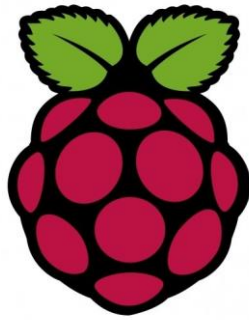


Figure 2: Raspberry Pi logo

IV. SYSTEM DESIGN AND IMPLEMENTATION

Hardware Specifications are- Raspberry Pi, Wi-Fi, Relays, Capacitors, Resistors, Diodes, LCD Display, lights, fan, Relay Driver IC. The circuit consists of raspberry pi which is used to control 4 loads, that is 3 lights and 1 fan. Liquid Crystal Display is used to display the status of the system. Power supply is used to supply power to the setup. Step down transformer, rectifier and regulator are used to regulate 5V DC, as relays are designed to run on a particular voltage from 5V/12V DC. Relay has 3 terminals- NO, NC and COM. It is an electromagnetic circuit and the 2 configurations in general of relays are- Normally close (NC) and normally open (NO).

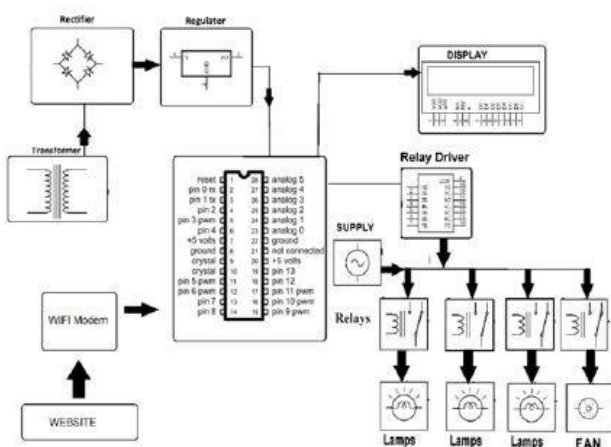


Figure 3: Block Diagram

V. SOFTWARE IMPLEMENTATION

Raspbian OS: It is a free operating system on Raspberry Pi hardware. It is a set of basic programs and utilities that make your hardware run. However, it is more than just an OS that not only has API's and packages but also a precompiled software bundled in a nice format for easy installation on your Raspberry Pi. It is maintained by Mike Thompson and Peter Green which completed the initial build in June 2012. The operating system is still under active development.

Cayenne myDevices: By using Cayenne we can develop our Internet of Things based system. Cayenne is software where we can register free of cost and connect through the server to Raspberry pi and control all the devices connected to it. It is a platform that provides support over Microcontrollers, Arduino, Raspberry pi and other controller boards. Any desired IOT systems can be put into effect using this open-source internet of the things development platform. You just need to set up your devices and run them on IOT Cloud. Cayenne is a platform for students, developers and researchers. Cayenne has different templates and tools for the user to choose and handle with ease. You can operate motors and other physical devices using Cayenne with simple clicks. Its development doesn't require much coding knowledge.

Register on Cayenne: Fill in your details the name, email, country, city, etc. And select the application for which you are going to develop an IOT system. Visit your mail-box and get login credentials. With which you can log in to the system. Choose your desired layouts for data display from home automation and more. You can change the application type between home automation, Office automation, Industry automation, Liquid level monitor, Garbage monitor and many more from the profile module. Optimally integrate your electronics systems to the online servers from Arduino, Raspberry Pi, ARM, 8051, PIC, AVR controllers and more with ease.



Figure 4: Cayenne myDevices

VI. RESULT

Home appliances can be monitored and controlled by using IOT. IOT can be used in many places like banks, schools, offices, hospitals, labs, colleges, supermarket and another sophisticated automated system. By using this system in various places, we can easily know the status of devices, whether ON or OFF and can easily control it from anywhere. This system provides interaction with machinery and devices.

VII. CONCLUSION

The present paper has demonstrated the smart home gadgets to be controlled by the Raspberry Pi using the Internet of Things. Raspberry pi plays a very crucial role in designing a smart home at a very low cost. The power dissipated by Raspberry pi is also very less as compared to other PCs. Moreover, it is cost-effective and power-efficient. The main objective of this paper is to show how home appliances can be remotely monitored and controlled through the internet using a web interface from anywhere in the world. This kind of project helps the aged person and physically challenged people to control home appliance as it might be difficult for them to move frequently to the switch they want to ON or OFF it. By using this IOT technology it can be implemented for various gadgets and easy accessibility.

VIII. REFERENCES

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