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Smart Remote Controlling System of Home Appliances

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Abstract
The device's control features combine cloud-based and wireless home automation technologies. This prototype, which cost less than $30,000 to build, does away with the need to pay for SMS service or to manage the server and database architecture because all that is required is an internet connection and a Cloud-service. The security for granting the approved access to users looking to manage and operate their home appliances remotely is ensured. This might persuade users to install the system in their homes and places of business. The cloud service used in the develop-ment of this system is the Google Firebase, which acts as an web server for storing and processing the data sent by the user through their mobile phone. In-order to automatically obtain data from the Firebase real-time database and give the control signals required for tripping the load and the NodeMCU board connects to the wireless system and subsequently to that of the internet.

Keywords: IoT, NodeMCU, WiFi management, and Cloud Firebase

I. INTRODUCTION

A system known as the internet of things (IOT) is frequently connected to electrical equipment and mechanical machinery with unique identifiers (UIDs) and is capable of passing data over the network without requiring any kind of communication, whether it be between humans or machines. It can be claimed that there is no IOT in this cosmos if there is no internet. In order for other internet-connected computer devices to access the data from the cloud server, IOT exchanges the data with the cloud server. Anything may be modified, from tiny medications to enormous structures, thanks to the Internet of Things. It has sensors, some of which are wired and some of which are wireless.

IOT devices frequently communicate with one another and act on information they gather from one another. A large portion of research is carried out by machines, such as those used to set up, instruct, or retrieve data, without the involvement of humans.

The goal of this Internet of Things project is to create intelligent wireless home automation that tracks, gauges, and manages electricity consumption. The Internet of Things (IoT) has breakneck advancements in wireless technology. The paper proposes a application for the Internet of Things used for controlling and monitoring heterogeneous home appliances through a cloud and mobile app. The primary objective of our proposed work is to design and implement an energy-saving and efficient model to control our appliances remotely having a handy and user-friendly mobile application.

II. RELATED WORK

Utilising a smartphone to control the home automation is a very effective way to reduce the electricity use. Depending on the motion and timer, the user can programme the chandelier to function manually or that of the automatic. One of the most outstanding inventions was the automated fan and light controller for the room. When someone enters the room, it will automatically turn on, and when they leave, it will turn off. A further innovation is the mode-based setting of light intensity. For instance, if a user wants to study, he or she can select study mode, which will enhance the lamp's light output. Another invention used the same application on light intensity, but the distinction is that depending on the number of people in the room, the light level is automatically adjusted. In addition, there are numerous ways to establish an A/C-specific energy-saving technology. To balance the temperature and make the environment comfortable, an artificial neural network is deployed. The system was able to cut energy consumption as a result of the analysis. Presently, the IoT's accessibility aids in invention. For instance, the power usage for the air conditioning system has been built to be controlled based on the ambient temperature and the humidity. the installation of an IR and WiFi-connected energy control and monitoring system However, the method contains restrictions regarding communication to the user. In this study, we suggested to create a system for updating electrical equipment that may track the permitted power usage and notify the user via a mobile device notification. The user might then turn the device off using the system.

III. PROPOSED WORK

IoT based Remote Monitoring and Controlling of electrical appliances aims to overcome all the shortcomings of these existing systems. This system uses the wifi module of the nodeMCU to connect to the internet to fetch and upload the status of the connected devices to the firebase cloud.

The advantage of choosing the system over comparable types of existing system is that the users can receive alerts and the status updates sent by the wifi, microcontroller-managed system on his phone from any location, regardless of whether his mobile phone is connected to the internet or not. The nodeMCU ESP8266 microcontroller, which includes an embedded, is the one utilised in present prototype. The smartphone's ability to connect and communicate with other devices is a further importantfeature.

Figure 1: Monitoring and controlling electrical appliances through a mobile app

IV. METHODOLOGY

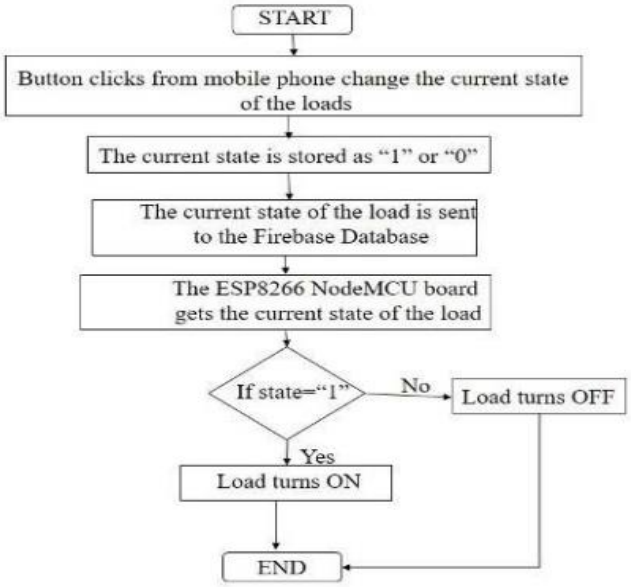


Figure 2: Flow diagram

The proposed system consists of following components:

1. Interface the Relay module with the nodeMCU
2. Firebase Realtime Database
3. Mobile application

The first step is to interface a relay module to NodeMCU **ESP8266**. Then you can control your appliances with the NodeMCU wirelessly. It is done by powering the nodeMCU and then connecting the relay module GND to GND. Lastly, the relay module signal to the NodeMCU D1.

The second step is to setting up the Firebase Realtime Database. The cloud-hosted Firebase Realtime Database is an Android-compatible database. Any changes to the data are immediately reflected by executing a sync across all platforms and devices because the data is saved in JSON format. As a result, we can easily and quickly create real-time applications that are more versatile. The Android app has to include the Firebase Realtime Database.

Last but not least, a completely functional Android app for this system was created using the MIT app creator. It is a blocks-based programming tool that enables anyone, even non-programmers, to begin programming and create completely working programmes for Android gadgets.

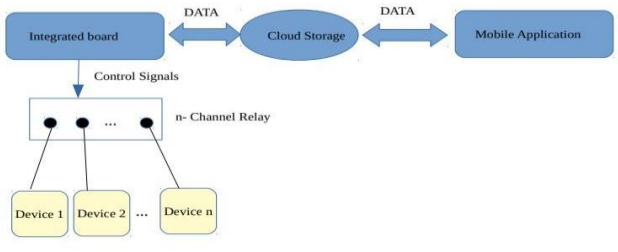


Fig. Block Diagram

The nodeMCU can be pre-programmed to store and fetch the ON/OFF status of devices from the firebase cloud storage. The Status data of the devices are updated in realtime in firebase cloud storage and the same is reached to the mobile app, Using which the users can remotely monitor and control the connected devices. The changes made to status of the devices are reflecting in the firebase realtime database and this data is fetched by the nodemcu. The relay operates based on the nodemcu control signals to change the state of the device.

4.1 Functionality

Integrated board

Input: Status of each electrical device to be set on/off from the cloud.

Output: Control signals to relay channels via nodeMCU. If a device is to be set ON, a low voltage is sent to the relay channel as the relay is a low enabled device. And a high voltage is sent to the relay to set the device OFF. Uploads default set values of each device to the cloud at the initial setup.

Functions of the integrated board:

- Connect devices to the board.
- Facilitate transfer and bring set status into effect.
- Connectivity to cloud for data transfer.
- It provides secured internet connectivity.
- Data encryption

Cloud Storage:

Input: Device status, set commands, user credentials from NodeMCU board, and mobile application, from authorized users only.

Output: Device status and set commands to the integrated board. Sends results to the mobile application.

Functions of the cloud storage:

- Provides interactivity between the boards and the applications via cloud database and APIs.
- Server sided data encryption and hashing.
- Administration of flow of data and control.
- User access management
- Stores voltage status of the devices.

Mobile Application

Input: User input for login (only authorized users). The command from the user to set the device on or off.

Output: Display the status of each device. Red-colored room button if all devices are powered off otherwise green in color.

Functions of the mobile application:

- It provides interactivity with the end-user.
- Monitor and control the devices of each room.
- Provides user login portal.
- Authentication check for *Forgot Password*

Relay

Input: Control signals from the nodeMCU board as follow:

The low input signal to power on the attached device.

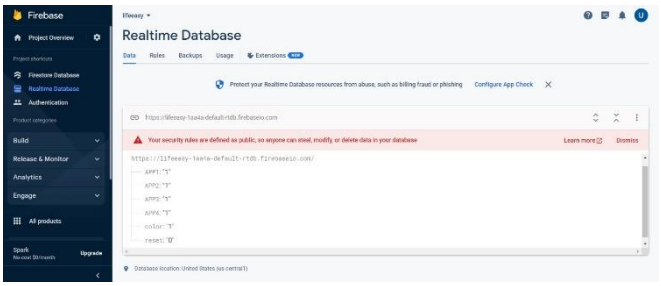
The high input signal to power off the attached device.

Output: Device is powered on/off for low/high voltage signal respectively as it is a low enabled device.

Functions of the relay:

To control 230V operable electrical devices using the controlling signals from the nodeMCU board.

V. EVALUATION



The states of electric loads (household appliances) are stored in the Google Firebase Database. The NodeMCU is connected to the loads via a relay, and this assembly is connected to the internet via a Wi-Fi network setup by utilising the built-in ESP8266 Wi-Fi module's Wi-Fi capabilities. The NodeMCU board is set up to GET the status of electrical loads from the Google Firebase Database automatically. The Web Application is designed to modify a load's status whenever a user hits a button associated with that load. The Google Firebase Database automatically provides the NodeMCU board with the status of the loads at any given time. The physical loads linked to the NodeMCU board can be switched on and off using this control signal.

VI. CONCLUSION

In this study, a user-enabled load manager for remote control of home appliances was built. The devices control functionality combines wireless and cloud based home automation systems. This prototype was built for less than $5,000 and eliminates the need for recurring SMS service costs or server and database infrastructure management because only an internet connection and a Cloud service are needed for these tasks. This might entice more customers to install this system in their residences and workplaces. Google Firebase is the cloud platform used in the construction of this system for which it provides a web server for storing and processing the user's mobile phone-sent data. In order to automatically obtain data from the Firebase real-time database and give the control signals required for toggling the load, the NodeMCU board connects to a wireless system and afterwards to the internet via a web browser.

This system might be useful in a variety of circumstances:

• While at work, school, or elsewhere in the globe, residents of a particular residence allow their occupants to check on and modify the status of their loads.

• In companies, it can be enhanced to manage other industrial operations centrally and remotely operate nuclear power plants in addition to controlling loads.

REFERENCE

1. The Office Of Chief Statistician Malaysia Department Of Statistics, "Department of Statistics Malaysia Press Release Population Projection (Revised), Malaysia , 2010-2040," 2016.
2. M. S. Ahmed, A. Mohamed, R. Z. Homod, H. Shareef, and K. Khalid, "The Awareness on the energy management in the residential buildings: A case study on the Kajang and Putrajaya," J. Eng. Sci. Technol., vol. 12, no. 5, pp. 1280–1294, 2017.
3. B. Ghazal, M. Kherfan, K. Chahine, and K. Elkhatib, "The Multi control chandelier operations using Xbee for home automation," in 2015 Third International Conference on Technological Advances in Electrical, Electronics and Computer Engineering (TAEECE), 2015, pp. 107–111, doi: 10.1109/TAEECE.2015.7113609.
4. P. Roy, J. Saha, N. Dutta, and S. Chandra, "The Microcontroller based on Automated Room Light and the Fan Controller," in 2018 Emerging Trends in Electronic Devices and Computational Techniques (EDCT), 2018, pp. 1–4.
5. N. Afiqah, B. Mohd, and N. M. Thamrin, "The Development of Automated Microcontroller-Based on Lighting Control System For the Indoor Room Implementation," in Proceedings of 2018, 4th International Conference on Electrical, Electronics and System Engineering, 2018, pp. 1–5.
6. R. M. Al-khatib and K. M. . Nahar, "EPSSR : Energy Preserving System for Smart Rooms," in IT-DREPS Conference, Amman, Jordan, 2017, pp. 1–6.
7. S. S. Refaat, H. Abu-Rub, and A. Mohamed, "Smart and Energy Efficient Air-Conditioning System," in 2017 19th European Conference on Power Electronics and Applications, 2017, pp. 4–9.