

IOT BASED HOME AUTOMATION SYSTEM

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ABSTRACT

This project presents the overall design of Home Automation System (HAS) with low cost and wireless system. It specifically focuses on the development of an IOT based home automation system that is able to control various components via internet or be automatically programmed to operate from ambient conditions. In this project, we design the development of a firmware for smart control which can successfully be automated minimizing human interaction to preserve the integrity within whole electrical devices in the home. We used Node MCU, a popular open source IOT platform, to execute the process of automation. Different components of the system will use different transmission mode that will be implemented to communicate the control of the devices by the user through Node MCU to the actual appliance. The main control system implements wireless technology to provide remote access from smart phone. We are using a cloud server-based communication that would add to the practicality of the project by enabling unrestricted access of the appliances to the user irrespective of the distance factor. We provided a data transmission network to create a stronger automation. The system intended to control electrical appliances and devices in house with relatively low-cost design, user-friendly interface and ease of installation. The status of the appliance would be available, along with the control on an android platform. This system is designed to assist and provide support in order to fulfill the needs of elderly and disabled in home. Also, the smart home concept in the system improves the standard living at home.

INTRODUCTION

Internet of Things (IOT) is a concept where each device is assigned to an IP address and through that IP address anyone makes that device identifiable on internet. The mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically, it started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet of Things" (IoT). The recent developments in technology which permit the use of wireless controlling environments like, Bluetooth and Wi-Fi that have enabled different devices to have capabilities of connecting with each other. Using a WIFI shield to act as a Micro web server for the Arduino which eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Arduino to communicate with the internet. With this in mind, an internet-based home automation system for remote control and observing the status of home appliances is designed.

Due to the advancement of wireless technology, there are several different types of connections are introduced such as GSM, WIFI, and BT. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in HAS project, WIFI is being chosen with its suitable capability. The capabilities of WIFI are more than enough to be implemented in the design. Also, most of the current laptop/notebook or Smartphone come with built-in WIFI adapter. It will indirectly reduce the cost of this system.

OBJECTIVES: -

Design of an independent HAS

To formulate the design of an interconnected network of home appliance to be integrated into the HAS. The objective to account for every appliance and its control to be automated and integrated into the network further formulated into the HAS

Wireless control of home appliances (Switch and Voice mode)

To develop the application that would include features of switch and/or voice modes to control the applications.

Monitoring status of appliances

Being able to view the status of home appliances on the application, in order have a better HAS.

Secure connection channels between application and Node MCU

Use of secure protocols over Wi-Fi so that other devices are prevented to achieve controlover the HAS. Secure connections are obtained by SSL over TCP, SSH.

Controlled by any device capable of Wi-Fi (Android, iOS, PC)

To achieve flexibility in control of the home appliances, and device capable of Wi-Fi connectivity will be able to obtain a secure control on the HAS.

Extensible platform for future enhancement

With a strong existing possibility of adding and integrating more features and appliances to the system, the designed system needs to be highly extensible in nature.

MAIN FEATURES OF PROTOTYPE: -

The features of the developed prototype are:

- The prototype establishes a wireless remote switching system of home appliances.
- The prototype uses Wi-Fi to establish wireless control, which gives an indoor range to about 150 feet.
- The command to switch on and off an appliance can be given from radio buttons on the application from one's smartphone.
- There is also a provision developed to use voice commands on smartphone to remotely switch home appliances
- Any device capable of Wi-Fi connectivity can be used to control the prototype.
- The control over home appliances is obtained over secure connections, by SSL over TCP, SSH.
- Simple design easy to integrate into a variety of appliances and extend on further range.
- Displays the status of each appliance on the application in smartphone
- Cost effective.

BLOCK DIAGRAM: -

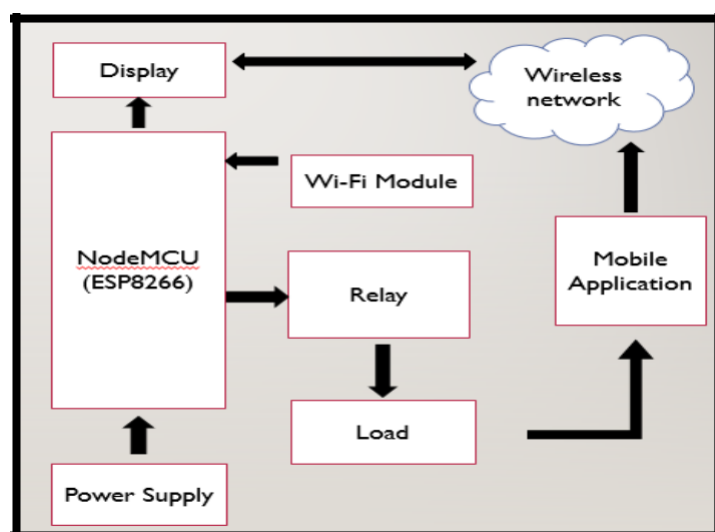
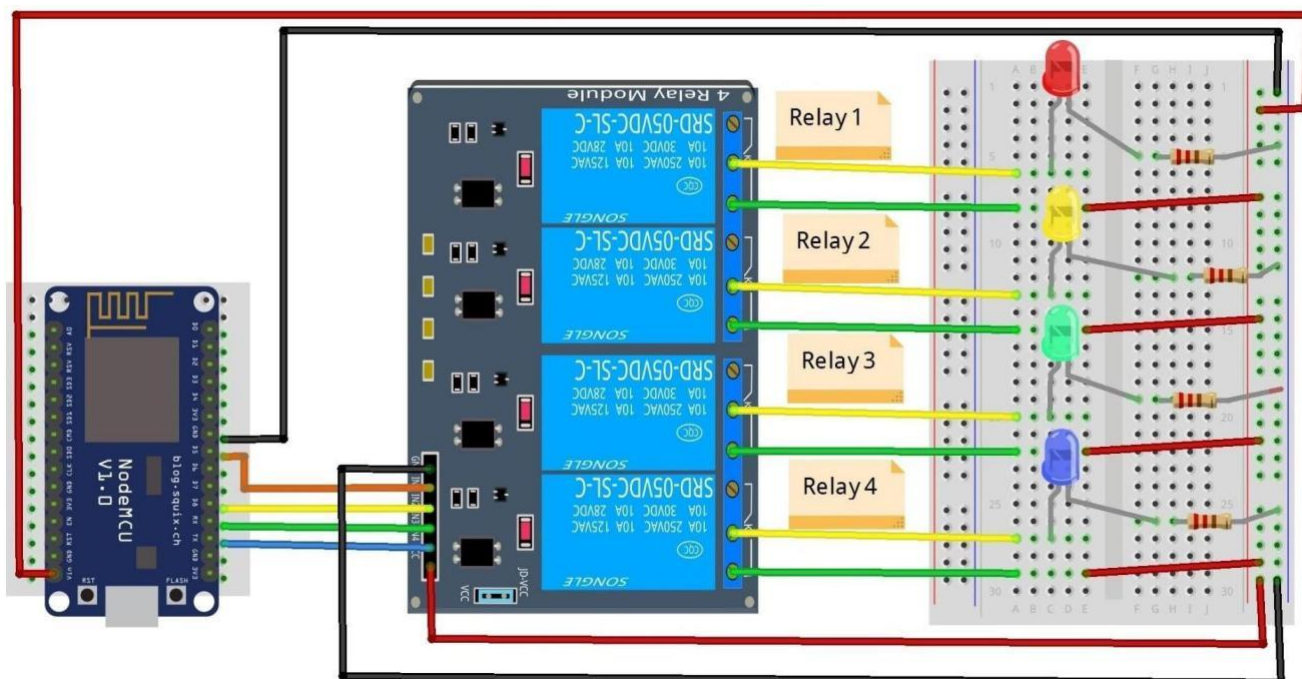


Fig. 1 Block diagram of proposed system.

The block diagram gives the functionality of the overall project. The Node MCU unit is the microcontroller or the main controlling unit of the system. The user uses the mobile application in setting commands for functioning of the appliances. The mobile application interprets the command form in user in voice or switch mode and sends signal to the Node MCU unit, over a wireless network established by Wi-Fi communication. Hence the Wi-Fi module (actually inbuilt into Node MCU), helps the microcontroller establish Wi-Fi communication with a device and take commands from an application over wireless network. The Node MCU on further receiving the signal then turns on/off the appliance with the help of relay. The Node MCU, relay and the final appliances are physically connected. There is a power supply unit that powers the microcontroller, the relay as well as the final appliances. There is also a display unit that displays the status of the application.

CIRCUIT DIAGRAM: -



LIMITATIONS: -

Android devices having lower API version than 16 requires internet access to convert the speech data to string data. Currently, the application is made for Android Smart Phones; other OS platform doesn't support our application. During voice mode, external noises (voice) may affect our result. The speech instruction that we command in our voice mode may not give exact result as expected. There hence lies an ambiguity in result.

FUTURE SCOPE: -

Looking at the current situation we can build cross platform system that can be deployed on various platforms like iOS, Windows. Limitation to control only several devices can be removed by extending automation of all other home appliances. The prototype can include sensors to implement automatic control of the home appliances like; an LDR that can sense daylight and switch lamp accordingly, a PIR to detect motion and be used for security purposes making an alarm buzz, or a DHT11 sensor that's senses ambient temperature and humidity of atmosphere and switch fan/air conditioner accordingly. Scope of this project can be expanded to many areas by not restricting to only home, but to small offices

RESULT: -

The experimental model was made according to the circuit diagram and the results were as expected. The home appliances could

be remotely switched over Wi-Fi network. Both the switch mode and the voice mode control methodologies were successfully achieved. The Blynk application was also successful in displaying the status of every application.

CONCLUSION: -

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the airconditioning system and even the entire house lighting system. And better still, the components required are so small and few that they can be packaged into a small inconspicuous container. The designed home automation system was tested a number of times and certified to control different home appliances used in the lighting system, air conditioning system, home entertainment system and many more. Hence, this system is scalable and flexible.

REFERENCE: -

1. Wikipedia (2009) Home Automation From http://en.wikipedia.org/wiki/Home_automation.
2. Theory of IOT from :<https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>
3. “*Smart Energy Efficient Home Automation System using IOT*”, by Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, Arun Kumar Mishra.
4. “*Visual Machine Intelligence for Home Automation*”, by Suraj, Ish Kool, Dharmendra Kumar, Shovan Barman.