

A NodeMCU Based Home Automation System

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Abstract - Analog switches are mounted on the walls. Operating them is a tedious task as they need to be physically pressed each time an appliance has to be powered on or off. This hassle is replaced by a smart technique that involves operating the switches through a Web Browser of a Mobile phone or a PC. The present smart switches available in the market are very expensive and also require additional devices like hubs for their working. This paper uses the Cloud and a Web Browser to control the manually operated switches. A cloud server is created for the environment where the switches are mounted. The switches are interfaced with NodeMCU which has an inbuilt Wi-Fi. It can use this to enable or disable the switches. The user communicates with the processor through the Web Browser. The processor then controls the switches based on the commands received from the user and also updates the user about the status of the switches after the control operation is performed to the cloud. The intensity of light, the speed of the fan and other devices can be controlled using the Web Browser.

Key Words: Home Automation, Smart Homes, Internet of Things, Internet, Automatic Control

1. INTRODUCTION

In the past few years, home automation segment has seen a rapid advancement and with that advancement, the evolution and development of new and improved technologies. With advancement of Automation Technology, life is getting simpler and easier in all aspects. In today's world, Automatic systems are being preferred over manual systems. Internet of Things is the latest emerging internet technology and has got its origin from home automation. The pivotal difference between standard home automation devices and IoT devices is that the IoT devices can transfer and share data over the existing network framework. Also, IoT devices are capable of being controlled remotely over the internet. Present technologies have to rely on different protocols for communication. Also some proprietary and some standard like Wi-MAX, Ethernet, Bluetooth, Z-Wave, Fiber Optics. The major problem with all these protocols is that they are not suited with each other. This paper uses basic and most extensively used standard like IEEE 802.11 (Wi-Fi).

The content of this paper is as follows: Section II gives a brief idea about the existing available work. Section III describes the new system with block diagram. Section IV gives the

hardware and the software implementation details. Finally, section V provides a conclusion.

2. LITERATURE SURVEY

The expeditiously growing internet has opened new horizons for development in various fields. The home automation industry has seen a brisk growth in the last few years. It has become a topic of interest of many people around the globe.

Vishwateja Mudiam Reddy & Naresh Vinay in their paper "Internet of Things Enabled Smart Switch"[1] designed a system which integrates the cloud and web app. With the help of flip-flops, logic gates and a processor, the switches could be controlled. The proposed model was intended for reducing the cost of these systems which was the main barrier in the wide adaptation of this technology.

Khusvinder Gill & Shuang-Hua Yang[2] created a common home gateway for ZigBee and Wi-Fi. This enabled remote control using a simple user interface. The system was cost effective and had good security inside the house.

Salma and Dr. Radcliffe[3] with an aim of increasing the popularity and reach of home automation designed a system that used the Novel Network Protocol. It gave the option of controlling the commercial devices through a mobile or laptop. An additional network device was used for remote access instead of a microcontroller.

A flexible and simple system with an ability to integrate with very fewer efforts for off the shelf products was created by Carelin and I. Jacob Raglend[4]. The system used ZigBee for home controlling and GSM for remote access. It did not provide any GUI and also it was prone to security threats as anyone could access the system.

Rozita Teymourzadeh, Salah Addin Ahmed[5] designed a GSM based system for home automation. Using the GSM protocol, it became possible to access the system by using the Short Message System (SMS). The system also gave feedback to the user about the current state of any desired object.

3. SYSTEM BLOCK DIAGRAM AND WORKING

The block diagram of the system is shown in Fig -1. The input will be given through a Web App which will be based on IoT platform. Through this Web App, besides the regular on or off operation, the intensity of different devices can be controlled. Also, depending on the environment and outdoor conditions, the devices will themselves change their working. The LDR

(Light Dependent Resistor) sensor will detect for the outdoor light. If not found sufficient, the system will start the tube light. Besides all this, the system will also support manual operation. The IR sensor will sense some aspects of the surroundings. If a person enters the room, the IR sensor will automatically start the prescribed devices.

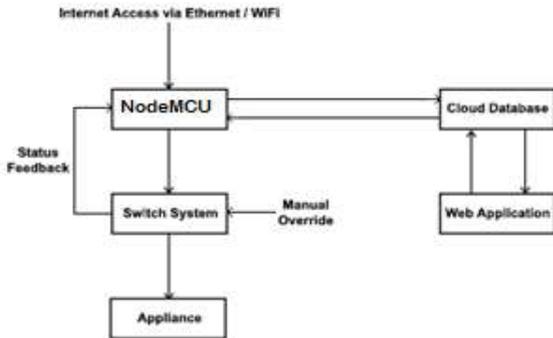


Fig -1: Block Diagram of the System

4. HARDWARE IMPLEMENTATION



Fig -2: NodeMCU (ESP8266)

The predominant part of this system is the NodeMCU (ESP8266). NodeMCU is shown in the Fig. 2.

NodeMCU is an open-source IoT platform. It is simple & smart, interactive, programmable & Wi-Fi enabled. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

The sole reason for using NodeMCU over Raspberry Pi is that the NodeMCU has inbuilt Wi-Fi. This reduces the cost and hence NodeMCU is cheaper than other devices available in the market. Inbuilt Wi-Fi helps in remote access. The system is accessible from any remote location around the globe provided an internet connection. Once given an input, the device will continue to operate even if there is no internet access. The device can be physically handled as well.

The implementation of the system is shown in the Fig -3.

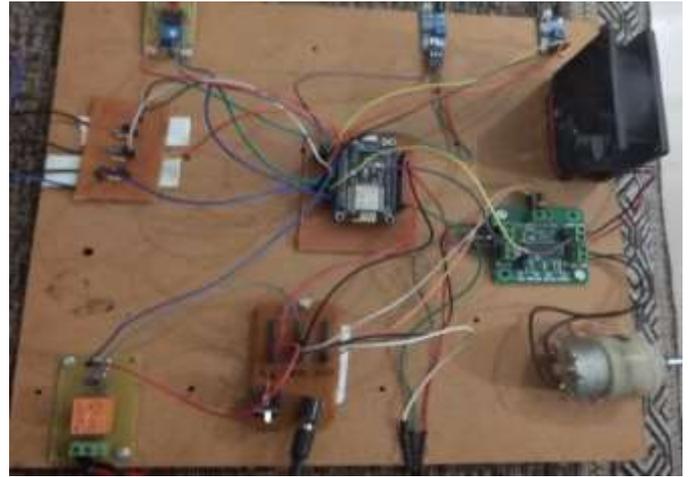


Fig -3: Block Diagram of the System

5. SOFTWARE IMPLEMENTATION

The system is controlled using a Web Page which is based on IoT platform. The Graphical User Interface of the Web Page is shown in Fig -4.



Fig -4: NodeMCU (ESP8266)

The intended device can be powered ON or OFF using the above application. Also, it provides the facility to set the intensities of different appliances. The system becomes platform independent due to the use of a web application. It can be operated from any location by just opening the IoT platform web application. The web application also serves as a platform for managing the devices and the data.

6. FUTURE SCOPE

Smart Homes

In the coming years, fully automated smart homes will surely become a reality as the home automation is developing rapidly. Due to good user convenience, smart homes are appealing a wide range of people all over the globe. The User can check for the electricity usage, the condition of his devices and get notification accordingly.

Smart Cities

With increasing automation and IoT, devices can communicate with each other. This will help in building new and smarter cities. Cities that would be free from pollution, traffic accidents, etc. problems.

Agriculture

The proposed system can be used in Agriculture as well. The various devices used in fields can be operated from any remote location.

7. CONCLUSION

The main barrier towards the acceptance of home automation presently is its high cost. This paper has studied and reviewed the presently available home automation system. These systems require additional network devices like hubs for their working, which in turn increase their cost. By the use of NodeMCU and the IoT platform, these devices can be made cost-effective. Above all, it will provide great user convenience as it will be possible to control the devices from a remote location. Using a web page or an application, the system has been made platform independent. There is no need for any particular operating system so as to operate this system. The system will provide optimal results.

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