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SMART HOME AUTOMATION USING NODEMCU

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Abstract: A smart home refers to a convenient home setup where appliances and devices can be automatically controlled remotely from anywhere with an internet connection using a mobile or other networked device. Devices in a smart home are interconnected through the internet, allowing the user to control functions such as security access to the home, temperature, lighting, and a home theater remotely. A smart home's devices are connected with each other and can be accessed through one central point—a smartphone, tablet, laptop, or game console. Door locks, televisions, thermostats, home monitors, cameras, lights, and even appliances such as the refrigerator can be controlled through one home automation system. The system is installed on a mobile or other networked device, and the user can create time schedules for certain changes to take effect.

Index Terms **- Home Automation, Relay, Node MCU (ESP8266), IFTTT, Internet of Things (IoT), Google Assistant, Voice Control, Smartphone, Blynk**

1. INTRODUCTION

The project proposes an efficient implementation for IoT (Internet of Things) used for monitoring and controlling the home appliances via World Wide Web. Home automation system uses the portable devices like smartphone, laptop, etc. as a user interface. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like ZigBee, Wi-Fi etc. This project aims at controlling home appliances via mobile app using Wi-Fi as communication protocol and node MCU as server system.

NodeMCU is an open source IoT platform. The user here will move directly with the system through a web-based interface over the web, whereas home appliances like lights, fan, etc. are remotely controlled through easy interface provided by a website/application. The server will be interfaced with relay hardware circuits that control the appliances running at home. The server communicates with the corresponding relays

The system is installed on a mobile or other networked device, and the user can create time schedules for certain changes to take effect. Smart home appliances come with self-learning skills so they can learn the homeowner's schedules and make adjustments as needed. Smart homes enabled with lighting control allow homeowners to reduce electricity use and benefit from energy-related cost savings.

2. SMART HOME AUTOMATION SYSTEM

Home automation is adopted for reasons of ease, security and energy efficiency. As demand for electricity is increasing day-by-day, therefore, smart home is the upcoming area of research to provide the remote access for controlling the home appliance using IoT [1]–[4]. IoT based application has also provided the boom for old aged people and the person having some sort of disability. This allows the user to control the home automation device such as fan, bulb etc., without even making any physical connection.

IoT has provided the applications to turn non-smart device into smart device, which allow users to access these devices through the Internet. It converts the home into smart home and provides a more robust method of controlling the home appliance. Also, the security can be added with the help of installed camera in the home, which can be traced through the Internet. Thus, user can monitor their home and can turn ON/OFF their appliances which will definitely going to save both the electricity and electric bills.

With this motivation, IoT based home automation system has been developed which uses voice as well as smartphone application service for controlling the home appliance. Inclusion of intrusion detection and monitoring of house for hazardous conditions like fire detection increase the usefulness of the system.

3. System Design and Implementation

Voice input is one of the important inputs used for human-machine interaction [5]. Therefore, to make smart home more user friendly, Google assistance along with smart phone application, Blynk is used to control the home system. Arduino IDE is used for programming the required code and embed into NodeMCU controller.

The advantage of multimodal is that in the presence of the noisy background surrounding the performance of the Google assistance degrades. Hence, in such scenario web based application can be helpful in controlling the appliance of the system. Thus, the proposed model is designed to provide better flexibility and making the system more robust.

The Project is divided into four parts: Configuration of smartphone app, Configuring Arduino IDE, hardware assembly and Configuring IFTTT to link google assistant for voice control.

The hardware part of the developed system is programmed using Arduino IDE and the android application used is Blynk. The hardware components have been programmed to communicate directly with the NodeMCU.

3.1 System Requirements

- NodeMCU (ESP8266)
- IFTTT
- Arduino Software IDE
- Relay Module
- Blynk App
- Fire detection sensor
- PIR (Proximity Infrared) sensor

NodeMCU (ESP8266) is an open source firmware that provides the flexibility to build the IoT based application [6]. NodeMCU has gained its popularity due to its low cost and Wi-Fi enabled features. It also provides the Nodejs that require less computation time to perform the task and use Lua script. Thus making the device to operate much faster and making it as a first choice for IoT applications.

IFTTT stands for “If This Then That”, is an interface which provide the web based service in which device are connected with the mobile application [7]. Thus, making it much easier for the device to work based on the mobile application using the conditional statements.

Arduino IDE is an open-source prototyping platform enabling users to create interactive electronic objects. Arduino IDE software is used to compile the code [8].

Flame sensor is used in this project as the fire detection sensor.

PIR (Proximity Infrared) transmitter and emitter based sensor is used in this project for motion detection

3.2 Working Model

The working of the smart home automation is shown in Figure 1.

As shown, initial requirement is the Internet connectivity to access your smart home. One can access their smart home either through the android app Blynk or through Google assistant.

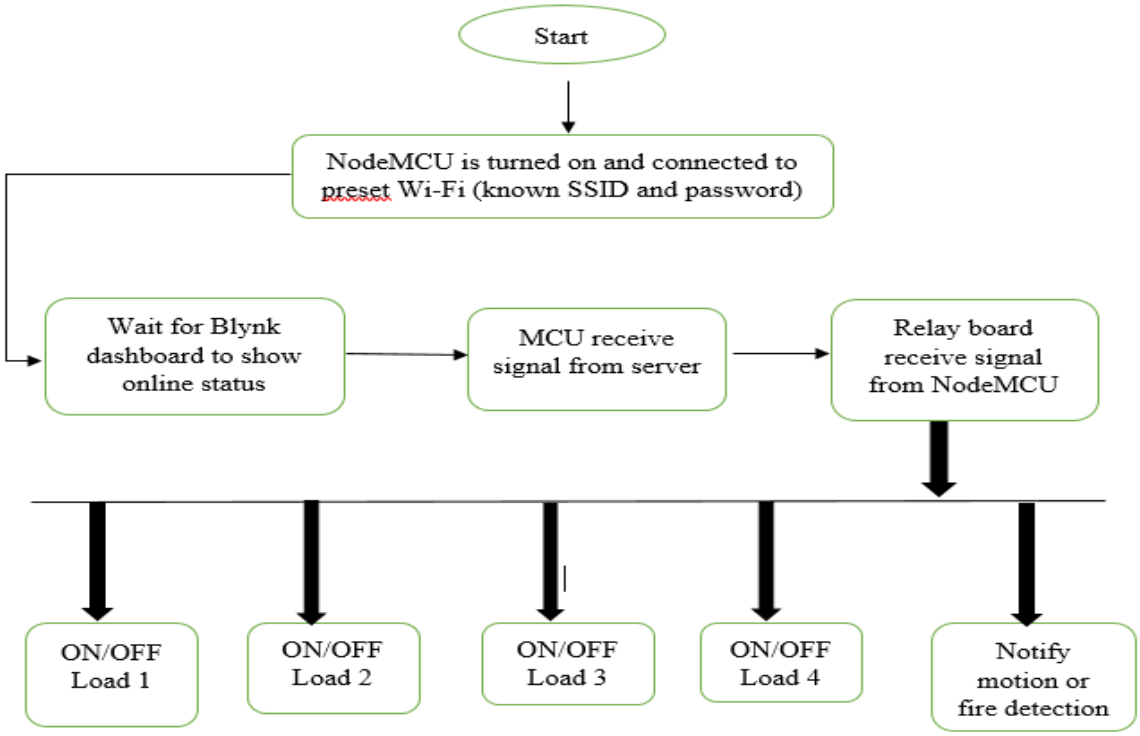

Figure 1: Work Flow of Smart Home Automation

After successful connection, users will be able to access the smart home appliances using an IFTTT statement command. It acts as the medium of connectivity between the Google assistant and the NodeMCU which is the main control unit of the smart home automation through the Blynk app. The home appliance is connected to the main controller unit with the sets of relay. The functions of these relays are to act as an ON/OFF switch on the main control unit.

3.2.1 CONTROLLING OF RELAYS

In this project four relay loads are connected to the NodeMCU controller consisting of two bulbs, a dc fan and an output power socket as shown in figure 2 representing the project prototype. The output power socket can be used to connect any home appliance like mobile charger or an AC table fan, etc.

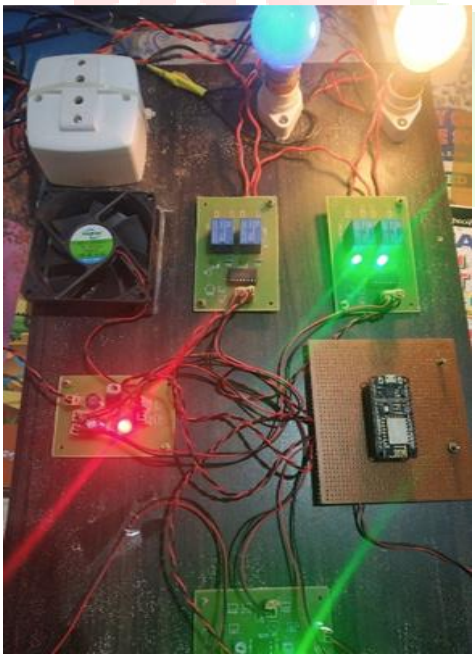

Figure 2: Project prototype consisting of 4 relays

The Blynk interface for controlling the relay loads is shown in figure 3.

Figure 3: Blynk interface for controlling relay loads

3.2.2 MOTION DETECTION

Any unauthorized or suspicious activity can be detected with the help of infrared transmitter and receiver based PIR sensor which is connected using LM358 IC in this project. Any suspicious motion can be detected while the owner of the house is away and appropriate steps can be taken by alerting neighbors, etc. Motion detection alert is as shown in figure 4.

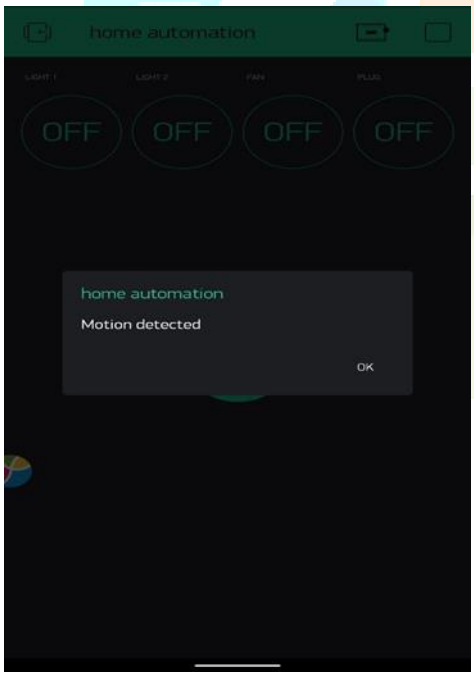

Figure 4: Motion detection Notification

3.2.3 FIRE DETECTION

Flame sensor is connected to the same LM358 IC which motion detection sensor is connected to in this project. When the sensor detects fire, an alert is sent to the mobile app as shown in figure 5.

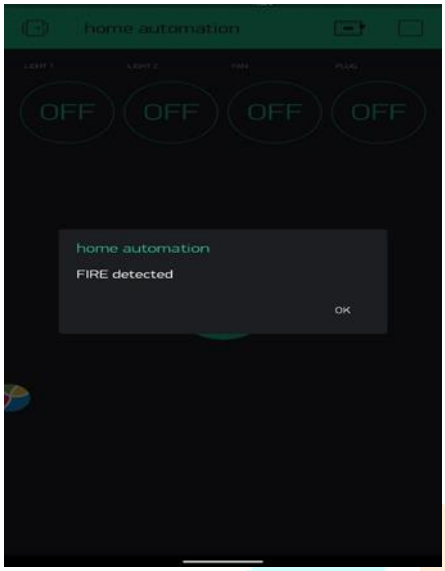

Figure 5: Fire detection alert notification

4. CONCLUSION

With the help of the design control unit, home appliance can be converted into a smart and intelligent device using IoT. The working of the proposed model was experimentally shown with help of connecting the two bulbs, a dc fan and an output power socket. Proposed system has two advantages. First, using the IoT connectivity, we can monitor and access our smart home easily from anywhere, which will definitely will prove to be energy efficient. Secondly, it act has a helping hand for the old age and differently abled person. For future work we would like to add up more controlling units that can make our smart home more intelligent that can be practically deployed in the real time situation.

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