Wi-Fi Operated Voice Controlled Home Automation System

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Abstract: *Home automation is a modern technology that helps to enjoy comfortable living conditions inside the home. With home automation, data can be instantly collected and passed between devices and analyzed simultaneously. By connecting the home appliances with the internet, they can be easily accessed from anywhere. In the home automation system, settings are feasible through smartphones or other remote-control devices. This paper gives the design and implementation of a new voice- controlled home automation system that uses Google Assistant for giving user's voice commands as input. It is a low cost and flexible home automation and monitoring system. It enables the user to use a home automation system based on the Internet of Things (IoT). Home appliances like fans and lights can be controlled. The fundamental purpose of this project is to control electronic appliances based on the situational demands of the user.*

Keywords: Home automation, Node MCU, Smartphones, Voice Controlled

I. INTRODUCTION

Internet of things (IoT) is the developing technology that deals with the connection of the hardware devices and the software applications over the network. The important application of IoT is Home Automation. The home automation system gives immediate access to control all the home appliances. The physically challenged and elderly people find it difficult to reach the switchboard to turn on and off the appliances. So, a voice-controlled home automation system can be useful for them to access the appliances by sitting in one place. This paper employs a smartphone for giving user commands by using the Google assistant and Node MCU microcontroller, with Wi-Fi (ESP8266) connectivity to gain access and control the devices and appliances. It uses the Arduino IDE to write and upload programs and Google Home IO- a cloud service to handle multiple feeds of data.

II. METHODOLOGY

This paper aims to control the various home appliances by receiving the voice command from the user through Google Assistant. The command is interpreted by the mobile and sent to the SINRICPRO if it's an appropriate command. The SINRICPRO acts as a central means through which the user communicates with the appliances. It sends the signals to the Node MCU which in turn sends the appropriate command to the Relay through which the appliances are controlled, thus it demonstrates the concept i.e. IoT. The ESP8266 is programmed to send controls to relay which in turn controls the appliances.

III. HARDWARE CONFIGURATION

3.1 Node MCU (ESP8266)

The Node Microcontroller Unit also called the Node MCU is an open-source hardware development board. It contains the chip called ESP8266 which is the wi-fi module used to connect the devices with the network. Node MCU is inexpensive hardware that is suitable for the construction of home automation systems.

Fig 3.1: Node MCU ESP8266

3.2 Google Assistant

Google Assistant is Google's voice assistant software that is used to give voice commands. The keyword "Hey Google/ Ok Google" is used to engage with the Google Assistant. Google Assistant is available in all kinds of android smartphones. The users can give the voice commands through Google Assistant to access smart devices and applications. It's a convenient method for users to automate their devices.
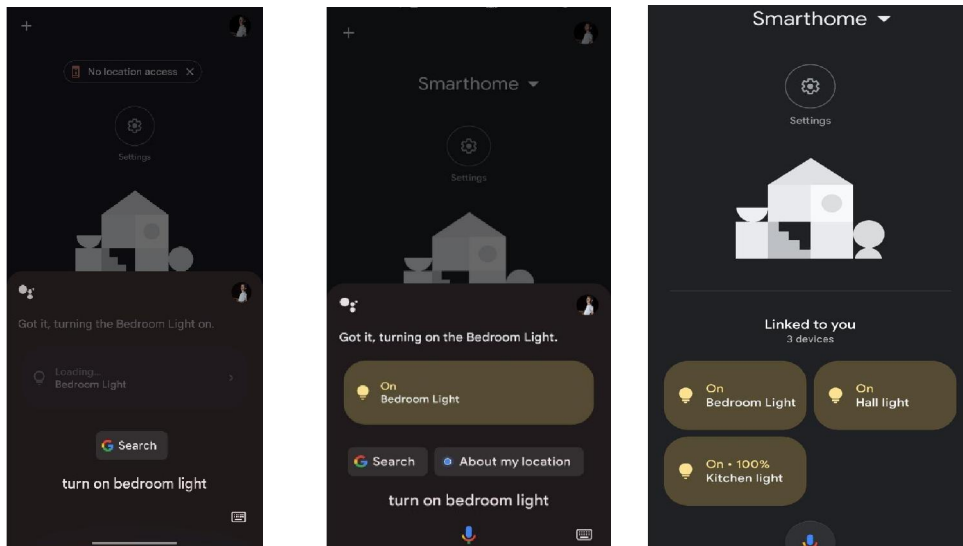

Fig 3.2: Dashboard of Google Home

3.3 4-Channel Relay Module

The relay module is the series or array of switches. It is used to turn on and turn off the electrical circuit. The relay works depending upon the input signals. The 4 channel relay module which contains 4 relays, handles the voltage and power much better than the microcontroller.
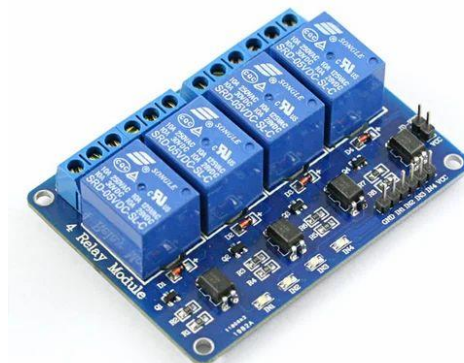

Fig 3.3: 4- Channel Relay Module

3.4 9V DC Battery

A battery is a device that stores chemical energy and converts it to electrical energy. The chemical reactions in a battery involve the flow of electrons from one material (electrode) to another, through an external circuit. The flow of electrons provides an electric current that can be used to do work. 4 Channel Relay Module and Node MCU is required Dc supply to start, so we use 9v DC Battery to provide supply to the equipment.

Fig 3.4: 9V DC Battery

IV. SOFTWARE CONFIGURATION

4.1 Arduino IDE

The circuit board is controlled by Arduino IDE until the board is either turned off or reset. It consists of two functions such as Setup () and loop (). Arduino Integrated Development Environment (IDE) is a software used to write programs and connect with the microcontroller. It supports a simplified version of the C and C++ programming languages.

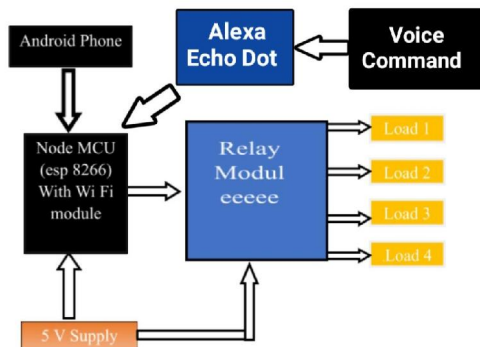## V. SYSTEM DESIGN

5.1 Block Diagram

Fig 5.1: Block Diagram of System
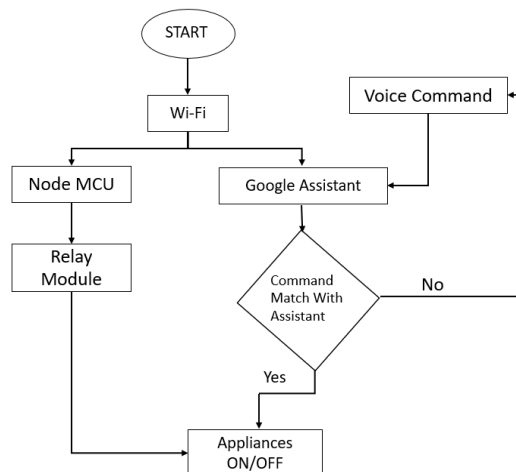
5.2 Flow Diagram

Fig 5.2: Flow Chart of System
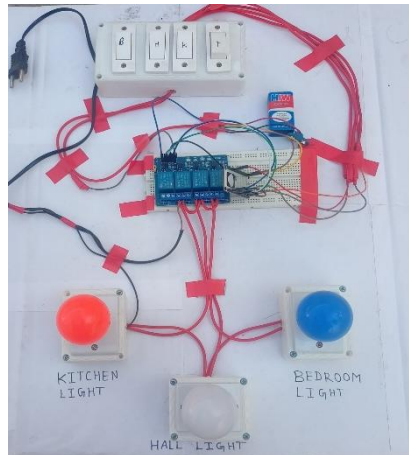
5.3 Model Representation

Fig 5.3: Model Representation of System

VI. CONSTRUCTION AND SETUP

6.1 Circuit connections
1. The circuit is very simple, we have used D1, D2, D5 & D6 GPIO to control the 4-channel relay module.
2. The GPIO SD3, D3, D7 & RX are connected with manual switches to control the relay module manually.
3. The Battery is connected to NodeMCU and Relay Module
4. The Appliance is connected with Relay Module

6.2 Google Home dashboard setup
1. Sign up for a free account using Gmail Id in the Google Home website
2. Create the dashboard and add the buttons to it and name the buttons as Hall Light, Kitchen Light ,Bedroom Light.
3. Add the gauge blocks to view the Real time status.

6.3 Creating applets using SINRICPRO
1. Sign up with Gmail Id.
2. To create new applets click on 'If This' option and connect it with the Google Assistant using the Gmail Id.
3. Create simple commands like 'Turn on Hall light'.
4. Click on 'that' button and connect with Google Home
5. Choose the feed names and finally click the Finish button to create the applet. Create applets for all the other relays.

6.4 Connecting Arduino IDE with Node MCU
1. Open the Arduino software and enter the board manager URL of the Node MCU ESP8266 in the preferences
2. Search for the ESP8266 community and Install it to the software.
3. Choose the Node MCU 1.0 (ESP-12E Module) and finally upload the source code.

VII. WORKING

From the above circuit connections, you can see that when the signal port is at low level, the signal light will light up and the opto-coupler 817c (it transforms electrical signals by light and can isolate input and output electrical signals) will conduct, and then the transistor will conduct, the relay coil will be electrified, and the normally open contact of the relay will be closed. When the signal port is at high level, the normally closed contact of the relay will be closed. So you can connect and disconnect the load by controlling the level of the control signal port.

VIII. RESULT AND DISCUSSION

The result of this paper provides the smart home automation system using voice commands. By giving voice command using Google Assistant the lights and fans are turned on and turned off. The voice commands "turn on Bedroom light" and "turn on Hall Light" is given by the user and the Google assistant responds to those commands as shown in the Fig -3.2. The Google Home dashboard displays the value 1 if the light/fan is on and 0 if the light is off.

8.1 Instruction Cycle and Output Response

LOAD	INPUT COMMAND	OUTPUT
BEDROOM LIGHT	TURN ON/OFF	LIGHT ON/OFF
KITCHEN LIGHT	TURN ON/OFF	LIGHT ON/OFF
HALL LIGHT	TURN ON/OFF	LIGHT ON/OFF
FAN	TURN ON/OFF	FAN ON/OFF
ALL LOADS	TURN ON/ OFF ALL	TURN ON/OFF ALL

IX. CONCLUSION

IoT Technology will become more efficient and everything can be controlled from one place. The IoT devices will work automatically and there is no need for human intervention. Home automation is flexible to accommodate new devices and appliances. A user can control the home appliances even if he/she is far away from home. In the future, the security system can also be enhanced by adding PIR sensors. It is known that all the homes will be equipped with such IoT devices which will make the daily lives and work of the users easier, faster and more accurate.

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