IOT BASED SWITCH

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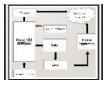
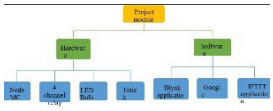
Abstract–This paper presents the overall design of Home Automation System (HAS) with low cost and wireless System. It specifically focuses on the development of an IOT based home automation system that is able to Control various components via internet or be automatically programmed to operate from ambient 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 communicatethe 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 1fulfil the needs of Elderly and disabled in home. Also, the smarthome concept in the system improves the standard living at home

1.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 eliminatesthe 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 appliancesis 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, WIFIis 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

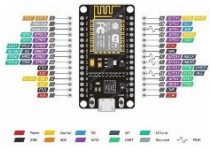
2. Information flow in proposed project:



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 powersthe microcontroller, the relay as well as the final appliances. There is also a display unit that displays the status of the application.



Node MCU is the microcontroller unit in the prototype. It has an in-built Wi-Fi module (ESP8266) that establishes wireless remote switching of home appliances.
Four channel relay module consists 4 individual relays physically connected between Node MCU and the home appliances. It takes signals form GPIO pins of Node MCU and accordingly connects or disconnects home appliances from the supply. They act as the switching device.
LED and resistors are used in this prototype to replace real appliances. They indicate power being turned on and off to the appliances. In real time operation they would be replaced by actual home appliances.
Blynk application was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it, etc. the prototype primarily uses Blynk application to sense commands from user to the hardware over wireless network.
Google assistant is a system software present on the android phone. It interprets the voice commands by the user to turn on or off an appliance.
IFTTT application the voice commands interpreted by the google assistant isn't understandable by Blynk application thus unable to send to the hardware. IFTTT is an intermediate application that interprets commands from Google assistant and sends on and off signal to Blynk application Via Blynk server.



3. Working– 3. Working
An IoT-based switch using NodeMCU, a channel relay, and the BlynkIoT application can be implemented to control electrical devices remotely. Here's an overview of how it works:

Components:
1. NodeMCU: It is a development board based on the ESP8266 Wi-Fi module, which enables connectivity to the internet.
2. Channel Relay: A relay is an electrically operated switch. The channel relay allows you to control high-power devices using a low-power signal.
3. BlynkIoT Application: Blynk is a platform that provides a mobile app to control IoT devices. It allows you to create a graphical interface and establish communication between the app and your hardware.

Steps to implement the IoT-based switch:

1. Hardware Setup:

- **Connect the NodeMCU board to your computer via USB for programming.**
- **Connect the channel relay to the NodeMCU board. The relay should be connected to the power supply and the device you want to control.**
- **Ensure that the connections between the NodeMCU and the relay are secure.**

2. Software Setup:
- **Install the Arduino IDE on your computer and set it up for programming the NodeMCU board.**
- **Install the required libraries for NodeMCU and Blynk. You can find these libraries in the Arduino Library Manager or download them manually.**
- **Open the Arduino IDE, create a new sketch, and include the necessary libraries.**

3. Blynk App Configuration:

- **Download the Blynk app from the app store and create a new account.**
- **Create a new project in the Blynk app.**
- **Add a button widget to the project's interface. This button will control the switch state.**

4. Code Implementation:
- **In the Arduino IDE, define your Wi-Fi credentials, Blynk authentication token, and other necessary variables.**
- **Set up the Wi-Fi connection and Blynk using the provided credentials and token.**
- **Configure the GPIO pin on the NodeMCU board that is connected to the relay as an output pin.**
- **Implement the Blynk button press event handler to control the relay's state. When the button is pressed in the app, the corresponding pin state on the NodeMCU board will change.**
- **Upload the code to the NodeMCU board.**

5. Testing:
- **Once the code is uploaded, you can disconnect the NodeMCU from your computer and power it using an external power supply.**
- **Open the Blynk app on your mobile device and navigate to your project.**
- **Press the button widget in the app to send a signal to the NodeMCU and control the relay.**
- **The relay will switch the connected device on or off based on the button's state in the app.**

By following these steps, you can create an IoT-based switch using NodeMCU, a channel relay, and the BlynkIoT application. This allows you to remotely control your devices over the internet using the Blynk Mobile Application
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Advantages:-The advantages of using an IoT-based switch using NodeMCU (ESP8266) as the underlying hardware platform. Here are some of the key advantages:

1. Easy Connectivity: NodeMCU is equipped with built-in Wi-Fi capability, which makes it easy to connect the switch to your home or office network. This allows you to control the switch remotely using a smartphone, tablet, or computer from anywhere with an internet connection.

2. Cost-Effective: NodeMCU is an inexpensive development board that offers a wide range of features. Compared to traditional smart switches or home automation systems, building an IoT switch using NodeMCU can be significantly morecost-effective.

3. Flexibility and Customizability: NodeMCU is an open-source platform that supports programming in Lua and Arduino IDE. This gives you the flexibility to customize the switch's functionality according to your specific requirements. You can easily modify and add features to the switch's firmware, such as scheduling, automation, integration with other IoT devices, and more.

4. Scalability: NodeMCU can connect to a variety of sensors, actuators, and modules, making it highly scalable. You can expand the capabilities of the switch by integrating additional sensors or devices to monitor and control various aspectsof your environment, such as temperature, humidity, lighting, or security systems.

5. Energy Efficiency: NodeMCU is designed to be power-efficient, allowing the switch to operate for extended periods using minimal power. This is particularly important for IoT devices that are continuously connected to the network and need to be operational 24/7.

6. Integration with Existing Infrastructure: NodeMCU supports various protocols and interfaces, such as MQTT, HTTP, REST APIs, and more. This enables seamless integration with existing IoT platforms, cloud services, and home automation systems, allowing you to leverage your existing infrastructure and services.

7. Rapid Prototyping and Development: NodeMCU provides a development environment that simplifies the prototyping and development process. Its compact size, easy-to-use programming interfaces, and extensive community support make it an ideal choice for quickly building and testing IoT-based switches.

8. Remote Monitoring and Control: With an IoT-based switch using NodeMCU, you can remotely monitor and control your appliances or devices. This allows you to check the status of the switch, turn devices on or off, and receive notifications or alerts based on predefined conditions.

conclusion and future expansion

Conclusion -It is evident from this project work that an individual control home automation system can be cheaply madefrom low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the air conditioning 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 tocontrol different home appliances used in the lighting system, air conditioning system, home entertainment system and many more. Hence, this system is scalable and flexible.

Future expansion– 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

5. Acknowledgement

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