CHAPTER-1

INTRODUCTION

Conventional lighting systems represent mainly incandescent light bulbs and compact fluorescent lights (CFLs).LED lighting system provides advantages over conventional lighting systems in terms of better energy efficiency, better energy costs, longer lifetime, less temperature senility, higher light output, more customizable options with respect to color and brightness. LED is semiconductor Technology that emits light at the junction of oppositely charged materials when voltage forces electron movement.

Different types of wireless network technology such as Bluetooth, WIFI, make the LED Control System more effective. Using these technology LED bulbs are easy to control from far distance through an Android Application.

The main objectives of this project are to implement an auto-intensity control of LED-based on LDR which is interfaced to an Arduino board. As the surrounding light decreases slowly from evening to night, the light intensity gradually increases and then gets gradually decreased from night to early dawn hence saves energy .Thus, the lights switch on at the dusk and light intensity increases till midnight and regressively decrease till dawn and then finally switch off automatically. The application includes: park lights, street lights, hospital lights, head light in automobile and many unexplored options where there is a need for more control over the light.

In this project we design a LED Control System that can be controlled using a Android based mobile device, using the Arduino Uno R3 and HC-05 Bluetooth Module. Here, the HC-05 Bluetooth Module is connected to the LED Controller App, that we have designed and can be installed on any Android based smartphone with an Android version above 5.0. The App can be used to turn on/off LED, and we also have the added features of controlling the brightness automatically depending on the amount of luminous energy in the environment, and color of the LED Bulb. The Application also contains additional features that give special light effects to the surroundings.

1.1 OBJECTIVE OF THE PROJECT:

The goals and objectives of the LED Control System through Mobile App are as follows:

- User needs to connect to LED using a Bluetooth connection.
- User can switch on or off the LED.
- User can set the color of the LED of his choice
- User can select to automatically change the brightness, or change them manually.
- User can add effects, Fade and Multi-Coloring.
- Makes system interface much interactive so that it can help elder people control electronics devices.

1.2 SCOPE OF THE PROJECT:

This "**LED CONTROL SYSTEM THROUGH MOBILE APP**" project is to demonstrate how we can control a LED bulb efficiently using this designed Android Mobile Application, LED Controller, installed on our android based mobile device. The project also demonstrates that this Application can be implemented not only in homes but also in malls, complexes, offices, stadiums, etc. which require high frequency Bluetooth range. With a few certain required modifications, this project can be implemented for controlling more than one LED bulb as well. The project interface is very user friendly. It's designed such that even elder people who are not able to understand technology can use this with ease.

CHAPTER-2

SYSTEM REQUIREMENTS SPECIFICATION

The system services, constraints and goals are established by consultation with system user. They are then defined in detail and serve as a system specification. The hardware and software components of a computer system that are required to install and use software efficiently are specified in the SRS. The minimum system requirements need to be met for the program to run at all times on the system.

2.1 HARDWARE REQUIREMENTS:

- Arduino Uno R3 Micro Controller
- HC-05 Bluetooth Module
- LDR(Light Dependent Resistor) Sensor
- RGB LED's
- BreadBoard
- BreadBoard Jumper
- HC-05 Bluetooth Module

2.2 SOFTWARE REQUIREMENTS:

- MIT App Inventor 2
- Arduino IDE

CHAPTER-3

DESIGN

We are living in a world where our phones are able to make our daily lives much easier. The purpose and functionality of our phones are increasing rapidly. We find it increasingly useful and easy to control various aspects of our life through our mobiles as it saves us both time and energy.

3.1 EXISTING SYSTEM

The current system to control the man-made light sources like bulbs, we still use physical switches for which we need to manually turn on and turn off to control them. These switches have only two modes of operation that is switch on and switch off; there is no intermediate level that can be set according to the surrounding lighting. It is not efficient to use this type of switches in this modern era. Even though the technology of the upcoming LED (Light Emitting Diode) bulbs allows us to change the brightness and colors of the bulb, we are restricted by the physical switches to control them completely.

3.2 PROBLEM STATEMENT

The problem with the current system is we cannot control the color and brightness of the RGB-LED Bulb easily based on the user's requirement. The brightness of the bulb does not change according to the amount of the light in the environment. The user cannot switch the LED ON/OFF from anywhere in the house but has to physically control it at the location of the switch.

3.3 PROPOSED SYSTEM

In this project, we propose an advanced light control system which is capable of replacing the old generation light control system. The main purpose of our mobile controlled bulb system is to control and modify the brightness and color of the LED bulb through an Android Mobile Application installed on our phone. The system is also equipped with a photo sensitive detector (LDR - Light Dependent Resistor) so that the brightness can be set

automatically depending on the amount of luminous energy in the environment at that moment of time. This Application is also built with other functionalities that gives special light effects to the surroundings, Fade that automatically increments and decrements the brightness values gradually, and Multi-Coloring that changes the LED color gradually.

At first, the Mobile device is connected to the HC-05 Bluetooth Module, which establishes a Bluetooth connection between the Mobile device and the LED. The Arduino Uno board is connected to HC-05 Bluetooth Module and LED circuit. The Arduino Uno Board contains a code embedded in its memory that performs actions on the LED according to input received by the user through HC-05 Bluetooth Module from the user's Mobile Device.

3.4 CIRCUIT DIAGRAM

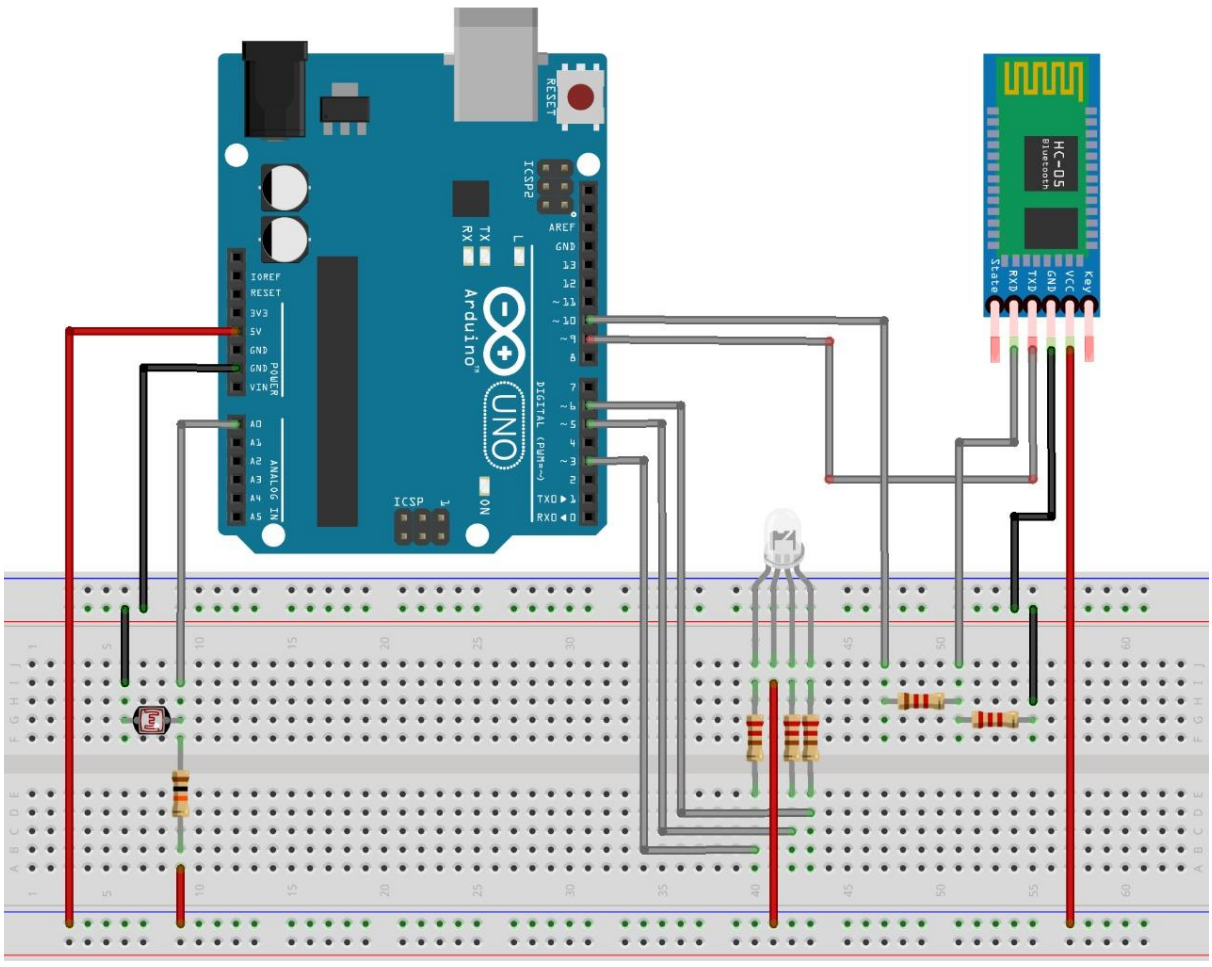

Figure 3.1 SCHEMATIC DIAGRAM OF LED CONTROL SYSTEM

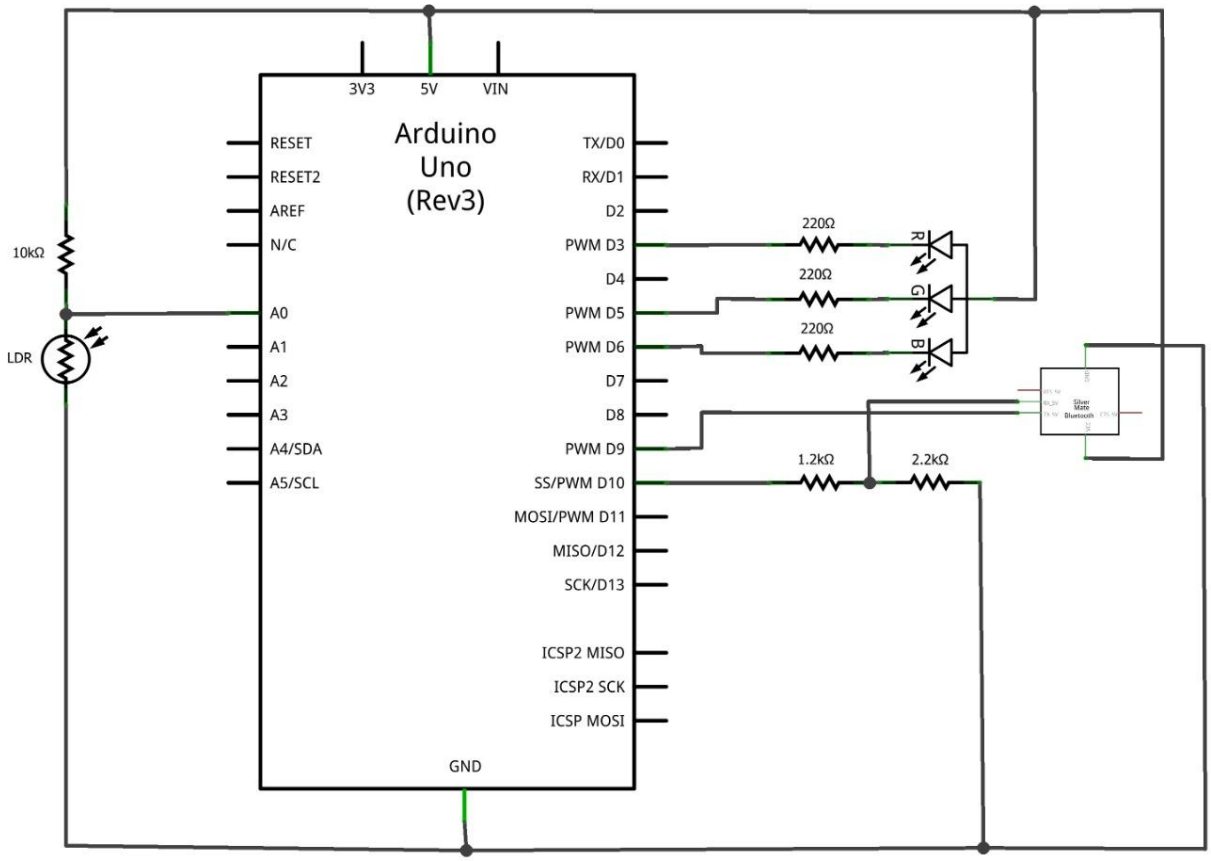

Figure 3.2 CIRCUIT DIAGRAM OF LED CONTROL SYSTEM

CHAPTER-4

CODING

ARDUINO CODE:

This code is uploaded into the Arduino Uno R3's board memory which performs the task of receiving the values sent from the Android Mobile Application through a HC-05 Bluetooth Module. These values are then processed by the below code and necessary actions are performed as per the user's input.

ANDROID CODE:

This Mobile Application, LED CONTROLLER, is created using MIT App Inventor 2 in which we are to design blocks to add functionality to an Android Application.

BLOCKS

1. Initialize Red, Green, and Blue Sliders to their respective colors.

2. Bluetooth Activity to connect and disconnect it the Bluetooth of the LED Control System and display the connection status on top of the screen.

3. Activity to create a toggle button to On / Off the LED.

4. Updating Red, Green and Blue Sliders on change in its position, and sending the data to Arduino through Bluetooth.

5. Updating Brightness Slider on change in its position, and sending the data to Arduino through Bluetooth.

6. Sending Auto-brightness Checkbox value to Arduino through Bluetooth.

7. Fade Activity to create a toggle button to On / Off the effect.

8. Multi Coloring Activity to create a toggle button to On / Off the effect.

CHAPTER-5

TESTING

Software testing is a process of executing a program or application with the intent of finding the software bugs. It can also be stated as the process of validating and verifying that a software program or application or product meets the business and technical requirements that guided its design and development works as expected.

5.1 CODE TESTING

This is done side by side with coding. This examined the logic of our program. Every path of program was tested.

5.2 UNIT TESTING

In computer programming, unit testing is a software testing method by which individual units of source code, sets of one or more computer program modules together with associated control data, usage procedures, and operating procedures, are tested to determine whether they are fit for use. Intuitively, one can view a unit as the smallest testable part of an application. In procedural programming, a unit could be an entire module, but it is more commonly an individual function or procedure.

In object-oriented programming, a unit is often an entire interface, such as a class, but could be an individual method. Unit tests are short code fragments created by programmers or occasionally by white box testers during the development process. It forms the basis for component testing.

5.3 INTEGRATION TESTING

Integration testing is the phase in software testing in which individual softwares modules are combined and tested as a group. It occurs after unit testing and before validation testing. Integration testing takes as its input modules that have been unit tested, groups them in larger aggregates, applies tests defined in an integration test plan to those aggregates, and delivers as its output the integrated system ready for system testing.

5.4 VALIDATION TESTING

Validation testing ensures that the product actually meets the client's needs. It can also be defined as to demonstrate that the product fulfils its intended use when deployed on appropriate environment.

5.5 OUTPUT TESTING

After performing the validation testing, the next step is output testing of our project since no system could be useful if it does not produce the output in the required format. Output with the format reguired by the user is compared.

5.6 TESTING CASES

SL No	Use case	Description	Expected result	Status
1.	Bluetooth connection test.	Bluetooth connection and disconnection to LED device on clicking CONNECT and DISCONNECT button respectively.	Successful connection and disconnection to LED device.	Passed.
2.	Displaying LED connection status.	Displaying "LED CONNECTED" or "LED NOT CONNECTED" on respective Bluetooth activity.	Display of the appropriate LED connection status successfully.	Passed.
3.	Turing the LED ON/OFF.	Turing the LED on or off on clicking the ON/OFF button.	Successful turning on and off of LED.	Passed.
4.	Color preview.	Displaying appropriate color preview based on the position of red, green.and blue sliders.	Successful display of color preview.	Passed.

5.	LED Color change.	The LED emits the light based on the color preview displayed	Color of the light emitted by LED is changed successfuly.	Passed.
6.	Manual Brightness change.	The brightness of LED is changed based on position of brightness slider.	Successful change in brightness of LED.	Passed.
7.	Automatic brightness change.	The brightness of LED is changed automatically on checking the Auto brightness checkbox “Auto”.	Successful change in brightness of LED automatically based on the light intensity in the environment.	Passed.
8.	Light Fading effect.	Toggling the LED light fade effect on clicking the FADE ON/OFF button.	Successful fading effect of LED light is seen.	Passed.
9.	Light Multi coloring effect	Toggling the LED light multi color effect on clicking the MULTI COLORING ON/OFF button.	Successful multi coloring effect of LED light is seen.	Passed.

CHAPTER-6

SCREENSHOTS

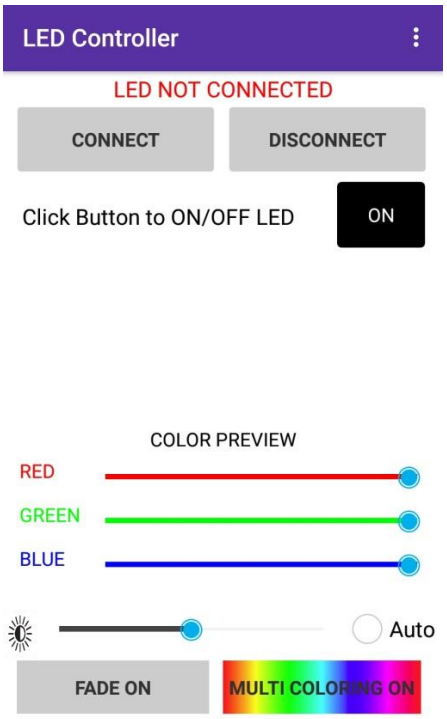

Figure 6.1 STARTUP SCREEN

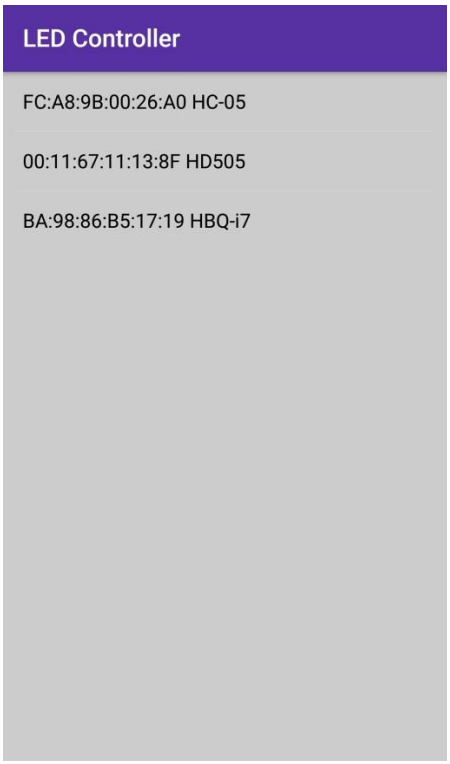

Figure 6.2 BLUETOOTH DEVICES LIST

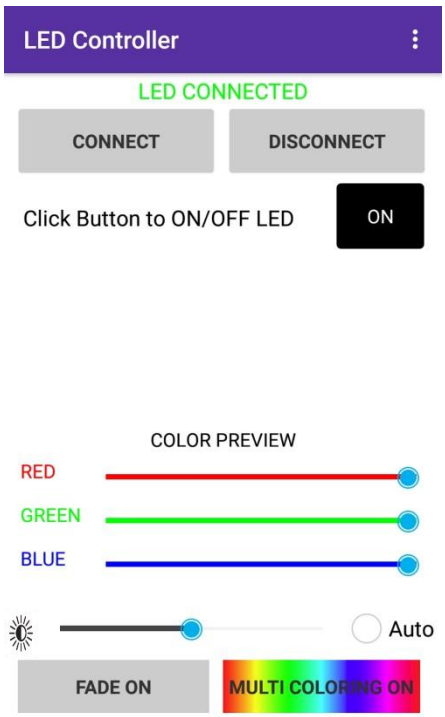

Figure 6.3 CONNECTED TO LED

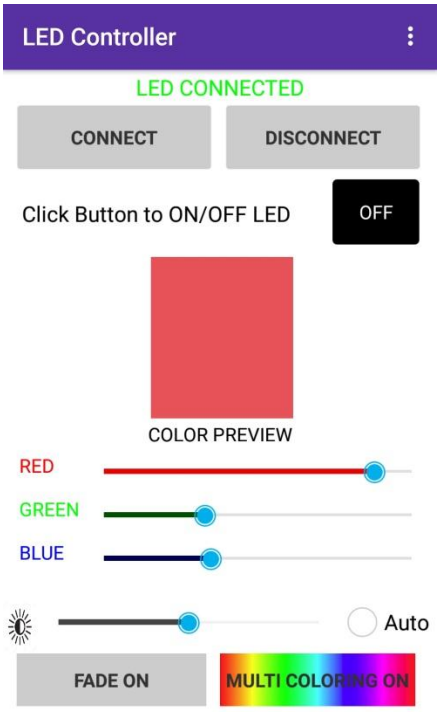

Figure 6.4 LED COLOR CHANGE

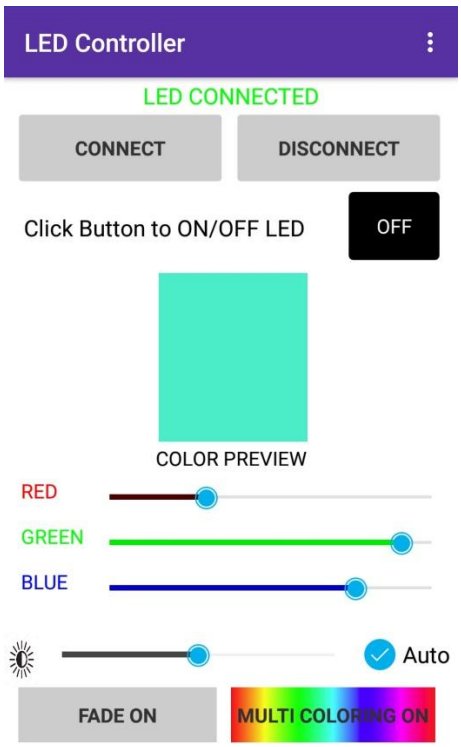

Figure 6.5 AUTO BRIGHTNESS ENABLED

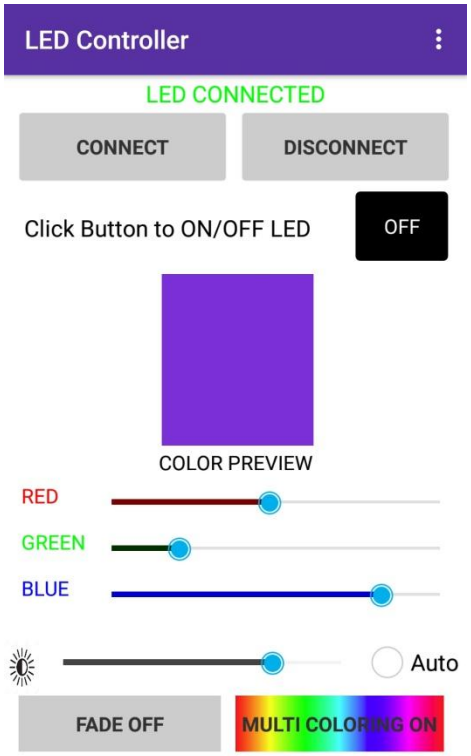

Figure 6.6 FADE EFFECT ENABLED

CHAPTER-7

CONCLUSION

The "**LED CONTROL SYSTEM THROUGH MOBILE APP"** project will provide a competent method for controlling RGB LED and make the whole process of energy saving easier and efficient. With a capability to change the amount of light emitted depending upon the environment is no doubt an innovation with many future applications like the fact that it can also be used to set color based on our requirement. The usage of the LED control system through android based mobile app will undoubtedly change the world that we see today.

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