Automated Bluetooth RGB Led Controller

Shri Ramdeobaba College of Engineering & Management, Nagpur
in partial fulfillment of requirement for the award of degree of

Bachelor of Technology

In

COMPUTER SCIENCE AND ENGINEERING

By

Anjali Kushwaha (01)

Janhavi Katre (05)

Khushi Kasat (07)

Chirag Lalwani (39)

Prashant Prithyani (55)

Guide

Prof. Pranali Talekar

Computer Science and Engineering

Shri Ramdeobaba College of Engineering & Management, Nagpur 440013

(An Autonomous Institute affiliated to Rashtrasant Tukdoji Maharaj Nagpur University Nagpur)

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SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR

(An Autonomous Institute affiliated to Rashtrasant Tukdoji Maharaj Nagpur University Nagpur)

Department of Computer Science Engineering

CERTIFICATE

This is to certify that the Thesis on **"Automated Bluetooth RGB Led controller"** is a Bonafide work of **Anjali Kushwaha, Janhavi Katre, Khushi Kasat, Chirag Lalwani, Prashant Prithyani**, submitted to the Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur in partial fulfillment of the award of a Degree of Bachelor of Engineering, in Computer Science and Engineering has been carried out at the Department of Computer Science Engineering, Shri Ramdeobaba College of Engineering and Management, Nagpur during the academic year 2021-2022.

Date:

Place:

Prof. Pranali Talekar
Project Guide
Dept. of Computer Science and Eng.

Dr. A. J. Agrawal
H.O.D
Dept. of Computer Science and Eng.

Dr. R. S. Pande
Principal

DECLARATION

We hereby declare that the thesis titled **"Automated Bluetooth RGB Led controller"** submitted herein has been carried out in the Department of Computer Science Engineering of Shri Ramdeobaba College of Engineering & Management, Nagpur. The work is original and has not been submitted earlier as a whole or part for awarding any degree/diploma at this or any other institution / University.

Date:

Place:

Anjali Kushwaha
Roll No. 01

Janhavi Katre
Roll No. 05

Khushi Kasat
Roll No. 07

Chirag Lalwani
Roll No. 39

Prashant Prithyani
Roll No. 55

APPROVAL SHEET

This report entitled "**Automated Bluetooth RGB Led controller**" by **Anjali Kushwaha, Janhavi Katre, Khushi Kasat, Chirag Lalwani and Prashant Prithyani** is approved for the degree of Bachelor of Engineering.

Prof. Pranali Talekar
Project Guide

External Examiner

Dr A. J. Agrawal
H.O.D

Date:
Place:

ABSTRACT

It is a matter of great pleasure to present this report on a project titled "**Automated Bluetooth RGB Led controller**". We are thankful to Shri Ramdeobaba College of Engineering and Management, Nagpur for providing us with this great opportunity to be working on this project.

We take this opportunity to acknowledge our profound indebtedness and extend our deep sense of gratitude to **Dr A. J. Agrawal,** Head of Department, for his support and guidance for our project. We would also like to express our gratitude to our project guide **Prof. Pranali Talekar**, for her valuable guidance and advice in the project that has helped us immensely in completing this project.

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Project By:
Anjali Kushwaha (01)
Janhavi Katre (05)
Khushi Kasat (07)
Chirag Lalwani (39)
Prashant Prithyani (55)

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The main motive of this Automated Bluetooth Led Light system is to control the electronic device with the help of a mobile application. This system is designed in such a way that everyone can access it. With the help of Bluetooth LE, it also improves their efficiency and productivity. The IoT gives the possibility to connect, manage and control a lot of devices and objects. It allows homeowners to control appliances, lights, and other devices remotely using a smartphone or tablet through Bluetooth.

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CHAPTER 1

INTRODUCTION

1.1 PROJECT DEFINITION-

The aim of this project is to create a system of automated LED lights that can be controlled through a Bluetooth-enabled device. The system will be designed with the purpose of providing a convenient and efficient way to control lighting in different parts of a home or office. The system should be able to recognize and respond to commands sent via Bluetooth and be able to change the settings of the lights accordingly. The system should also be able to save the settings and trigger them upon request. Finally, the system should be secure and reliable, ensuring that only authorized devices are able to control the lights.

1.2 OBJECTIVES-

The objective of Bluetooth automated LED lights is to provide users with a convenient, energy-efficient lighting solution that can be controlled wirelessly via Bluetooth. This allows users to customize their lighting environment to their own needs and preferences without having to manually adjust switches or dials. Bluetooth automated LED lights can also be used to set moods and create a unique atmosphere in any room.

Smart bulbs have been increasing in popularity recently and are steadily becoming a key part of the smart home toolkit. Smart bulbs enable the user to control their light via a special application on the user's smartphone; the bulb can be turned on and off and the color can be changed from the application interface. In this project, we built a smart bulb controller that can be controlled from a manual button or a mobile application via Bluetooth. To add some flair to this project we have added some features which allow the user to choose a lighting color from the list of colors included in the application interface. The user can create their own color mix using a PWM feature which can also be used as a dimmer for the three basic colors (red, green, blue). We also added external buttons to the circuit so that the user can switch to manual mode and change the light color from an external button.

Objectives summarized in points are as follows:

- To provide an efficient, cost-effective and automated lighting solution for households and businesses.
- To allow for easy, wireless control of LED lighting through Bluetooth connectivity.
- To enable users to customize their lighting environment with various features such as dimming, scheduling and color changing.
- To provide energy savings through automated lighting control.
- To increase safety and security by providing the ability to remotely control lighting.

- To allow for easy installation and maintenance of LED lighting systems.

1.3 NEED OF OUR PROJECT-

- The main motive of this Automated Bluetooth Led Light system is to control the electronic device with the help of a mobile application.
- This system is designed in such a way that everyone can access it. With the help of Bluetooth LED, it also improves their efficiency and productivity.
- The IoT gives the possibility to connect, manage and control a lot of devices and objects.
- It allows homeowners to control appliances, lights, and other devices remotely using a smartphone or tablet through an internet connection.
- Bluetooth automated LED lights can be a great addition to any home or office space. They are energy efficient, easy to install and can provide a variety of lighting options. Automated LED lights can be controlled using a smartphone or tablet, allowing you to control their brightness, color, and even turn them on and off remotely. These lights can add a unique touch to any room and are a great way to add a modern and stylish look to any space.

1.4 FEATURES-

Some features of Bluetooth automated LED lights include:

- Wireless control – using Bluetooth technology, you can control these lights from any smartphone or tablet. You can set timers, dim the lights, and even change the color of the light to whatever you want.
- Energy efficient – LED lights are known for their low energy consumption. This makes them a great choice for saving on energy costs.
- Durable – LED lights are more durable than traditional incandescent bulbs and have a longer lifespan.
- Variety of colors – automated LED lights come in a variety of colors and can be used to create unique lighting designs.
- Easy to install – automated LED lights are easy to install and do not require any special wiring.
- Affordable – these lights are generally very affordable and can be found in most home improvement stores.
- Dimming: Bluetooth LED lights can be dimmed remotely, allowing users to adjust the brightness to suit their needs.

- Smartphone App Control: Many Bluetooth LED lights come with a companion smartphone app that allows users to control their lights remotely.
- Color Changing Capability: Bluetooth LED lights come in a variety of colors and can be controlled to create different color combinations.
- We have a color wheel feature in the application which allows users to directly choose and change from different colors and apply effects immediately.
- Equipped with many functions, such as changing the color of the lights, controlling the brightness and applying various effects to it.
- LED lighting produces less waste light and more useful lumens than other lighting technologies.
- Improvement in your overall energy efficiency

Some features of our Bluetooth automated LED lights that can be included in future:

- Voice Control: Bluetooth enabled LED lights allow users to control their lights using voice commands.
- Scheduling: Bluetooth LED lights can be programmed to turn on and off at specific times, allowing users to set up automated schedules to save energy.
- Smart Home Integration: Bluetooth LED lights can be integrated with other smart home devices, such as thermostats or motion sensors, to create a fully automated home.

CHAPTER 2

LITERATURE REVIEW

2.1 OVERVIEW OF ANDROID LED CONTROLLER-

LED controllers, also called LED light controllers, are the necessary parts to remote control the lighting effects for LED strips and LED lights, including adjust brightness level, select color, and switch color-changing modes.

The smartphone application is nothing but an android application which is the main source for giving the instructions. With the app, the smartphone can be a Bluetooth LE central device that can initiate connections to Bluetooth peripheral devices.

There are a number of benefits to using Android LED controllers, including:

- Convenience: Android LED controllers allow users to control their lighting systems remotely using their Android device, which can be more convenient than using physical switches or dimmers.
- Flexibility: Android LED controllers can offer a wide range of control options, such as the ability to adjust the brightness, color, and other parameters of the lights.
- Energy efficiency: Android LED controllers can help users to save energy by allowing them to turn off lights when they are not needed or to adjust the brightness of the lights to match the ambient light level.
- Customization: Android LED controllers can offer a variety of customization options, such as the ability to create and save lighting profiles or to set up automated lighting schedules.
- Ease of use: Bluetooth-based LED controllers are generally easy to set up and use, and may come with intuitive applications or user interfaces that allow users to easily adjust the lighting settings.
- Cost: Bluetooth-based LED controllers may be a cost-effective option for controlling LED lighting systems, as they do not require additional wiring or infrastructure.
- Integration with other smart home devices: Android LED controllers may be integrated with other smart home devices, such as thermostats or security systems, allowing users to control multiple devices from a single application.

2.2 ALREADY PROPOSED METHODS

- A paper published in the journal Electronics in 2017 that described the design and implementation of a Bluetooth-based LED control system using Arduino. The authors discussed the benefits of using Arduino for LED control, such as its low cost, ease of use, and wide availability. They also described the challenges that they faced in implementing the system, such as the need to ensure compatibility with different Bluetooth devices and the need to overcome interference from other Bluetooth devices.

- A paper published in the journal Sustainability in 2018 that described the design and implementation of a Bluetooth-based LED control system for commercial buildings. The authors discussed the benefits of using Bluetooth technology for LED control, such as energy efficiency, cost savings, and flexibility. They also described the challenges that they faced in implementing the system, such as the need to ensure compatibility with a variety of devices and the need to overcome interference from other Bluetooth devices.

- A study published in the journal Energy and Buildings in 2019 that compared the performance of Bluetooth-based LED control systems to other technologies, such as Zigbee and Wi-Fi, in terms of energy efficiency, reliability, and cost. The authors found that Bluetooth-based LED control systems had a number of advantages, including low power consumption, ease of use, and wide compatibility with devices. However, they also identified some challenges, such as the need to address security concerns and the potential for interference from other Bluetooth devices.

- A paper published in 2019 by: Rachael Olomo and Omoruyi Osemwegie about Arduino Based Traffic Light System with Integrated LED Advertising Display talks about how the proposed work was compared to the other researcher works, and it was far better in terms of low cost, and programming time. For example, some authors used VHDL code, and ALTERA kit to achieve four lane intersections which are more complex and expensive compared to the proposed method which the design is based on microcontroller, and easier to implement on Arduino platform

- A paper published in the journal Renewable and Sustainable Energy Reviews in 2020 that reviewed the use of Bluetooth technology for LED control in different applications, such as smart homes, offices, and public spaces. The authors discussed the benefits and challenges of using Bluetooth for LED control, as well as the different Bluetooth technologies that have been used, such as Bluetooth Low Energy (BLE) and Bluetooth Classic. They also identified some potential areas for future

research, such as the integration of Bluetooth-based LED control systems with other Internet of Things (IoT) technologies.

2.3 DRAWBACKS

There are a number of potential drawbacks to using Arduino in Bluetooth-based LED control systems. Some of the challenges that have been identified in the existing literature include:

- Security concerns: Bluetooth-based LED control systems can be vulnerable to security attacks, such as unauthorized access or denial of service attacks. Researchers have identified a number of potential security vulnerabilities in Arduino-based Bluetooth LED control systems, including the lack of secure communication protocols and the use of weak passwords.

- Range limitations: Bluetooth technology has a limited range, typically up to around 30 meters (100 feet) in an open space. This can be a challenge in larger buildings or in outdoor applications, where the range may need to be extended. Researchers have suggested a number of potential solutions to this problem, such as the use of repeaters or the integration of Bluetooth with other technologies, such as Wi-Fi or Zigbee.

- Interference from other Bluetooth devices: Bluetooth devices can interfere with each other if they are operating on the same frequency. This can be a problem in environments where there are a large number of Bluetooth devices, such as offices or public spaces. Researchers have suggested a number of potential solutions to this problem, such as the use of frequency hopping or the implementation of interference-mitigation techniques.

- Compatibility issues: Arduino-based Bluetooth LED control systems may not be compatible with all types of Bluetooth devices. This can be a challenge if the system needs to be integrated with other devices, such as smartphones or tablets. Researchers have suggested a number of potential solutions to this problem, such as the use of universal communication protocols or the development of device-specific drivers.

- Limited scalability: Arduino-based Bluetooth LED control systems may not be suitable for large-scale deployments, due to the limited processing power and memory of the Arduino platform. Researchers have suggested a number of potential solutions to this problem, such as the use of more powerful microcontrollers or the implementation of distributed control architectures.

CHAPTER 3

HARDWARE AND TECHNOLOGY

3.1 TECHNOLOGY USED

- Arduino UNO
- Resistors 300Ω (3x)
- Bluetooth Module (HC-06/other)
- Android Phone
- 4 pin RGB LED (1x) or 2 pin Red, Green, Blue LEDs (1x each)

3.2 TECHNOLOGY USED

Arduino UNO

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board.

Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.

The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

Let's discuss each component in detail.

- **ATmega328 Microcontroller**- It is a single chip Microcontroller of the Atmel family. The processor code inside it is 8-bit. It combines **Memory (SRAM, EEPROM, and Flash), Analog to Digital Converter, SPI serial ports, I/O lines, registers, timer, external and internal interrupts, and oscillator.**
- **ICSP pin** - The In-Circuit Serial Programming pin allows the user to program using the firmware of the Arduino board.
- **Power LED Indicator**- The ON status of LED shows the power is activated. When the power is OFF, the LED will not light up.

- **Digital I/O pins**- The digital pins have the value HIGH or LOW. The pins numbered from D0 to D13 are digital pins.
- **TX and RX LEDs**- The successful flow of data is represented by the lighting of these LED's.
- **AREF-** The Analog Reference (AREF) pin is used to feed a reference voltage to the Arduino UNO board from the external power supply.
- **Reset button**- It is used to add a Reset button to the connection.
- **USB**- It allows the board to connect to the computer. It is essential for the programming of the Arduino UNO board.
- **Crystal Oscillator**- The Crystal oscillator has a frequency of 16MHz, which makes the Arduino UNO a powerful board.
- **Voltage Regulator**- The voltage regulator converts the input voltage to 5V.
- **GND**- Ground pins. The ground pin acts as a pin with zero voltage.
- **Vin**- It is the input voltage.
- **Analog Pins**- The pins numbered from A0 to A5 are analog pins. The function of Analog pins is to read the analog sensor used in the connection. It can also act aGPIO (General Purpose Input Output) pins.

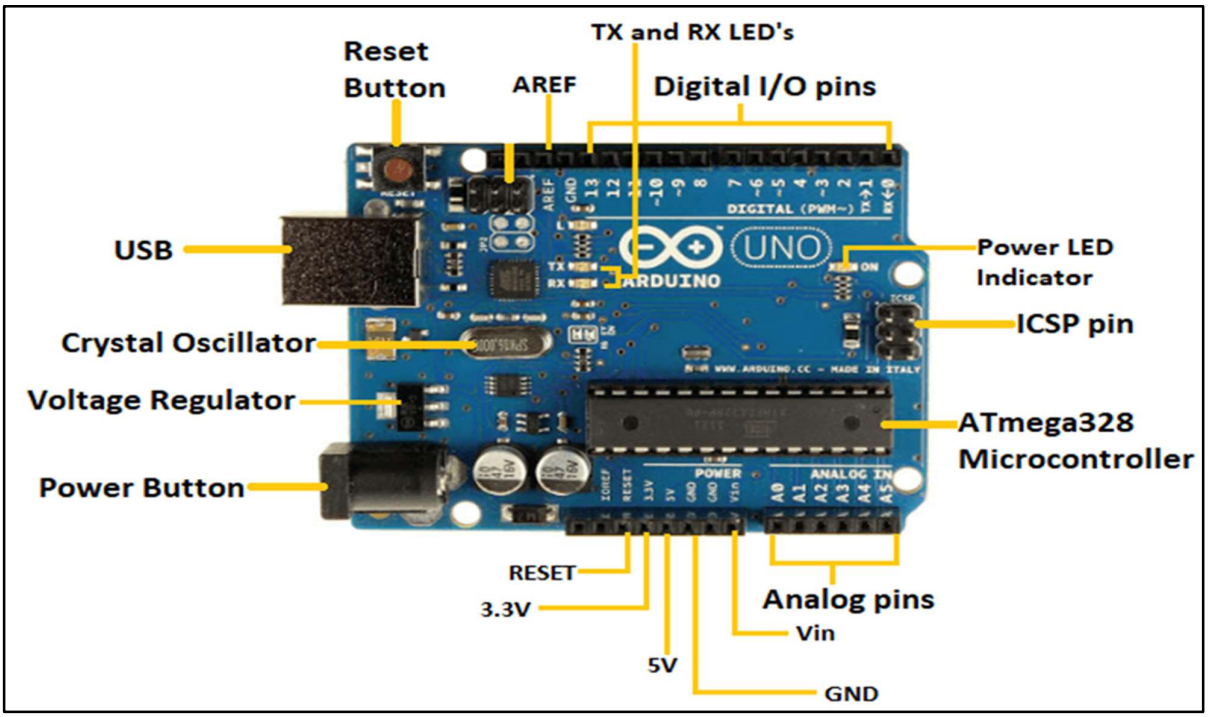


Figure: 1

- **HC-06 Bluetooth Module**

HM-06 is a **Bluetooth module** designed for establishing short range wireless data communication between two microcontrollers or systems. The module works on **Bluetooth 2.0 communication protocol** and it can only act as a slave device. This is the cheapest method for wireless data transmission and more flexible compared to other methods and it even can transmit files at speed up to 2.1Mb/s.

HC-06 uses frequency hopping spread spectrum technique (**FHSS**) to avoid interference with other devices and to have full duplex transmission. The device works on the frequency range from 2.402 GHz to 2.480GHz.

Pin configuration

The HC-06 module has six pins as shown in the pinout. In them we only need to use four for successfully interfacing the module. Some breakout boards will only leave four output pins only because of this reason.

Pin	Name	Function
1	Key	The pin state determines whether the module works in AT command mode or normal mode [High=AT commands receiving mode (Commands response mode), Low or NC= Bluetooth module normally working]
2	Vcc	+5V Positive supply needs to be given to this pin for powering the module
3	Gnd	Connect to ground
4	TXD	Serial data is transmitted by module through this pin (at 9600bps by default), 3.3V logic
5	RXD	Serial data is received by module through this pin (at 9600bps by default),3.3V logic
6	State	The pin is connected to the LED on the board to represent the state of the module

Table: 1

HC-06 Features and Electrical characteristics-

- Bluetooth protocol: Bluetooth V2.0 protocol standard
- Power Level: Class2(+6dBm)
- Band: 2.40GHz—2.48GHz, ISM Band
- Receiver sensitivity: -85dBm
  USB protocol: USB v1.1/2.0
- Modulation mode: Gauss frequency Shift Keying
- Safety feature: Authentication and encryption
- Operating voltage range: +3.3V to +6V
- Operating temperature range: -20ºC to +55ºC
- Operating Current: 40mA

HC-06 Bluetooth Module Advantages-

- HC-06 is the best option when short distance wireless communication is needed. The module is used for wireless communications of less than 100 meters.
- The module is very easy to interface and to communicate.
- The module is one of the cheapest solutions for wireless communication of all types present in the market.
- The module consumes very less power to function and can be used on battery operated mobile systems.
- The module can be interfaced with almost all controllers or processors as it uses UART interface.

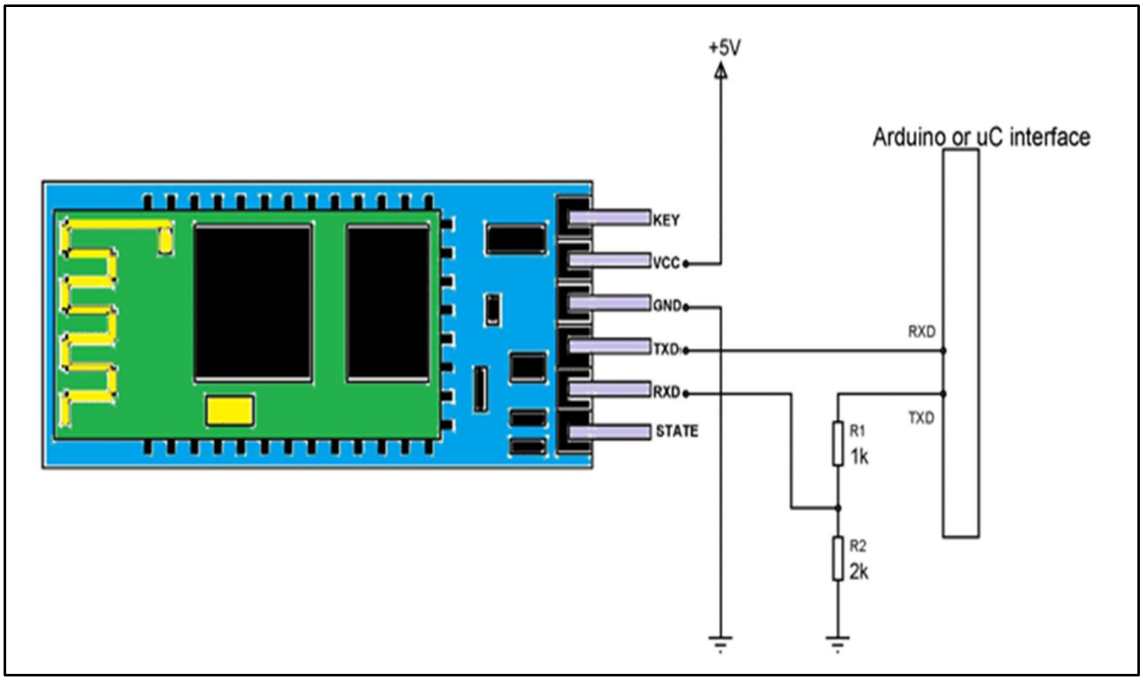


Figure 2

HC-06 and Arduino-

Bluetooth is a type of wireless communication used to transmit voice and data at high speeds using waves of radio. It's widely used in mobile phones for making calls, headset and share data. This type of communication is a cheap and easy way to control something remotely using Arduino.

HC-06 module has 4 pins to be connected to Arduino, they are:

- RXD
- TXD
- VCC
- GND

RXD will receive data from Arduino; TXD will send data to Arduino; VCC is the power supply (3.3V 6.6V) and GND is the ground.

The sketch for this Project is very simple, all you have to do is check the serial port if there's data available.

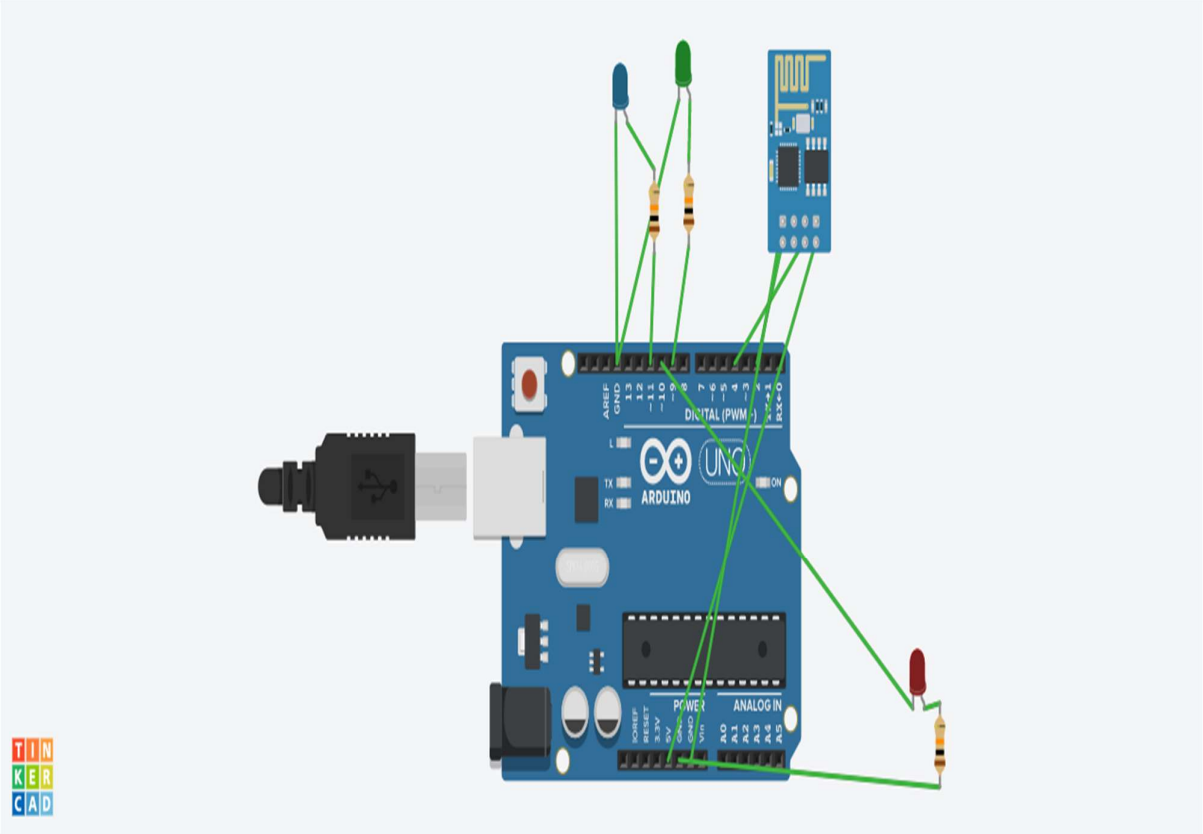


Figure 3

The first screen of the apk is shown above, click at ‘Paired Devices’. It’ll list all the paired devices, then you select the Bluetooth module you’ve paired before.

1. Color Wheel Selector is available for users to make a selection.

2. Color Wheel Selector then sends current values/settings from the Color Wheel Selector to Arduino through Bluetooth.

3. The user can turn on and off led with TURN ON and TURN OFF buttons

4. Blink feature will blink the LED continuously.

CHAPTER 4

METHODOLOGY

Problem Statement: Automated Bluetooth RGB Led controller

4.1 DRAWBACKS OF EXISTING WORK

- Limited range: As mentioned previously, Bluetooth technology has a limited range, which may restrict the ability of users to control the LED lights from a distance or if there are obstacles in the way.
- Requirement for a separate device: Users would need to have the Bluetooth-enabled device in order to use the color wheel and control the LED lights. This may not be as convenient as a solution that allows users to control the lights directly from their phone.
- Compatibility issues: Depending on the specific Bluetooth LED lighting system, it may only be compatible with certain devices or operating systems. This could limit the number of users who are able to control the lights and create potential difficulties for users with incompatible devices.
- Security concerns: Bluetooth technology has the potential for security vulnerabilities, such as the risk of unauthorized access or hacking. This could be a concern for users who are interested in controlling their LED lights through a secure connection.

4.2 PROPOSED TECHNIQUE

The proposed technique of developing a phone application could address these drawbacks by providing an additional control method that allows users to control the LED lights directly from their phone. The phone application could potentially have a wider range of customization options, such as a color wheel with a larger selection of colors and the ability to create custom effects. By offering both the color wheel on the Bluetooth-enabled device and the phone application as control options, users have more flexibility and convenience in controlling their LED lighting system.

CHAPTER 5

IMPLEMENTATION

5.1 ANDROID STUDIO

Android Studio provides many excellent features that enhance productivity when building Android apps, such as a blended environment where one can develop for all Android devices, apply Changes to push code and resource changes to the running app without restarting the app, a flexible Gradle-based build system, a fast and feature-rich emulator, GitHub and Code template integration to assist you to develop common app features and import sample code, extensive testing tools and frameworks, C++ and NDK support, and many more. So, we have prepared a complete Android Studio tutorial that will help the Android Developer to get more familiar with Android Studio.

5.2 FEATURES OF ANDROID STUDIO

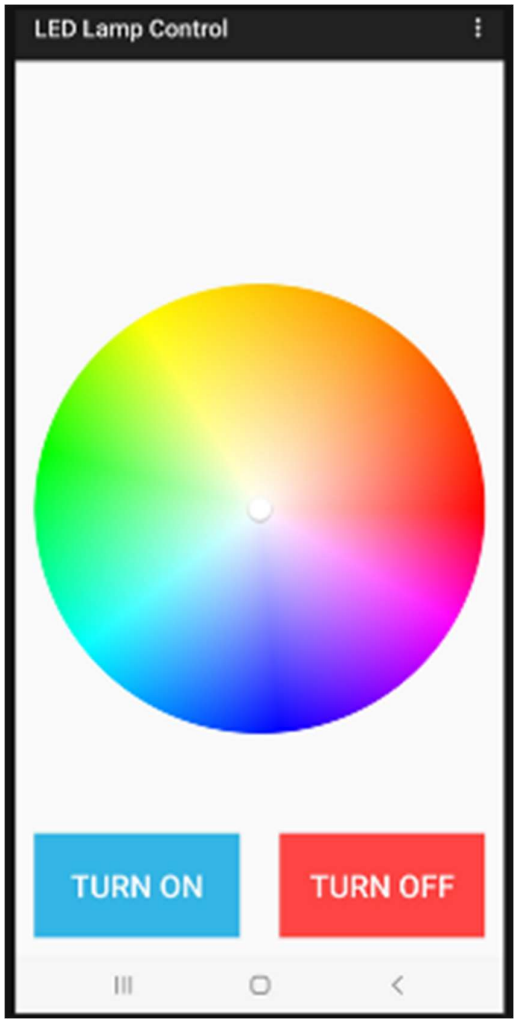
- It has a flexible Gradle-based build system.
- It has a fast and feature-rich emulator for app testing.
- Android Studio has a consolidated environment where we can develop for all Android devices.
- Apply changes to the resource code of our running app without restarting the app.
- Android Studio provides extensive testing tools and frameworks.
- It supports C++ and NDK.
- It provides built-in support for Google Cloud Platform. It makes it easy to integrate Google Cloud Messaging and App Engine.

5.3 WORKFLOW

- Set up an Android development environment by installing Android Studio and creating a new project.
- Connect the HC-05 module to the computer and make sure that it is visible to the Android app. You may need to install the appropriate drivers or libraries to enable communication with the module.
- Use the Android Bluetooth API to scan for available Bluetooth devices and establish a connection with the HC-05 module.
- Create a user interface for the app, such as a color wheel or a set of sliders, that allows the user to select a color.
- Use the Android Bluetooth API to send commands to the HC-05 module to change the color of the LED based on the user's selection. The HC-05 module will then communicate with the LED using a protocol that you will need to implement, such as serial communication over UART.

- Test the app to make sure that it is functioning correctly and that the LED is changing color as expected.

User interface



5.4 HARDWARE PROGRAMMING

Hc Module

- TX -pin 2
- RX pin 4
- VCC 5v

- GND-GND

RGB LED

- Red to Pin 10 of Arduino
- Blue to Pin 11 of Arduino
- Green to Pin 9 of Arduino
- Anode to 5V If Strip Gnd of driver to gnd of Arduino

Arduino Programming

```
#include <SoftwareSerial.h>

SoftwareSerial mySerial(2, 4); // RX, TX

/* LED strip */

// Pin assignment

int blue = 11;

int red = 10;

int green = 9;

bool ledStripState = false; // on == true; off == false;

/* Bluetooth serial comm. */

char character;

String command;

/* User Functions */

void ledStripOn();

void ledOldColor();

void ledStripOff();

void ledBlink();

void commWithBT()
```

```
{
 while (mySerial.available() > 0)
 {
  character = mySerial.read();
  command.concat(character);
  Serial.print(character);
  delay(1);
 }
 if (command == "LED_ON")
 {
  ledStripOn();
  //ledOldColor();
  ledStripState = true;
 }
 else if (command == "LED_BLINK")
 {
  ledBlink();
  ledOldColor();
  ledStripState = true;
 }
 else if (command == "LED_OFF")
 {
  ledStripOff();
  ledStripState = false;
```

```
  }
  //RGB_RRRGGGBBB
  else if (command.indexOf("RGB_") == 0)
  {
    Serial.println();
    String cmd = command.substring(4, 7);
    int value = cmd.toInt();
    Serial.println(value);
    analogWrite(red, value);
    cmd = command.substring(7, 10);
    value = cmd.toInt();
    Serial.println(value);
    analogWrite(green, value);
        cmd = command.substring(10, 13);
    value = cmd.toInt();
    Serial.println(value);
    analogWrite(blue, value);
  }
  command = "";
}
void ledStripOn()
{
  digitalWrite(red, HIGH);
  digitalWrite(green, HIGH);
```

```
  digitalWrite(blue, HIGH);
}
void ledStripOff()
{
  digitalWrite(green, LOW);
  digitalWrite(blue, LOW);
  digitalWrite(red, LOW);
}
void ledBlink()
{
   for(int i=0;i<100;i++)
{
  ledStripOn();
  delay(1000);
  ledStripOff();
}
  }
void setup()
{
  Serial.begin(115200);

  pinMode(9, OUTPUT);
  pinMode(10, OUTPUT);
  pinMode(11, OUTPUT);
```

```
  mySerial.begin(9600);
 }
void loop()
{

  if (mySerial.available() > 0)
  {
    commWithBT();
  }
}
```

CHAPTER 6

TESTING AND DEBUGGING

6.1 - TESTING PROCEDURES-

Unit testing: Unit testing is a software testing method that involves testing individual units or components of the app to ensure they are working correctly. In the context of your Android LED control app, this could include testing the color wheel interface, Bluetooth communication, and LED control functionality separately.

User testing: User testing involves getting feedback from actual users of the app to see how it performs in a real-world setting and to identify any issues or areas for improvement. This could involve recruiting a small group of volunteers to test the app and providing them with a set of tasks to complete, or it could involve releasing a beta version of the app to a larger group of users and gathering feedback through in-app surveys or a feedback forum.

Hardware testing: To test the hardware component of the project (e.g. the Arduino microcontroller and LED light), you can verify that the hardware is set up correctly and functioning as expected. This could involve checking connections, power supply, and any other hardware settings.

Communication testing: If the app communicates with the hardware over Bluetooth or another communication protocol, you can test that the communication is working correctly. This could involve sending test messages back and forth between the app and hardware and verifying that they are received and processed correctly.

Integration testing: Once the hardware and software components are working independently, you can test that they are functioning correctly when integrated together. This could involve running the app and observing the behavior of the hardware (e.g. checking that the LED light changes color as expected).

6.2 DEBUGGING TECHNIQUES

Using log statements: One common technique for debugging Android apps is to use log statements in the code to print out messages or variables at certain points during execution. These log messages can be viewed using the Android Studio logcat console or by using a log file. This can help you identify where errors are occurring or what values are being used at different points in the code.

Replicating error conditions: Another useful technique is to try and replicate the error conditions under which bugs occur. This can help you narrow down the cause of the issue and find a solution more quickly. For example, if the app is crashing when a certain button is pressed, you could try pressing the button multiple times in different scenarios to see if you can reproduce the crash and identify the root cause.

CHAPTER 7

RESULT, FUTURE SCOPE AND CONCLUSION

7.1 RESULTS

Once the code is uploaded, you will need an Android App to control the LED Color. This Application enables us to connect the phone and the Arduino board through Bluetooth. Hence the RGB lights work according to the color selected.

Bluetooth automated LED lights allow you to control the color and brightness of your lights from any Bluetooth-enabled device such as a smartphone or tablet. You can set schedules, adjust brightness levels, and choose from a range of colors to match your mood or environment. In addition, these lights can be programmed to turn on and off at certain times of the day, making them an ideal energy-saving solution for any home or office

7.2 FUTURE SCOPE

Getting a light to turn on and off may sound easy and probably even useless. But if we come to think of it, there's much more to this project than just this much. The project can just be modified a little bit to have real life implementations which would do wonders.

Imagine having something similar in the Kitchen. A kitchen area with a LED strip/ lamp placed on top of the stove, preferably as long as the kitchen bench. What if this was controlled automatically by an Android phone? The phone could be made to automatically connect to the controller device for the LED strip/lamp, via Bluetooth, & turn on/off the lamp whenever a person enters/leaves.

Not only that, the device could be made smarter by using an LED strip of light which changes colors/patterns on receiving phone calls/messages. This would really be an added advantage as the kitchen is generally a noisy place with the air extractor, microwave, blender and other appliances used frequently. Some kind of hands-free notifications in such environments would surely be appreciated.

i. With LED lighting, we can use the power of color to create a sense of warmth, vibrance, creativity, power and more.
ii. Chromotherapy or color therapy is based on the premise that colors and light can be used to correct physical ailments. Depending on the location and nature of the ailment a specific color may ease it.
iii. Each color and shade of a light can invoke an emotional response. In many ways, a

color and its meaning are deeply ingrained into each of us.

iv. Music sync: with a built-in sensitive microphone, we can change the light colors to the beat of the music.

v. Effects: The phone application could include various effects that can be applied to the LED lights, such as flashing, fading, or transitioning between colors.

vi. Scheduling: Users may be able to set schedules for the LED lights to turn on and off at specific times or on certain days of the week.

vii. Custom configurations: Users may be able to create and save custom lighting configurations for different occasions or moods.

7.3 CONCLUSION

a. This shift from wired to wireless solutions for networked lighting control is being driven by three main advantages of wireless systems: lower cost, greater design flexibility, and future extensibility.

b. The automation system connects with the smartphone through Bluetooth. The smart phone sends control signals to switch home appliances ON or OFF by an android app through Bluetooth interface. Smart lighting is an advanced way to light your home

c. Bluetooth LE, enable the LED lighting system to be more intelligent, energy efficient, and convenient lighting system

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