An IoT Based Smart Home Automation Using Google Assistant

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ABSTRACT

Home automation systems have become an essential component of contemporary homes as a result of the quick spread of smart gadgets and the rising popularity of voice-controlled assistants. This study proposes a comprehensive home automation system that integrates Google Assistant with the goal of improving the ease and efficacy of everyday household tasks. The technology allows users to operate a variety of smart appliances and gadgets using voice commands using the numerous device interoperability and natural language processing capabilities of Google Assistant. In this paper, the Home Automation System's design, implementation, and assessment are covered, along with some of its advantages, features, and practical uses. The results show whether the system works in the context of home automation to improve comfort, energy efficiency, and all-around user experience.

Index Term: Home automation, IFTTT, IoT

INTRODUCTION

The advent of smart home technology has completely changed how we communicate with our living areas. As more products become internet-connected and speech-controlled virtual assistants like Google Assistant gain popularity, homeowners can now take advantage of the ease of managing their homes with straightforward voice commands. Home automation systems offer homeowners a convenient way to manage their living spaces, providing benefits such as enhanced security, energy efficiency, and improved quality of life. Voice-controlled assistants, like Google Assistant, have emerged as a dominant interface for interacting with these systems due to their natural language processing capabilities and ease of use. This paper focuses on the implementation of a Home Automation System using Google Assistant, the IFTTT (If This, Then That) application, the Blynk application, and the Node MCU microcontroller board.

The proposed system seeks to give consumers an easy-to-use interface for controlling different smart appliances and appliances in their homes. Users may monitor and operate their home automation system with straightforward voice commands by utilizing Google Assistant's natural language processing and speech recognition capabilities. IFTTT serves as a link between Google Assistant and other smart devices or services, enabling automatic interactions and building tailored scenarios depending on certain triggers and actions.

Additionally, the system is more adaptable and expandable thanks to the combination of the Blynk application and the Node MCU microcontroller board. The Node MCU acts as a potent and adaptable hardware platform for interacting with various sensors and actuators, while Blynk offers a user-friendly mobile app interface for managing and monitoring linked devices.

The integration of Google Assistant, IFTTT, Blynk, and the Node MCU is the main topic of this paper's discussion of the design and execution of the home automation system.

We examine the architectural elements, communication protocols, and interaction pattern between these elements. In order to show how the system may improve house management, energy efficiency, and user experience generally, we also showcase a number of real-world use examples. We use centralized controller,

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linked smart gadgets, and the Google Assistant platform make up the Home Automation System. Google Assistant accepts voice instructions from users and analyses and interprets them using cutting-edge natural language understanding algorithms. The system then converts these instructions into the necessary operations to manage the attached devices. For instance, users may simply say, "Hey Google, turn off the living room lights," and the system will send the command to the proper light switches, instantaneously shutting them off. We tried to offer a versatile and extendable platform for managing smart homes by fusing voice control, automation, mobile app interfaces, and hardware capabilities.

RELATED RESEARCH

Systems for home automation have made significant improvements in recent years, offering homeowners more control, convenience, and energy efficiency. Voice-controlled assistants and home automation systems have been the subject of several research examining various elements. Researchers have focused on various topics, including device interoperability, user interfaces, energy management, and personalized automation.

For instance, Gupta et al. [1] developed a system that used Google Assistant to manage smart appliances and gadgets, showcasing how voice commands may be used to streamline home management activities. In a similar vein, Abderamane et al. (2019) [2] created a home automation system with Google Assistant incorporated, highlighting the value of voice control in boosting user experience and increasing accessibility. They built a framework that linked Google Assistant with IFTTT in order to construct customized automation scenarios. Their work showed that it is possible to develop automated processes that are based on certain triggers, such as user preferences or environmental circumstances.

In another study Amazon Alexa was suggested as the virtual assistant in Vighnesh et al.'s (2022) [3] proposal for a voice-controlled home automation system. With their technology, customers may use voice commands to operate lights, appliances, and security equipment. Their approach, however, focuses on integrating Google Assistant as the main control hub and taking use of its vast ecosystem and user base.

Following an alternate study, Jaihar et al. [4] created a context-aware home automation system that made use of machine learning methods to forecast human preferences and modify smart devices accordingly. While the focus of this research was individualized automation, the emphasis in our system is on voice commands' simplicity and use. Additionally, Hewitt et al. [5] looked at how to combine several voice-controlled assistants, such as Google Assistant, Amazon Alexa, and Apple Siri, on a single platform for home automation. The problem of platform fragmentation was the focus of their research. Their study makes use of Google Assistant's potent natural language processing and connectivity with a variety of smart devices, focusing primarily on its capabilities and integration.

The advent of IoT-based home automation systems has increased the popularity of the Node MCU microcontroller board, which is based on the ESP8266 Wi-Fi module. Researchers have interfaced sensors and actuators with the Node MCU board to enable communication with smart devices. As an illustration, Singh et al. [6] suggested a home automation system that made use of the Node MCU board to regulate the temperature, lights, and security equipment. Their study demonstrated the Node MCU's adaptability and agility in interacting with a range of components in a smart home context.

An intuitive mobile app interface is offered by the Blynk application for managing and keeping an eye on linked devices. To improve user experience and control flexibility, Blynk integration in home automation systems has been studied. Suesaowaluk et al. [7] for instance, created a platform for home automation that combines Blynk with Google Assistant to give consumers seamless management over their smart homes using voice commands and a mobile app interface. Their study emphasized how crucial it is to have several control interfaces for improved usability.

In summary, existing research showcases the effectiveness of these technologies in enabling voice control, automation, mobile app interfaces, and hardware integration and review highlights the growing interest in home automation systems that integrate Google Assistant, the IFTTT application, the Blynk application, and the Node MCU microcontroller board.

METHODOLOGY

The primary parts of our proposed system are the Google Assistant, IFTTT, Blynk, and the Node MCU microcontroller, as well as a relay board with 4–8 relays and a ULN 2803 IC. Natural language voice commands may be given to the Google Assistant [11]. Since every component of this system is WiFi-connected and online, it is considered part of the Internet of Things (IoT) [12]. In addition to having GPIO (General-purpose input/output) pins for connecting external components, the Raspberry Pi provides all the features of a minicomputer. The GPIO registers of the Raspberry Pi are used for output. The Raspberry Pi's GPIO pins may be easily connected to our power strip. Raspberry Pi's input/output ports are linked to a power strip, and it gets data on the status of the connected home appliances. Any phone connected to a network and running the Android operating system can use an application to access the status of the home appliances. It shows how an automation system was designed and put into action so that home appliances may be remotely monitored and managed using an Android smartphone or tablet.

- **Equipment's used in the system**

The Node MCU microcontroller, an open source IoT platform, was used for this work. It includes hardware that depends on the ESP-12 module as well as firmware that runs on Espressif Systems' ESP8266 Wi-Fi SoC (System on a Chip). The term "Node MCU" naturally refers to the firmware rather than the improvement units. The scripting language Lua is used by the firmware. It is built on the Espressif Non-OS SDK for ESP8266 and is dependent on the eLua venture.

The hand-off module is an electrically operated switch that enables you to turn off a circuit using voltage or potentially more current than a microcontroller could handle.

Adding stickiness and temperature information to your do-it-yourself hardware projects is really simple with the DHT11 moistness and temperature sensor. It is perfect for remote weather stations, indoor environmental controls, and homestead or garden monitoring systems.

- **System Design**

When the MCU transmits a begin flag, the DHT11 switches from low control utilization to running mode while it waits for the MCU to complete the begin flag (see Fig. 1). When it is done, DHT11 transmits a reaction flag with 40 bits of data to the MCU that includes information on temperature and relative mugginess. Customers can read and acquire some information. DHT11 won't provide the reaction flag to MCU (in Fig. 2) if it doesn't get the begin motion from MCU. After gathering data, DHT11 will switch to a low-control use mode until it receives a start signal from MCU once more (see Fig. 3).

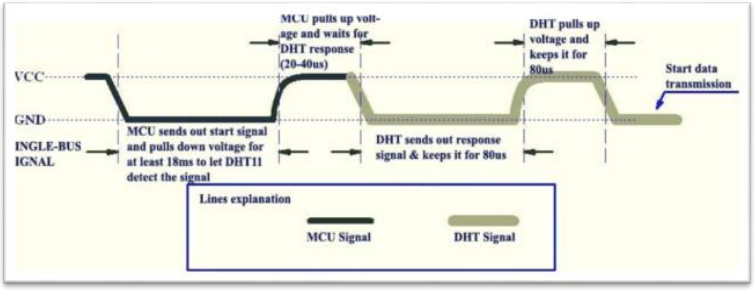

Fig 1: MCU Sends out Start Signal & DHT Responses

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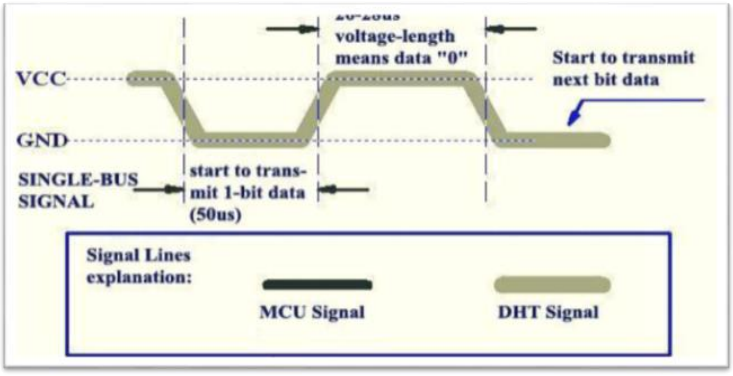

Fig 2: Data "0" Indication

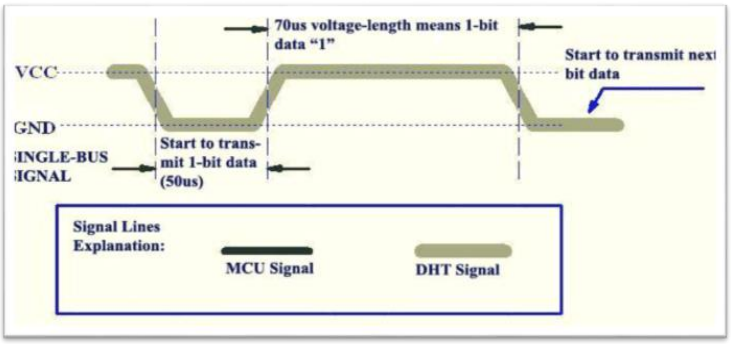

Fig 3: Data "1" Indication

- **Simulation**

1. Components Requirement:

- ESP8266
- 4 channel 5v relay
- 220v Fan
- LED
- Breadboard
- USB Cable
- Connecting Wires
- Android Phone with Blynk App

2. Circuit Diagram:

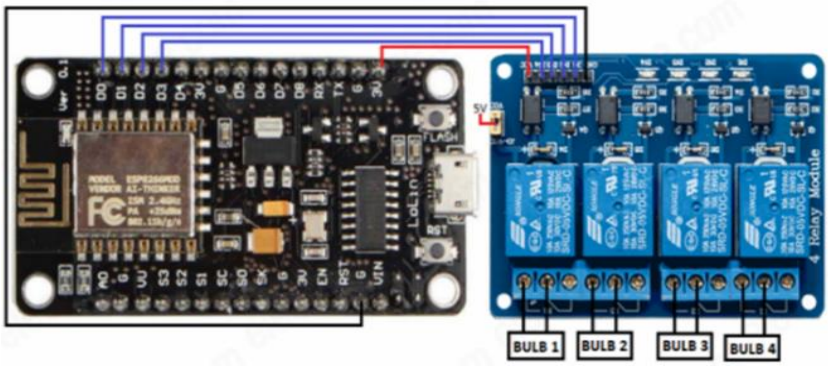

Fig 4: Home Automation using ESP8266, Blynk App Circuit Diagram.

Our system is shown in Fig 4. The connection with NodeMCU to 4- Channel Relay Board is following:

- Connect D0 pin of NodeMCU to D1 pin of 4- Channel Relay board.

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- Connect D1 pin of NodeMCU to D2 pin of 4- Channel Relay board.
- Connect D2 pin of NodeMCU to D3 pin of 4- Channel Relay board.
- Connect D3 pin of NodeMCU to D4 pin of 4- Channel Relay board.
- Connect 3.3V of NodeMCU to Vcc pin of 4- Channel Relay board.

Connect GND pin of NodeMCU to GND pin of 4- Channel Relay board.

To ensure user account security two-factor (2FA) authentication is used. Users must submit two distinct authentication factors as part of a security procedure called two-factor authentication (2FA) before they may access a system or an account by sending a one-time password OTP to the user's mobile number

EXPERIMENTAL RESULT

It can be run by the blynk app and with the voice control of Google assistant at the same time. Here we show some of our practical appliance of this project. We first run the Blynk app and connect Node MCU with this app in Fig-5. When we command the Blynk app to on the switch in fig-6 the light finally gets on in Fig 7. The same command could be run with google assistant and it presents in Fig 8 and Fig 9. Now we can switch on the light and fan same time using both app (in Fig 10) and google assistant (in Fig 11), and the light and fan are turned on at the same time in Fig 12. We can now turn the light and fan off using google assistant (in Fig 13 and Fig 14). Home automation system helps us to manage hassle- free home management as it offers to operate the system from any places of world. As a result power consumption and unwanted accidents can be reduced.

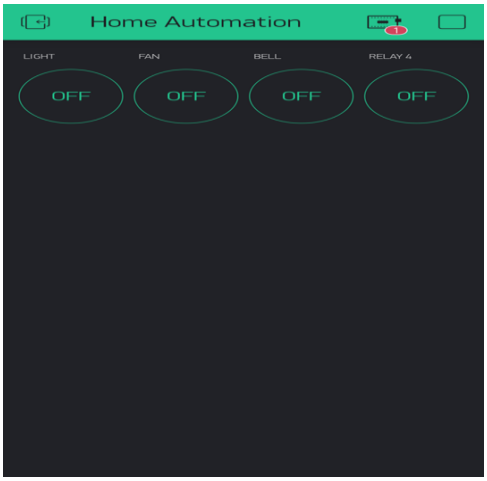

Fig 5: Run the blynk app for the project Home Automation

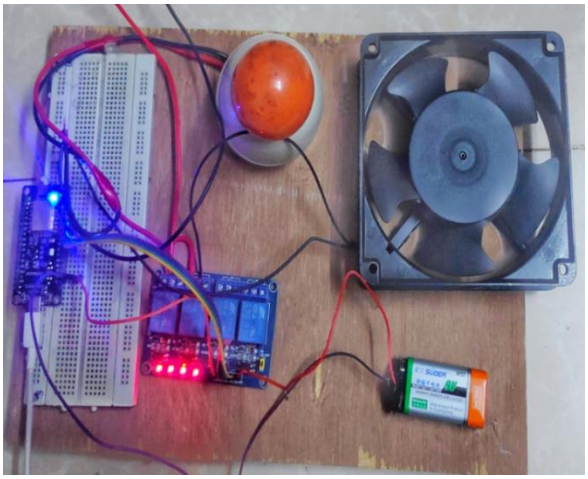

Fig 6: The device Node MCU get the connection with Blynk app

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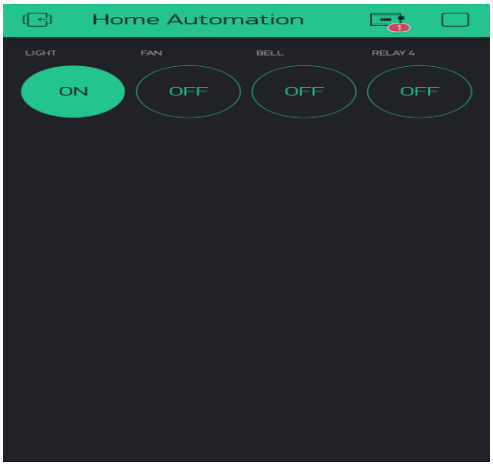

Fig 7: The light switched by the app

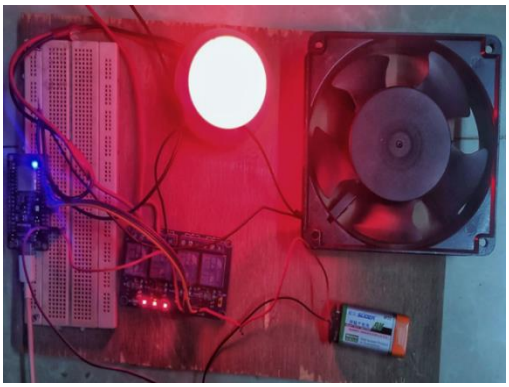

Fig 8: After switching the Light in app it become on.

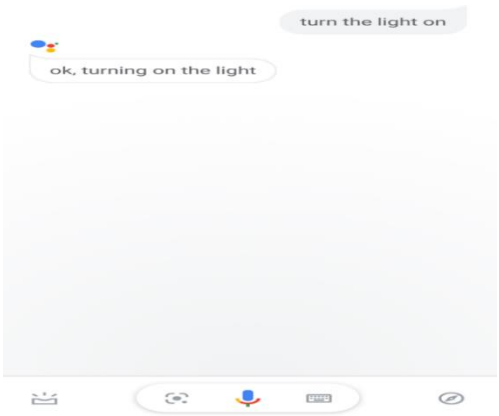

Fig 9: Turning on light with Google Assistant

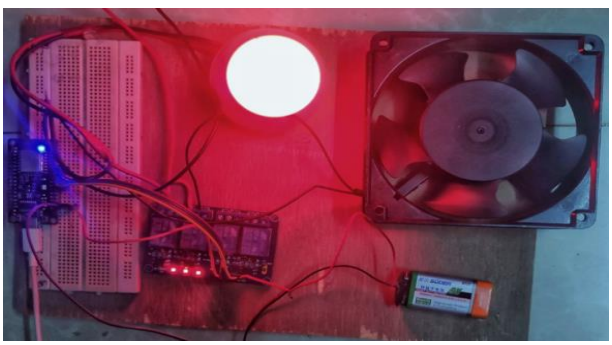

Fig 10: The light switched by the Google Assistant

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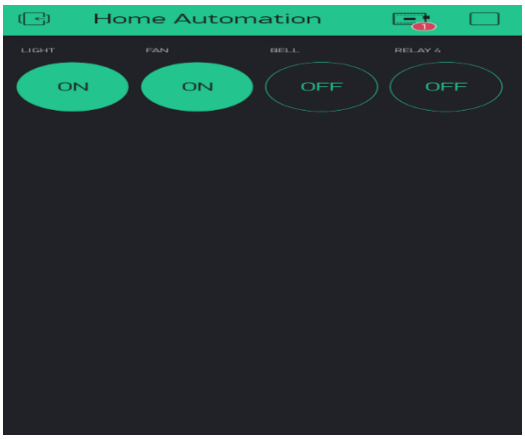

Fig 11: Switch on the light and fan by app

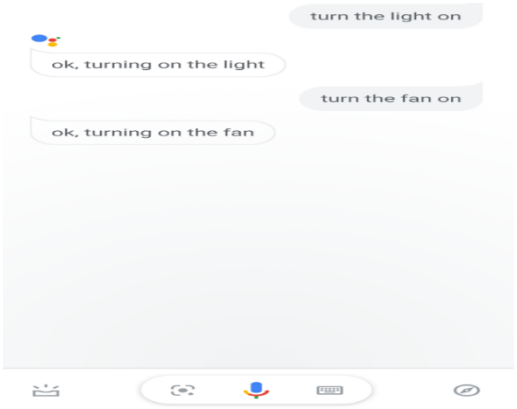

Fig 12: Switching the light and fan by Google assistant

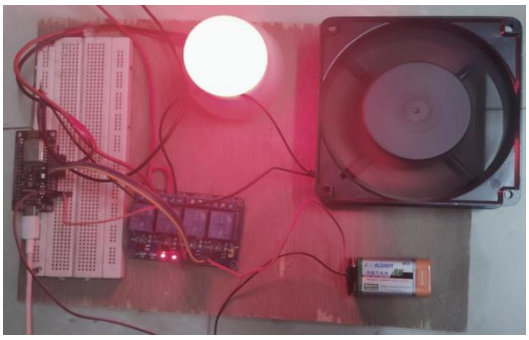

Fig 13: Light and Fan turned on

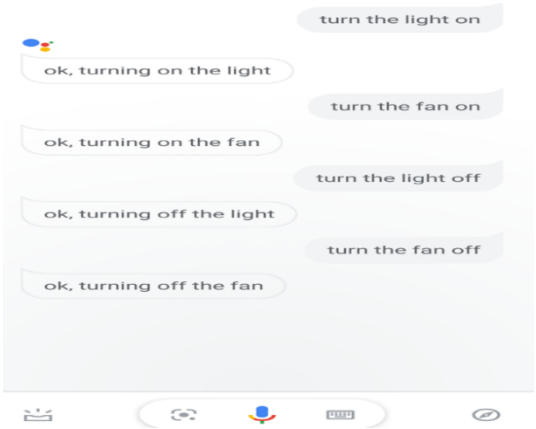

Fig 14: Turn the light and fan off by Google assistant

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CONCLUTION AND FUTURE SCOPE

Smart home automation project allows a wireless communications among various sensors, android devices and applications hence this system offers interoperability, remote access, expandability, upgradability, security as well as provides comfort to users. In future we will focus to minimize the human oriented errors and work on it. Innovative methods of interacting with smart home equipment could result from integration with technologies like augmented reality (AR) and virtual reality (VR), giving users engrossing control and monitoring experiences, which we want to introduce in our future work. Examining how Google Assistant and IoT home automation can improve eldercare, emergency response systems, and health monitoring could change the way we look after our loved ones.

REFERENCES

1. Gupta, Manish Prakash. “Google assistant controlled home automation.” International Research Journal of Engineering and Technology 5.5 (2018).
2. Abderamane, Amadou, et al. Home Automation with Google Assistant. Diss. Department of Technical and Vocational Education (TVE), Islamic University of Technology, Gazipur, Bangladesh, 2019.
3. Vighnesh, M., et al. “Voice controlled home automation, security system and virtual joystick-controlled robot for patients in home quarantines.” Journal of Physics: Conference Series. Vol. 2318. No. 1. IOP Publishing, 2022.
4. Jaihar, John, et al. “Smart home automation using machine learning algorithms.” 2020 International Conference for Emerging Technology (INCET). IEEE, 2020.
5. Hewitt, Mary, and Hamish Cunningham. “Taxonomic Classification of IoT Smart Home Voice Control.” arXiv preprint arXiv:2210.15656 (2022).
6. Singh, Harsh Kumar, et al. “A step towards Home Automation using IOT.” 2019 Twelfth International Conference on Contemporary Computing (IC3). IEEE, 2019.
7. Suesaowaluk, Poonphon. “Home automation system based mobile application.” 2020 2nd World Symposium on Artificial Intelligence (WSAI). IEEE, 2020.
8. https://en.wikipedia.org/wiki/Home_automation | Home automation | 28th May, 2019
9. https://www.techopedia.com/definition/29999/home-automation-system | Home Automation System | 28th May, 2019
10. https://www.elprocus.com/home-automation-systems-applications/ | Home Automation Systems and Applications – Structure, Types | 28th May, 2019
11. https://en.wikipedia.org/wiki/NodeMCU | Node MCU | 29th May, 2019
12. https://www.instructables.com/id/Programming-ESP8266-ESP-12E-NodeMCU-Using-Arduino-/ | PROGRAMMING ESP8266 ESP-12E NODEMCU USING ARDUINO IDE – A TUTORIAL| 30th May, 2019