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# Bluetooth based Home Automation By using Arduino

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**Abstract:** The world is rapidly becoming more automated. People had limited time to do any work, therefore automation became an easy approach to control any device that worked according to our wishes. This study is primarily concerned with the development and design of a home automation system using an Arduino and a Bluetooth module. With an Android application, a home automation system provides simple and current technology. The Uno Arduino with Bluetooth module is used to control home appliances such as fans, bulbs, air conditioning, and refrigerators. When individuals are not at home, our main goal is to monitor and operate houses using an Android phone and to provide a security-based smart home. Our goal is to control household appliances in a smart home in a user-friendly, low-cost, and easy-to-install manner.

**Keywords:** Arduino, Home automation, Smart phone, Security.

## Introduction

Nowadays, everyone has a smartphone and expects to be able to control everything from it. Because everyone understands how to use a cell phone, it is incredibly simple to use and comprehend. Lights, fans, switches, and freezers are all

controlled via an Arduino-based Bluetooth remote. Because everyone nowadays uses a smartphone, home automation design is significantly easier and more popular. We're going to use Arduino, which is the most widely used gadget for automation. Arduino is a piece of hardware that is used to connect a computer to a project model so that we can control it using Arduino code. Arduino is a sort of microcontroller that functions similarly to a human brain in that it processes any type of data before performing important logical and mathematical operations on it. The Arduino is linked to a Bluetooth module that receives data from the user. The Arduino is also connected to a relay module, which takes data from the Arduino and acts as a switch. Bluetooth is a wireless radio transmission technology that provides the essential technologies to develop intelligence and controllability over short distances. This creates a personal area network in the home, where all appliances can be connected and monitored using a smartphone and a microcontroller using Arduino.

## Methodology

Home automation is a networked, controllable device system that aims to make our homes more pleasant, efficient, and secure. There are five parts to this device. Arduino, Bluetooth module, relay drivers, android application, and step-down transformer, which reduces the input voltage and sends it to Arduino through the VIN pin. Additionally, the Arduino links the Bluetooth module to turn ON or OFF the devices that provide data to the microcontroller, such as lights, fans, machines and so on. The microcontroller gathers data and feeds it to relay drivers, which act as switches. We upload the software to Arduino according to our needs, and it then executes some

mathematical and logical operations to control relay drivers.

All these parts are connected as shown in figure: 1.

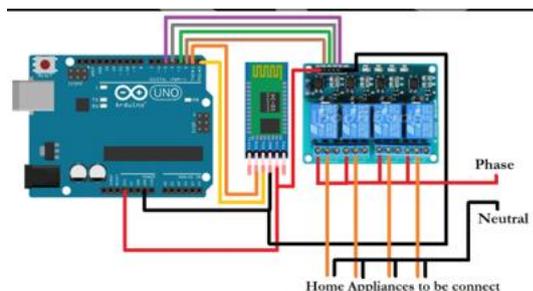


Fig 1 – Circuit diagram of the home automation.

The Arduino Bluetooth module is connected to the Android application (HC-05). There are eight switches connected to relay drivers and eight relays connected to home appliances in Figure b.



Fig 2 – Mobile application.

## Architecture of device

The goal of this technique is to automate machines with the help of an Android application. The device's architecture is depicted in Figure 3.

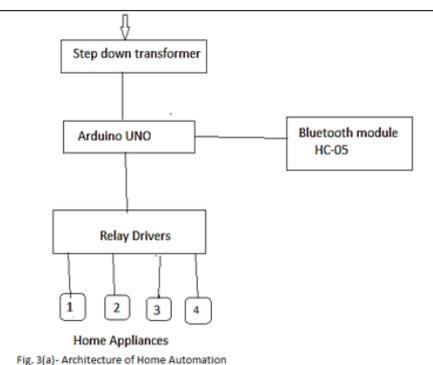


Fig. 3(a)- Architecture of Home Automation

### Home automation

The Arduino Uno(R3) will interface with the Android application via the Bluetooth module. This module is extremely durable and provides the highest level of efficiency, safety, and security when it comes to adding smart home equipment with the least amount of human interference. The Bluetooth signal used the least amount of energy to connect any signal without losing information and with the fewest harmonics. The Arduino with microcontroller is the heart of the home automation system. People should must have mobile application with proper Bluetooth connection. It should be used as multi-applications which works together. Arduino board is configured for each and every home appliance using coding in microcontroller. We can operate the electromagnetic relay that acts as a switch to receive signal from the Bluetooth module HC-05 using a microcontroller. When a signal is sent from the transmitter to the relay, the relay acts as a switch, controlling a variety of smart home products (multitasking). There are three

main parts of this home automation that are given below.

1. Arduino Uno R3
2. Bluetooth HC-05
3. Relay Drivers

## Description of Hardware

### 1. Arduino Uno R3:

The Arduino Uno R3 is a microcontroller chip based on the Atmega328 that has 14 I/O pins, six of which can be used as yields and six of which can be used as information sources. A 16 MHz resonator, a USB connection, a power jack, and a reset button are all included. The microcontroller had 32KB of ISP (In-System Programming) flash memory, 2KB of RAM, and 1KB of EEPROM (Electronic Programming RAM) (electrically erasable programmable read-only memory). Serial communication is supported on the board through UART (Universal asynchronous receiver-transmitter) and SPI (Serial Peripheral interface). It is easier to understand because of the well-designed form of Arduino. We employ high-level programming languages like C, C++, and others in Arduino. It is a user-friendly language that is simple to grasp. Multitasking, automation, and time domain are just a few of the benefits. In Figure 4, an Arduino Uno R3 is shown.



### 2. Bluetooth Module HC-05:

The microcontroller is connected to the android application through a Bluetooth module HC-05. Bluetooth receives data from the user and transfers it to the microcontroller (Arduino Uno R3). The Bluetooth serial port protocol (SPP) is a simple to use wireless serial port module that is Bluetooth v2.0+ advanced. Enhanced data rate with 3Mbps modulation using a 2.4 GHz radio receiver and BB (base band). The Arduino pins Tx and Rx are connected to the Bluetooth Rx and Tx pins, respectively. The HC-05 module is a simplistic Bluetooth SPP (Serial Port Protocol) module that is designed for simple remote sequential association setup. It makes use of the CSR Blue Canter 04-External single chip Bluetooth framework with CMOS and AFH (Adaptive Frequency Hopping Feature). It bears a small impression of 12.7mmx27mm. The Bluetooth HC-05 module HC-05 is shown in Figure 5.



Fig 5: Bluetooth module HC-05

### 3. Relay Drivers:

A relay is an electromagnetic switch that is used to electrically separate two circuits before connecting them magnetically. When the Arduino sends a signal, the relay driver receives it and begins working. They're typically used to connect an electronic circuit (with a low voltage) to an electrical circuit (with a very high voltage). A hand-off, for example, can swap a 230V AC main circuit with a 5V DC battery circuit. In this method, a small sensor circuit can control a fan or an electric knob. The information and yield components of a transfer switch can be separated. When a small voltage from an electronic circuit is coupled to the information region, it forms an attracting field. The working voltage is another name for this voltage. Typical transfers are available at a variety of working voltages, including 6V, 9V, 12V, and so on. There are three contactors in a simple hand-off: normally closed (NC), routinely open (NO), and normal (COM). The COM is normally closed when no information is exchanged (NC). When the working voltage is applied, the transfer curl is charged, and the normal (COM) contact is changed to a routinely open state (NO). Different transfer arrangements, such as

SPDT and DPDT, are available, each with a different number of changeover contacts. The electrical circuit can be turned on and off by using a legal combination of contactors. Figure 6 shows a relay circuit.

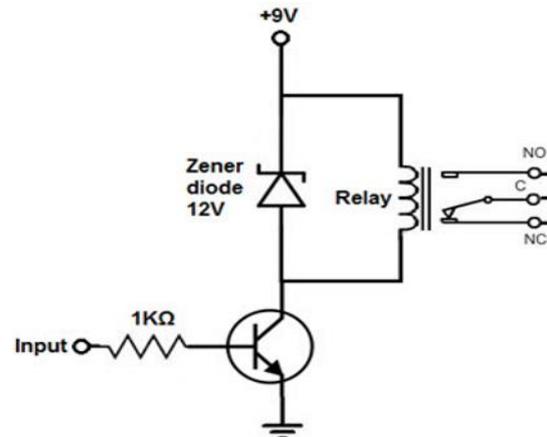


Fig 6: Relay drivers circuit diagram

We employ a transistor to drive the hand-off, which allows us to use less power to drive the transfer. Because a transistor is an intensifier, the base lead receives sufficient current to produce an increased current stream from the transistor's emitter to the collector. If the base achieves appropriate control, the transistor lead from Emitter to Collector is connected to the transfer and powered. When power is sent to the relay, the electromagnetic effect causes it to act as a switch, allowing us to turn on or off our home appliances. The relay module is depicted in Figure 7 below.

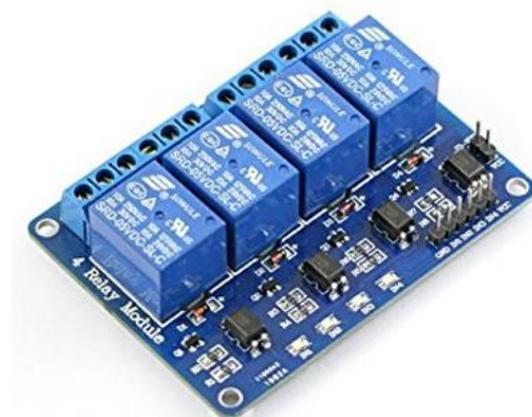


Fig7: Relay drivers module

## Advantages

1. It is simple to use because everything is automated.
2. It is managed via a smartphone application, therefore there is no need for additional training.
3. We can adjust the control system to meet our needs.
4. Because it is built on an Arduino system, we can readily grasp how it works.
5. It helps us save time.
6. A single Android application can handle all of your home appliances.
7. This application is simple to install and extremely user-friendly.

## Result

The final result, according to the planned design, will lead to the growth of home automation. This project has resulted in the creation of an automation system that allows us to effortlessly operate home appliances such as lights, fans, tube lights, air conditioning, bulbs, and refrigerators. One of the project's goals is to provide us with a smart automation and low-cost project. We also supplied information about the Arduino Uno R3, HC-05 Bluetooth controller, and relay module in this document, as well as information about their functions. The benefits of home automation have been explored in addition to the components. The technology is simple to use and secure. Figure 8(a)(b)(c)(d) depicts the project's final outcome.

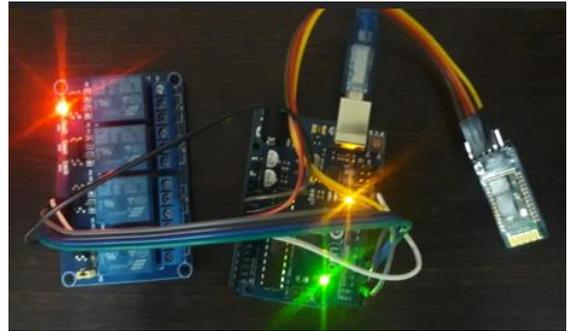


Fig 8(a): Arduino with relay drivers module

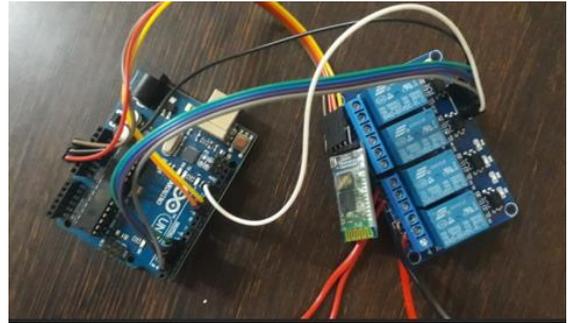


Fig 8(b): Arduino with Bluetooth module

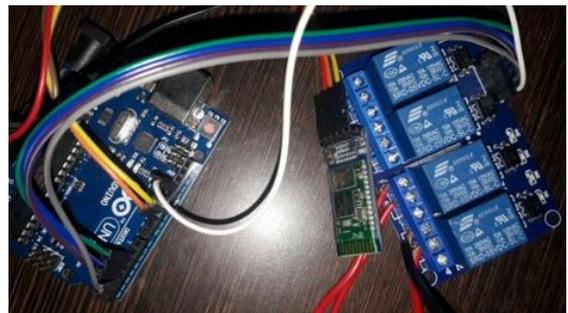


Fig 8(c): Relay drivers module with Bluetooth

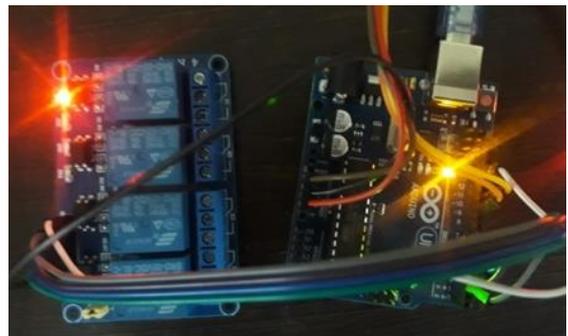


Fig 8(d): Home Automation system

## Conclusion

As a result of the preceding explanation, it can be concluded that home automation is

an unique type of equipment that regulates household appliances without requiring additional effort. And in this paper, we presented how home automation is planned and works, talked about methodology and how it can be used, and talked about new technologies that can be included in the future that lowers human effort, which is now being investigated, We've also developed a device that is small in size, low in cost, has greater capacity, a longer battery life, and can receive signals from further away. The goal of this research study is to develop a technology that saves electricity while also improving human life..

[6]. Silviu Folea, Daniela Bordencea, Casiana Hotea, Honoriu Valean “Smart Home Automation System Using Wi-Fi Low Power Devices”.

### References

[1]. N. David, A. Chima, A. Ugochukwu and E. Obinna,”Design of a home automation system using Arduino”, International journal of Scientific & Engineering Research, Vol. 6, pp. 795-801, june-2015.

[2]. Prof. M. B. Salunke, Darshan Sonar, Nilesh Denge, SachinKangude, Dattatraya Gawade, “Home Automation Using Cloud Computing and Mobile Devices”, Vol. 3, Issue 2 (Feb. 2013), ||V2|| PP 35-37

[3]. A. ElShafee and K. A. Hamed, "Design and Implementation of a Wi-Fi Based Home Automation System, "World Academy of Science, Engineering and Technology, vol. 68, pp. 2177-2180, 2012.

[4]. Ahmed Elshafee, Karim Alaa Hamed, "Design and Implementation of a Wi-Fi based Home Automation System”, International Journal of Computer, Electrical Automation, Control and Information EngineeringVol: 6, No: 8, 2012, pp 1074 - 1080.

[5]. Zekeriya Keskin, Yunus Emrekocaturk, okan Bingol, Kublai Tasdelen, “Web-based smart home automation: PLC controlled implementation”, vol11, NO 3, 2014.