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AN ORGANIZED STUDY OF SMART HOME AUTOMATION SYSTEMS

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ABSTRACT

In this age of digitization and automation, the usage of the internet has invaded every part of our lives. It provides a space for wirelessly connected, programmable devices via a network infrastructure, or "internet of things" (IoT). An IoT-based smart home is proposed in this study. The smart house can be controlled manually or automatically thanks to the technology. The relay mode and the mode selector, which can be used to choose the mode, are the two main components of the proposed system. Hardware implementation can be used to test the proposed system effectively. It may be automatically controlled with a virtual switch through an Android app. When the manual mode is selected, the automated mode is turned off, and vice versa.

Keywords: Smart Home; IoT; Internet of Things; Automatic.

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INTRODUCTION

Automated processes have replaced manual ones as a result of automation and digitization. The use of the internet has been effortlessly incorporated into contemporary life [1, 2, 30]. A location for

connected [3] objects that may be wirelessly controlled by a network architecture known as the internet of things (IoT) [4,5] is provided by the internet. The idea of the internet of things (IoT) has received more attention recently [6,7]. The internet of things (IoT) system's physical components includes sensors and microcontrollers, which send data to a server [31]. With the internet of things (IoT), it is possible to create a smart home that can link to and include mobile devices and home appliances [8, 11]. For smart houses, there are several well-established types. It [9] used the ZigBee protocol to monitor temperature because it consumes a lot less electricity. They use Bluetooth and REST-based web services as an interoperable layer. [12] This method provides connectivity without requiring an internet connection via Bluetooth or the internet. Young-Guk Ha [13] implements a ZigBee-based intelligent automation system. One objective of this system is security. Kiran and Stankovic [14] looked at the need for smart nursing home sensors to enable quicker diagnosis and treatment. Noguchi et al. described the results of the accumulating sensor data in detail. [15] and applied to predict how others will behave. Lakshmi and Brundha [10] utilize the home automation system to boost security by taking a photo of anyone entering the house. The research of Vikram et al.[16] aims to develop low-cost smart homes. Sangeetha and Soundhari [17] developed a voice-activated Android app for controlling home appliances. Chiao et al. [18] build a Bluetooth-based mobile sensor that can be controlled by an app on an Android Smartphone. Yang et al. proposed a home automation design that would promote the use of home automation and digital control [19]. There are currently Bluetooth-based automation solutions, however they are not adaptable enough. Only limited distances can be covered via Bluetooth [20, 21]. Solutions based on ZigBee are also limited to indoor use and have comparable distance problems. Utilizing an internet of things (IoT) Wi-Fi system for a smart home may have benefits such as real-time connectivity without regard to location [22-25], cost, and utility [26]. However, it should be noted that not all customers truly have an integrated internet router in their home. Smart homes frequently solely offer and promote options for remote automatic switching. There are physical switches as well, such as the hotel swap switch and automatic remote controllers. However, this strategy presents a confusing switching function when determining the ON/OFF switch conditions. This can be avoided by mounting a sensor to detect changes in condition on the physical switch, albeit doing so will increase the system's manufacturing cost. This study proposes a dual mode that combines manual and automatic switching systems approaches, using a third-party smart phone app named Blynk. The system makes advantage of both the NO (Normally Open) and NC (Normally Closed) functions of the relay. In addition to one relay in place of a mode, relays are numbered based on the amount of electronic equipment that has to be managed. The modes are divided into manual and automatic groups. A switch within the home can be flipped to manually run the device. On the other hand, the Blynk application has buttons and timers that may be used to operate the system automatically. The key difference between the two systems is the existence of a third relay that controls the dual-mode capability, enabling the system to operate both online and offline with no sensors. Each mode can take the place of the others as needed [32].

MATERIAL AND METHOD

The Interface of the Home Automation System Components

1. **System Overview**: The cross system, the high voltage, and the low voltage are the three main parts of the system. A relay connects the high voltage with low voltage. The relay is controlled by a Node MCU microcontroller. The Node MCU serves as the system's mastermind. It handles relay control, information synchronization, and communication with Blynk.
2. **High Voltage Section**: Components that can withstand high voltage make up the high voltage part (220 volts AC). Two of the relays are relay mode and relay control. To switch between automatic and manual modes, use the first one. However, the second one is utilized for automatic control. There are two groups in the high voltage section: manual mode conditions and automatic mode conditions. The first condition (default) occurs when the system is in manual mode. This situation makes manual switching using a mechanical

Switch possible. In this mode, all application switching will be disabled. Additionally, switching can be done automatically with a timer that is set in the Blynk program and occurs when the switch is in the automated mode. The manual switch is not functional in this situation.

3. **Low Voltage Part**: The low voltage component is essential since it regulates the entire system. This system is under the control of the Node MCU. This microcontroller executes commands from the Blynk application when the relay is set to automated mode. The mode that will be used in this section is controlled by a single physical switch (the mode switch). When there is no internet connection or you cannot access an application, this switch can be helpful. The MCU and the Blynk application will synchronize at predefined times. Sync will start if an internet network is reachable. The virtual switch conditions for the Blynk application and the currently selected mode are synced when in automated mode.

4. **Node MCU:** An ESP8266-equipped microcontroller board is called the Node MCU. Because it features a microcontroller with built-in Wi-Fi, it does not require additional Wi-Fi gadgets. The Node MCU uses the normal programming syntax for Lua firmware. To make programming easier, the Node MCU board library can be utilized with the Arduino IDE application [27, 28]. Numerous businesses are presently manufacturing ESP8266 to support internet of things (IoT) projects. The Node MCU is a board with many different pinout possibilities that is easy to use. Additionally, the Node MCU has a USB port, which makes it simple to connect it to a computer. [Figure: 1]

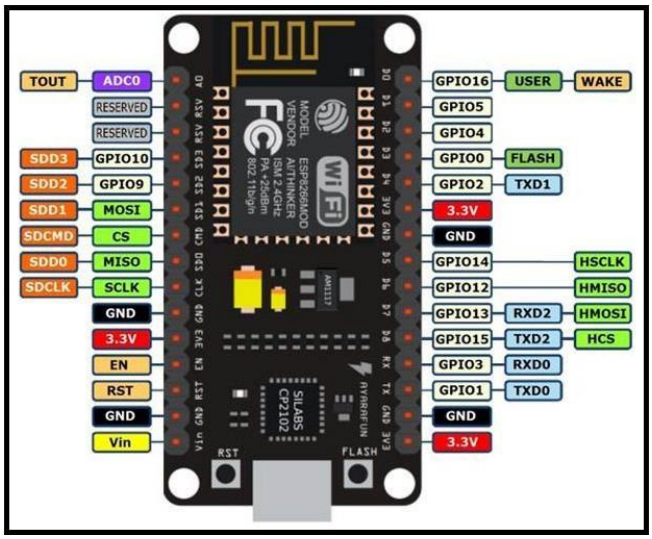

Figure 1: Node MCU ESP8266

5. **Blynk Apps:** Real-time remote control of electronic gadgets is made possible by the internet of things (IoT) Blynk platform via a Smartphone app. Utilizing the dashboard provided by Blynk, users can create a graphical user interface using widgets from the program [29]. To use Blynk, you must first install the library on the Arduino IDE and create an account in the Blynk app. Once you've created an account there, you can contribute new research to create a Blynk interface. The study will produce an authentication token that will be emailed to you. This unique code will be used when programming the Node MCU through the Arduino IDE. The Blynk application has a timer function and a virtual switch that may be used in automatic mode to turn on the relay. The user of this software can set the mode if desired and check the mode's state using a virtual switch. [Figure:2]

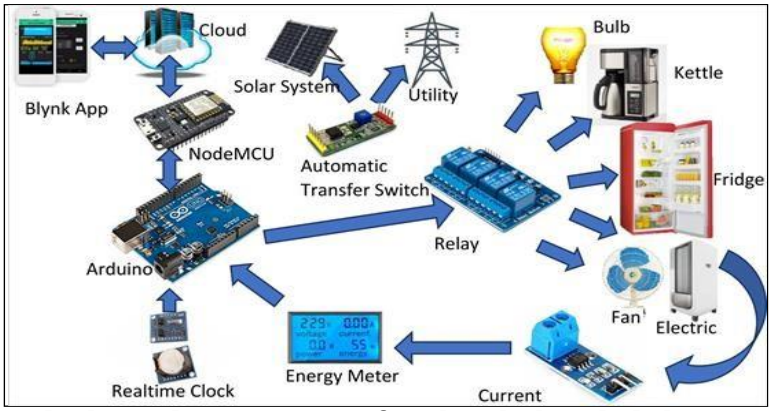

Figure 2: How the Blynk Application is interfaced with the whole home automation system

RESULT

The Application Process for the Home Automation System

Five relays are used in the implementation: four are used for control, and one is used as a relay mode. In order to control the switching of four lights, the implementation is done at the school. Implementation results in lights that may be manually turned on or off using a physical switch to show the system's status. The virtual mode switch is set to manual in the Blynk application. Through the Blynk program, the light output can be managed in automatic mode. The physical switch has no impact on the lamp's condition in this stage. The virtual mode switch is automatic in the Blynk program.

CONCLUSION

The fundamental component of the suggested system is the relay mode, which can be adjusted to select the mode. The real switch must be pressed to turn on the light in manual mode; the application's virtual switch has no impact. With the help of the provided timer and a virtual switch in the software while in automatic mode, the lights can be controlled automatically. When the switch is in automated mode, it does nothing. The lamp's condition always follows the virtual or actual switch in the relay mode, and the system always synchronizes at each interval.

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