

# Bluetooth Based Device For Integrating Wireless WT Sets With Smartphones Through An App

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## Abstract

The domestic extension of building automation is the smart house. At first, it included controlling and automating comfort-related systems, like lighting, heating, ventilation, air conditioning, and security. In this essay, the design and implementation of a cheap smart home controlled by an Android phone are discussed. This framework is designed to help and accommodate the needs of the elderly and disabled people living in our homes. The idea of a smart home system will also improve the quality of our homes. A wireless Bluetooth device and analogue sensors are used in the fundamental control system to enable wireless access to smartphones. The system's architecture gives users safer control over the existing electrical switches rather than removing them entirely. Every user interface shows the most recent switch status, and the switch state is synchronised everywhere. This system's goal is to manage electrical appliances throughout the house while being easy to set up, straightforward to operate, and reasonably priced. Investigated was the use of an Arduino Uno and a Digilent chipKIT to construct a home automation and monitoring system. Even though this system is touted as being affordable, it costs a lot more than the home automation system based on Bluetooth. Researchers created a low-cost, wirelessly controlled automation system. Users had remote-controlled wireless access thanks to Bluetooth technology.

Keywords: — WT Sets Automation , Arduino, Bluetooth Transmission, Smart House , Efficient-cost

## I. INTRODUCTION

In this digital age, we need everything that is practical to be automatic to reduce human effort. We need to conserve energy because the current energy crisis continues to be our biggest challenge. We use the use of sensors to achieve this. By converting these physical qualities into signals that can be detected electrically, sensors are devices that detect and measure nonelectrical factors including temperature, motion, humidity, speed, distance, weight, etc. Our daily lives now include sensors on a daily basis. Everyone uses sensors, from big businesses to little families. The new fad is smartphones, which have simplified life more than before. They fit easily into pockets and are constantly with you. Because of the portability of smartphones, designers and marketers have created services and products specifically for the mobile market. Applications exist for online shopping, banking, trade stocks and uncountable day to day tasks. How, then, can home automation systems continue to be unconnected to mobile technology? This project involves designing a home automation system that can be operated with any smartphone. Bluetooth is used to connect the automation system with the smartphone. The smart phone uses a Bluetooth interface to send control signals to an Android app, which turns on or off home appliances. Four household appliances are connected to the Arduino by relays, and the project is created on an Arduino UNO. The Arduino board is coupled with an HC-05 Bluetooth module in order to connect with the smartphone. The smartphone is used to communicate text strings to a linked device via the "Bluetooth Terminal" app. The smartphone also supports the "BT Voice Control for Android" software. US English voice instructions are translated into text strings and sent to a paired device by the BT Voice app. Through the HC-05 Bluetooth Module, either app can pair with the home automation system. Each module can be paired with other devices using a password and a specific MAC address. This offers a few advantages, like as

- Improve the performance of household appliances and devices.
- Allow for reduced energy consumption.
- Provide residents with comfort and security.

The Bluetooth interface on the smart phone sends user commands to the Arduino board as integers. The home

appliances are given these numbers, and when they receive the numerical command, they turn ON or OFF. The Arduino sketch searches for the Bluetooth module's numerical commands and activates relays to switch appliances. The quick development of technology has led to our use of cellphones to remotely operate home appliances. An automated system may function with versatility, thoroughness, and the lowest rate of error. The idea of a home automation system worries researchers and producers of home appliances. Automated systems save time and energy while also reducing the demand for human labour. Home automation systems were originally designed as labor-saving tools, but today their main objective is to enable elderly and disabled people to carry out daily duties and control household equipment from a distance. It is inexpensive and simple to install a Bluetooth-based wireless

home automation system in an existing residence. Research has shown that GSM and wireless technologies are slower than Bluetooth systems. Depending on the type of Bluetooth device, Bluetooth technology can transmit data serially at up to 3 Mbps across a distance of 10 to 100 metres. The suggested method's design is based on the Arduino board, Bluetooth module, sensors, and a smartphone application. A relay connects household appliances to the Arduino board, and the Bluetooth module HC-05 communicates with the Arduino board.

Investigated was the use of an Arduino Uno and a Digilent chipKIT to construct a home automation and monitoring system. Even though this system is touted as being inexpensive, it costs a lot more than the home automation system based on Bluetooth. Researchers developed a cheap, wireless automation system. Thanks to Bluetooth technology, users have wireless access that could be remotely controlled.

Hardware and software make up the two main components of the suggested system. The three main hardware components that make up the hardware part are the smartphone, Arduino board, and Bluetooth module. The Bluetooth terminal smartphone app and the Arduino Integrated Development Environment (IDE) make up the software component, which enables wireless communication between smartphones and Arduino boards.

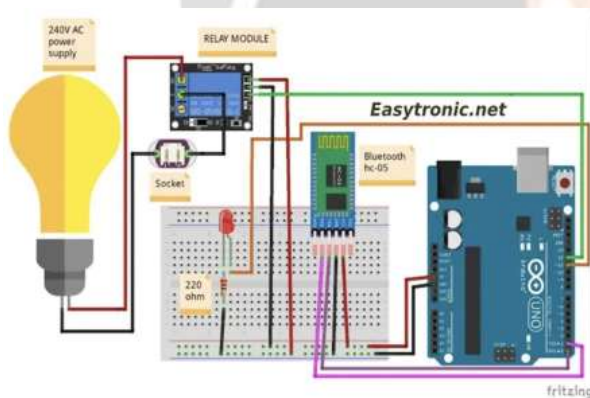


Figure 1: Circuit Diagram

## II. LITERATURE SURVEY

In recent years, several works and reviews have been published, providing crucial knowledge for researchers to understand various approaches to implement devices through bluetooth which can be controlled by smartphones. These are work excerpts from authors found most relevant to this research.

For getting the complete insights regarding the ideology for implementing this project, Dauda Auwal [1] employed a connection between the home appliances through the bluetooth terminal which can be controlled by an application installed on the smartphone. The outcomes showed a basic idea of implementing this project. In another word, it gives knowledge about how we can connect the WT sets via bluetooth through the smartphones and operate them according to our needs.

Sandile Zondo [2] sought to extract reliable traits to implement the idea of connecting the WT sets through an application via bluetooth. He proposed many ways of implementing it but published the most efficient one in his research paper. He proposed the requirements as well which is needed to implement the whole idea.

The requirements include hardware and software stuff for example in case of hardware; he includes Arduino UNO, Bluetooth module hc-05, 4 channel relay board, ultrasonic range sensor and in case of software; he includes the Arduino IDE and bluetoothterminal application.

Prajwal K C [3] put some light on how we can assemble the hardware parts with each other. Starting with Arduino UNO, Arduino is a tool for building computers that are more capable than a desktop computer of sensing and controlling the physical world. The open source IDE is available for free download, and the boards may be manually put together or purchased already put together. The ATmega328 serves as the foundation for the Arduino Uno microcontroller board. It has a USB port, a power connection, an ICSP header, a reset button, a 16 MHz ceramic resonator, 6 analogue inputs, 14 digital input/output pins, and 6 of these may be used as PWM outputs. Everything required to support the microcontroller is included; all that is required to get going is the insertion of a USB cable, an AC-to-DC converter, or a battery. When an Arduino Uno and a smartphone are in wireless contact, the Bluetooth module HC-05 is utilised. With an operational voltage range of 3.6 to 6 volts, the HC-05 is a slave device. A simple and useful way to connect 4 relays for your project's switching needs is using the 4 Channel Relay Board. This board is ideal for low voltage applications and compact places due to its extremely small size.

Sanjoy Ganguly [4] put some insight on how we can connect the software with the hardware to control the appliances. Starting with the IDE, Integrated Development Environment, or IDE, is what is used to programme the complete system under consideration using the Arduino IDE tool. the code needed to get smartphone serial data. Below is a screenshot of the Arduino IDE code for turning on and off a light. It used the digitalWrite function to control the appliances that were installed on the Arduino Board.

R.Piyare [5] suggested the complete circuit diagram which involves the appliances with the Arduino board connected through the relay board. Poonam V. Gaikwad[6] proposed the Arduino code for automation of the WT sets through an application. The code consists of low and high variables to determine the lights on and off. Then we need to upload that code to the Arduino using Arduino IDE. It uses the digitalWrite function to handle the external home appliances connected to the arduino board. Nupur K. Sonawane[7] gave some insight about how we can configure the application with bluetooth. Basically according to her first we have to open our phone bluetooth setting, select the pair device option and then connect with the HC-05 with some predefined password. Once the app is connected it will show the option for controlling the WT sets that we have configured. About the cost analysis for the entire process Fathia Chekired [8] did some research on the cost analysis and proposed that the cost breakdown of the used system in this study is compared to Oued Kniss, an Algerian online retailer of a variety of goods, including electronic equipment. Since prices are subject to fluctuation, typical average prices are taken into account. The hardware cost of the proposed circuit is significantly lower than that of the current "commercial" control methods.

### III. EVALUATION

Over the course of history, houses have changed from being fire-lit caves to torches and candles, which can be used to warm and illuminate a room, and lastly to electricity, which has allowed homes to be more comfortable. Later, electronics were used, making it possible to use the appliances and conduct programming functions and regulatory functions. Now think about the setting in the room. An Arduino UNO will operate equipment and read sensor data. How the Arduino UNO will interface with the gadgets and sensors is shown in the image "Room Architecture." One PassiveIR (to detect human presence in the room), one temperature sensor (LM35 to gather room temperature), and LDR are all controllable devices that are present in the room (to detect light intensity near the room window). The benefits are assessing daily in providing:-

1. Savings: With all of the electrical equipment that is connected, including smart sprinklers, lights that can communicate wirelessly, tracking of power retailers, and water heating and cooling modules, less energy and water will be used.
2. Control: Human labour can be replaced by automated equipment to a good extent, but since humans make mistakes more frequently and more frequently in stressful circumstances, automated equipment can operate diligently, adaptably, and almost error-free.
3. Convenience: The majority of your living room and room lighting may be altered as you enter your house remotely, the home theatre and TV may play your favourite music as a result, and the front door may open naturally as some of the most opulent characteristics of the smart home, when you approach it with your hands full of shopping. But peace and harmony aren't just about living a lavish and simple life; clever locks can also give you the opportunity to grant access to a select group of people in specific instances rather than always. In addition, a sensor that alerts you when your refrigerator is empty or low on supplies can help you



"arrange" your entrance or exit from anywhere in the world.

4. Security: As well as being sensible estimated options for each checking security certified framework, they are also straightforward, associated replies for wellbeing for the sharp home. You can view remote-enabled CCTV cameras linked to development sensors that ignore smoke warnings from inside or outside a locality using a video live, email, and prepared writings.

5. Safety: Since they can communicate with the owner legally on any occasion, wherever you need, verified sensors that can detect water spills, phases of stickiness, carbon dioxide, development, warmth, and any other ecological issues that could be foreseen help prevent incidents from turning into catastrophes. elderly autonomy Automated sound updates and voice-activated ready systems are just a few examples of the local mechanisation components that enable seniors to live independently for longer. Additionally, Wi-Fi-enabled cameras with way reports can assist friends and family keep an eye on senior citizens when they are unable to do so themselves.

The smart home automation system project uses an open source Android platform. Any Android application can connect to the Bluetooth module HC-06 and control home appliances like the lighting in a room, a water pump motor, or a garage motor. When pairing for authorised use, the Bluetooth connection between the application and the Bluetooth device requires a password for this project's safety. The list of available devices in the Android application can then be controlled as remote devices after the Bluetooth connection confirmation message for success appears.

#### IV. CONCLUSION

In this essay, we've spoken about designing and implementing a wireless, flexible, and affordable home automation system. The system is not accessible to any users or outsiders. To access the home appliances, users must have cell phone and Arduino Bluetooth pairing passwords. This improves protection from illegal users. Without an internet connection, this technique may be used to test any appliances that require apps for on-off switching. Thanks to this technology, the disabled are no longer immobile. The home automation system enables users to turn on and off their appliances with the appropriate input via the Bluetooth interface, and to view the status of their appliances on the LCD by downloading an Android app on their smartphone.

Since several years ago, intelligence has been encouraged to design our networked houses and has changed and is still changing our daily lives. Up until robots and connected items, Garage doors, for example, had automations installed initially, followed by programming and remote control (heating regulation, etc.). Home automation software running on smartphones and/or tablets is used to manage the entire system. In this instance, a home automation system that uses an Arduino Mega controller as the system's brain and the Bluetooth connection protocol to monitor a few domestic items locally or remotely has been constructed. This study focuses on lighting management to reduce energy consumption, enhance occupant comfort, and significantly increase the energy efficiency of the home. With the help of inexpensive components that may be used extensively in poor nations, we were able to build and install automatic control systems based on Arduino in-house. The created circuit will use less energy and increase the occupants' comfort and safety in the home. Any home can readily adopt this design, which necessitates the usage of sensors. It was possible to lower the overall cost of the control unit and the energy usage of the infrastructure that this system regulates by using this design.

Consider the following recommendations for additional research: Better sensors with more functionality should be taken into consideration. LDR sensors, which only work in the presence of light, should be used in conjunction with another appropriate sensor, such as an infrared one. Since they are not dependent on light but rather the heat produced by individuals entering the rooms, infrared sensors are appropriate in all circumstances and may be viewed locally or online. To test all the parameters and establish the potential for energy savings, instal the system and the sensors in a real home and observe their behaviour over an extended period of time.

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