Smart Home Automation Based On Bluetooth with IR Receiver

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Abstract— The safety and happiness of life at home are ensured by the current home automation system. As a result, the adoption of home automation technologies is growing in popularity, and as the saying goes, as technology advances, so do homes. Energy conservation is therefore more crucial than ever due to increased energy usage and population. The inability to handle equipment from remote locations is one of the major reasons of energy waste. Thus, by creating the Arduino UNO, the ATMEL has been able to advance Arduino in recent years. Here, we present a really intriguing concept: utilizing an Android application and Bluetooth, users may operate home appliances from distant locations. The basic goal is to build a Bluetooth-enabled, Arduino-powered home automation system that can be operated remotely by any Android smartphone. Therefore, we create an Arduino-based Bluetooth module that includes an IR receiver, a relay module, a Bluetooth module, and manual control switches to control home appliances. Through the Bluetooth module, the Arduino receives data from the smartphone. In order to operate the home appliances, the Arduino will then send a signal to the relay module. Both the manual switches and the IR remote control can be used to control the devices and turn on and off household appliances. This module is simple to use and makes it simple to utilize your home appliances.

Keywords— Android app, smartphone, Bluetooth module, IR receiver, 4 channel relay module, and Arduino.

I. INTRODUCTION

The world is experiencing technological advancement in all spheres, making it feasible to upgrade and create a "smart home," Through the home automation system, lights, fans, switches, and refrigerators are all controlled by Bluetooth-based remotes powered by Arduino. Therefore, it makes life easy. The construction of an Arduino-based home automation system capable of remotely or automatically controlling a variety of devices is the subject of this project. To operate home appliances via Bluetooth, IR remotes, and manual switches, we build home automation systems. Your home's technological equipment are automatically controlled through home automation. You can control these devices remotely because they are Bluetooth-connected. Devices can be set up to operate one another automatically through home automation, eliminating the need for manual control through an app.You can balance and alter your home's electricity needs with the help of your smart system. Global System for Mobile Communication and ARM-based technology were used in the development of the current home automation system. Using a basic GSM-based phone and an SMS, you may manage your home appliances. Wi-Fi functionality is absent from ARM-based architecture. This research intends to investigate if it is feasible to use GSM technology to create SMS-based home appliance control without attempting to connect to other local networks.

II. RELATED WORK

First, automation is becoming more and more prevalent. People have less time to complete tasks, thus automation is a quick approach to make any machine or item perform as we want it to. We are aware that everything is becoming automated and that the world is changing quickly. An Arduino-based home automation system was built in this instance. The Bluetooth module, which collects user data, is linked to Arduino. The action is performed by relay, which is likewise connected to Arduino and gets data from it. Here, a Bluetooth module of the HC-05 model is used, which is widely used in several fields. Through this Bluetooth module, a mobile application can control the system. Because it can remotely monitor your house's appliances and make sure they are all switched on and off safely, home automation can help you save money on your power bills. It will improve energy effectiveness.

➢ One of the most important requirements for home automation is that it maintains your residence secure.
➢ Using automated tasks can help you save time.

An Arduino, the HC-05 Bluetooth module, an IR remote control, a 4-channel relay, various loads, and manual switches make up the project. You must activate Bluetooth and attach the HC-05 Bluetooth module in order to control the relays from a mobile device. You can quickly operate the appliances from the Bluetooth app once you've connected Bluetooth (in the smart phone). You may operate the appliances with any IR remote. Additionally, manual switches can be used to operate the appliances.

III. METHODOLOGY

The following characteristics of the suggested system:
1. Arduino Uno.
2. Equipment managed by an Android app.
3. IR Receiver (TSOP 1738)
4. Manual Switch
5. HC-05 Bluetooth Module
6. Mobile management

The project's main goal is to build an Arduino Uno-based home automation system with Bluetooth, an IR remote control, and a relay for four different loads. It intends to operate home appliances by manual input, an Arduino-based Bluetooth remote, and an IR remote.

1. To use Bluetooth to monitor and control home appliances
2. To manually operate the appliances in addition to using an IR remote.
3. To learn more about the IR sensor, HC-05 Bluetooth module, and Arduino UNO board.
4. To be able to construct a circuit, connect a circuit, and comprehend how it operates.
5. For the purpose of pairing the Bluetooth module with a smartphone and cheek
6. Develop your coding skills for the project.
7. To test the project and program the Arduino UNO based on its components.

IV. CIRCUIT DIAGRAM

Below is a schematic for a Bluetooth-based smart home automation system with an IR receiver circuit link. The idea is to use an Android application on a smartphone to operate household appliances from distant locations. We link the Arduino to our smartphone through Bluetooth using an Android app created by the MIT App Inventor website. Thus, we may regulate and balance our electricity demands by controlling home appliances in three distinct ways. Our project is broken up into three sections: The transmitter unit, which is made out of an Arduino Uno and a smartphone, is the first section. The next part is the receiver unit, which is made up of the Bluetooth module (HC-05) and the IR Receiver (TSOP-1738).The third part, the control unit, is made up of switches, a relay module, and the Bluetooth application.
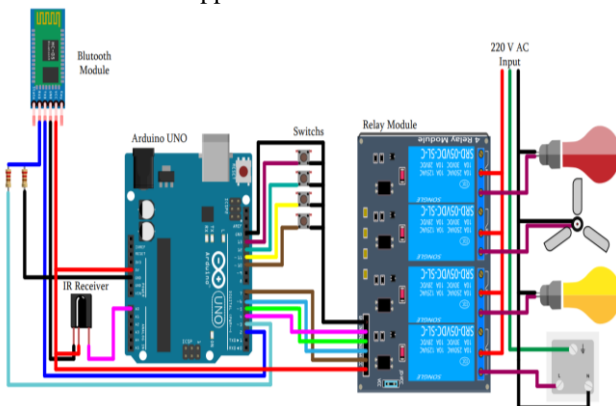

Figure 1. Bluetooth-based smart home automation circuit schematic with an IR receiver

The Arduino Uno is used to interface with every component of the project. Therefore, thousands of projects have used Arduino as their brain throughout the years. It is the center of our endeavor, in other words. The Bluetooth module has four pins, all of which are necessary in order to connect to the Arduino as indicated in the circuit diagram. The Arduino's 5V pin is attached to the VCC pin since that is where the module gets its input voltage. The ground pin of the module is designated as GND, and it links to the Arduino's ground pin. The receive and transfer pins of the module are labeled RXD and TXD, respectively. The smartphone's serial data is transmitted to the module through the RXD pin, and then uses the TXD pin to send the data to the Arduino. The Arduino's pin number two is directly connected to the module's TXD pin. Through a voltage divider circuit, the RXD pin of the module is linked to the TX pin of the Arduino. The RXD pin of the module is connected to Arduino pin 3 by a voltage divider circuit. The Bluetooth module is employed in accordance with the design to transport the data (control signal) from the smartphone to the Arduino after being saved from it. As shown in the schematic design, it is also possible to connect the TSOP to other devices and enable wireless communication by receiving the control signal from the IR receiver. The information is then transmitted from the RXD pin to the TXD pin. The Arduino's pin number two is directly connected to the module's TXD pin. The RXD pin of the module is connected to the TX pin of the Arduino through a voltage divider circuit. The module's RXD pin is coupled to Arduino pin number 3 via a voltage divider circuit. In accordance with the design, the Bluetooth module is used to re-save the data (control signal) from the smartphone and then transmit it to the Arduino. In order to connect the TSOP to other devices and allow connectivity, it is also possible, as shown in the schematic design, to receive the control signal from the IR receiver. The inbuilt decoder and IR receiver are turned on by the first pin, a power input pin, which is connected to the Arduino's 5V pin. The second pin is the ground pin, which serves as the Arduino's sole common ground. The third pin serves as the output pin for the Arduino, where the data (control signal) is transformed. Following the transmission of the data through one of the techniques, the relay module subsequently received the control signal needed to operate the designated appliance. The Relay Module is a four-channel module, as shown in the circuit diagram, making connection to the Arduino simpler and requiring fewer connections. The module has six pins, all of which are required to connect to Arduino. The Arduino's 5v pin will be wired to the Vcc. The second pin, designated as GND, will be used to manually control the appliances by connecting to GND on your Arduino and the witch's other end. The remaining four pins of the Arduino are used to transmit a control signal that operates the relay. The IN1 control relay 1 is therefore linked to Arduino pin number 4, the IN2 control relay 2, Arduino pin number 5, the IN3 control relay 3, Arduino pin number 6, and the IN4 control relay 4, Arduino pin number 7.

V. RESULTS AND DISCUSSION

This study investigates if concepts or solution approaches recommended in the research are satisfied by the practical implementation by compiling a list of the findings obtained via practical activity. The Bluetooth module is the primary means of communication for this project. The following findings illustrated in the digits below were attained from the series of trials we conducted:

1. Remote control of appliances is possible using Bluetooth.
2. Using the IR Receiver Method, appliances can be controlled remotely across short distances.
3. The Manual Control Method can be used to manually operate appliances.

5.1 Loads Controlled by Bluetooth Module (HC -05):

Figure 2. Load 1 - 5W lamp is ON/OFF

Figure 3. Load 2 - 60W lamp is ON/OFF
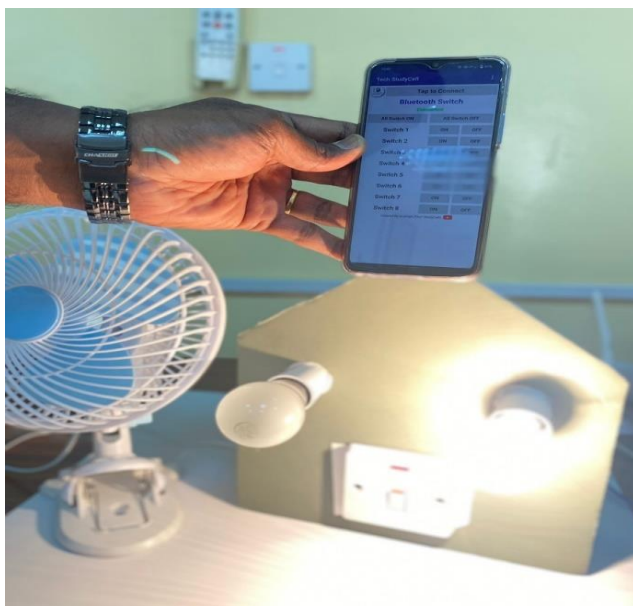

Figure 4. AC socket load-3 is ON/OFF

Figure 5. Fan is ON/OFF for load 4

Figure 6. Loads everything ON

Figure 7. Loads everything OFF

Figure 10. AC socket load-3 is ON/OFF

5.2 Loads IR Receiver Controlled (TSOP 1738):

Figure 8. Lamp load 1–5W is ON/OFF

Figure 11. Fan is ON/OFF for Load 4

Figure 9. 60W lamp load 2 is ON/OFF.

Figure 12. OFF for all loads
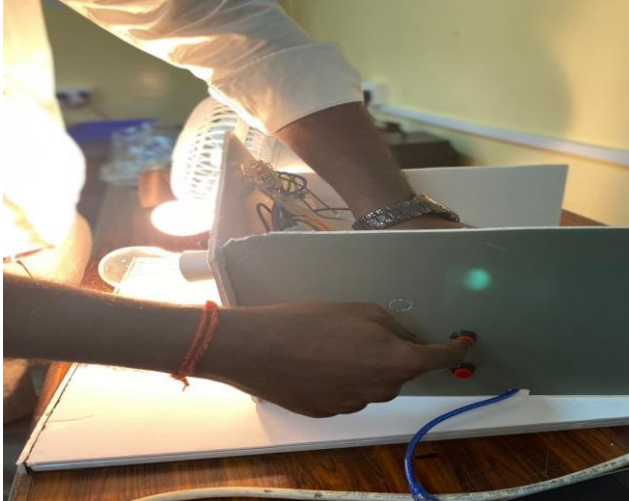
5.3 Manually Controlled Loads:
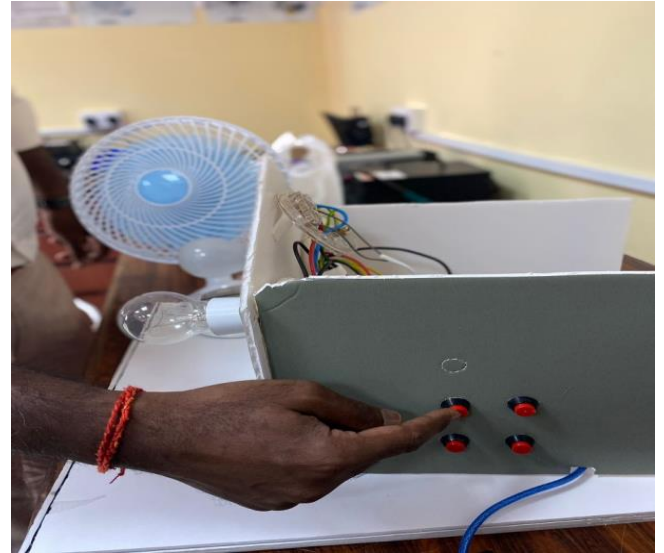

Figure 13. Lamp load 1–5W is ON/OFF.

Figure 14. 60W lamp load two is ON/OFF
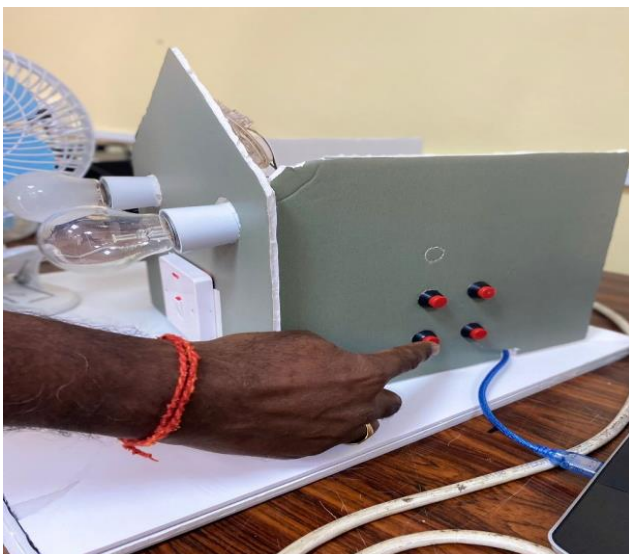

Figure 15. AC socket load 3 is ON/OFF

Figure 16. Fan is ON/OFF for load 4

VI. CONCLUSION AND FUTURE SCOPE

According to the aforementioned explanation, a specific tool used to manually control appliances in our homes in a central location that is both conveniently accessible and requires little effort is that Bluetooth-based IR receiver for smart home automation. Customers need to know their mobile phone and Arduino BT pairing passwords in order to access the home appliances. This enhances defense against unauthorized users. Without an internet connection, this technique can be used to test any equipment that needs on-off switching. We also discussed all the components that went into our project, effort, and application. We have developed a device that is portable, simple to use, dependable, and cost-effective. The goal of this project is to develop a tool that improves people's lives while using less energy.

The need for automation has grown significantly over the past few decades, and it has greater potential than it is currently being used for. New uses for automation and ways to employ it will proliferate as technology develops. Future products will have improved proportions, a better appearance, and many of the features listed below.

➢ During a power outage, the status of the appliance can be stored in memory.
➢ Using RTC, an appliance scheduler or timer can be implemented (Real Time Clock).
➢ Using Wi-Fi connectivity, an IOT device may be modified.

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