NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

Project Report

Title:

Wireless LED RGB Light

Prepared by:

Mohammed Omer Ali 1NH18EE031

Rachana R 1NH18EE044

Rutik Laxman: 1NH18EE048

Guided By:

Mr. Ramakrishnan S

Asst. Professor

Dept. of Electrical and Electronics, NHCE

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CERTIFICATE

Certified that the Mini Project work entitled "**Wireless LED RGB Light**" carried out by "M.D. Omer Ali 1NH18EE031", "Rachana R 1NH18EE044", "Rutik Laxman: 1NH18EE048" students of New Horizon College of Engineering submitted the report in completion of project at Department of Electrical and Electronics Engineering, New Horizon College of Engineering during the Academic Year 2019-20. It is certified that all the corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for said Degree.

Project Guide

Mr. Ramakrishnan S

HOD-EEE

Dr. S. Ramkumar

Abstract

In this mini project, an RGB light-emitting diode (LED) lamp was designed for a smart home system. The ultimate aim of this project is to produce an energy-efficient as well as an environmental-friendly lamp that is able to be utilized for primarily home light. The RGB light module is made-up of an ESP8266 micro-controller, which controls the brightness of the RGB LED lamp using pulse-width modulation (PWM). The RGB lamp itself is controlled by the user using Android-based application, which communicates via Wi-Fi (Wireless Fidelity) with a central host that passes the command to the lamp device through TCP/IP protocol. The RGB lamp that uses 42.8 mA current consumption in an idle condition and 603.1 mA in active condition for 12 VDC supply voltage.

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of ant task would be impossible without the mention of the people who made it possible, whose constant guidance and encouragement crowned our efforts with success.

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CHAPTER 1:

Introduction :

In recent years the depletion of petroleum product and the issue of environmental change have pulled in open consideration on vitality preservation and condition assurance. Governments and expert affiliations have progressively controlled the particular for "green" items and created the declaration instrument. As vitality utilization on lighting rises constantly, lighting hardware which is ecologically well disposed and has high vitality productivity ends up famous. Vitality and cost would then be able to be spared through the improvement of lighting productivity. Among all the lighting items, Light Emitting Diode (LED) is one of most encouraging light sources since LED gives a few remarkable qualities including little size, directional light emanation, cold temperature activity, and controllability. With the improvement of related innovations, LED currently can be broadly applied on different territories. Applications from family apparatus to indoor lighting are regular in the day by day life. Moreover, the advanced cells and tablets have introduced another way of life for individuals. Many control frameworks have been created and incorporated with applications (APPs) of advanced mobile phones and tablets. Clients can download the APP and afterward remotely control the family unit machine, which is altogether different from conventional ways. In this paper, a LED lighting control framework dependent on the Bluetooth remote system is proposed. Fig.1 shows the framework chart. Through the association between Bluetooth in the PDA and the Bluetooth module, sign and order are transmitted remotely. Clients can control the brilliance and shades of LEDs by APP on Android framework. Incorporated with micro-controller, a remote RGB LED darkening control framework is likewise executed.

The light-emitting diode (LED) has been drawing a lot of consideration as a cutting-edge illuminator as a result of its various preferences, including vitality investment funds, long lifetime. Red-green-blue (RGB) LEDs can give a wide shading extent to LCD backdrop illumination, just as full shading customizability for general lighting applications. This recently created illuminant is the main light source at present fit for this sort of distinctive and dynamic lighting execution. In any case, the tunable light yields have been found to initiate light consistency issues for RGB LED

lighting, on the grounds that the radiant force and shading yields are effectively affected by intersection temperature varieties brought about independent from anyone else warming of the LEDs and aggravations in encompassing temperatures. Accordingly, appropriate control systems are required to balance out light yield, so as to neutralize temperature varieties. In our undertaking we have considered every one of the parameters and we have structured the circuit so that it tends to be steady on a similar current yield for longer time and we have utilized a warmth sink to disperse warmth created by the LED.

CHAPTER 2:

Literature survey:

Inorganic luminescent materials have wide applications in numerous optoelectronic gadgets, for example, shows, sensors, light transmitting diodes and so on. The exploration on strong state lighting dependent on phosphor changed over white light transmitting diodes (pc-WLEDs) has picked up a unimaginable drive in the previous decade because of their inborn favorable circumstances and wide applications. pc-WLEDs have a few points of interest over regular lighting advancements: long lifetime, high iridescence proficiency, low power utilization and so forth are some of them.

This section portrays a prologue to strong state lighting, methods for white light age what's more, fundamental ideas of phosphors including vitality forms, execution prerequisites, requirement for advancement of new red phosphors and so forth. The best in class in inquire about endeavors on red phosphors, explicitly Eu3+ actuated molybdate and tungstate-based phosphors for pc WLED applications is likewise included and the part winds up with a review of the ebb and flow research work.

Solid State Lighting:

Vitality is one of the significant contributions for monetary advancement of any nation. A significant and mounting utilization of vitality is the age of power. Productive utilization of power requires industrious vitality preservation endeavors. Vitality proficiency is accomplished at the point when vitality use in a particular item is decreased without influencing yield or client comfort levels. About 20% of power is utilized for lighting. The most generally utilized wellsprings of counterfeit enlightenment are glowing and fluorescent lights. Customary brilliant and fluorescent lights depend on either warming or release of gases. The two marvels are related with enormous vitality misfortunes that happen as a result of the high temperatures and huge Feeds movements included. There is a significant extent of decreasing vitality utilization through vitality proficient lighting plans. Strong state lighting (SSL) is rising as a profoundly capable field and a potential substitute to existing lighting advancements. The exploration on SSL has increased mind boggling

drive in the previous decade because of their inborn focal points of high light productivity, low vitality utilization, long assistance lifetime and sturdiness contrasted with ordinary light sources (Nakamura Set al 1994; Aanegola Set al 2003; Narukawa Yet al 2004; Rohwer L. S et al 2003). Lighting applications that utilization light transmitting diodes (LEDs), natural light transmitting diodes (OLEDs) or light emanating polymers are generally alluded to as strong state lighting (SSL). Not at all like glowing or fluorescent lights, which make light with fibers and gases encased in a glass bulb, strong state lighting comprises of semiconductors that convert power into light.

In 1907, H. J. Round covered light outflow from a silicon carbide intersection diode, which is the primary light producing diode (LED) ever. Autonomously, Losev watched discharge from ZnO and SiC diodes, as distributed in 1927 (Zheludev N et al 2007). Around then the capability of the innovation was not understood and the developments remained generally unnoticed. It was not until 1962 that the principal down to earth noticeable range LED was created, by Nick Holonyak at General Electric. In the decades that pursued, LEDs were utilized widely in numerical shows and flagging applications in light of the fact that the wavelengths created by semiconductor lasers have by and large been longer than 0.7 µm. Anyway this circumstance was totally changed with Shuji Nakamura's innovation, who effectively manufactured twofold hetero structure InGaN/GaN blue LED chips without precedent for 1993 and later in 1994 prevailing with regard to creating high power blue InGaN/AlGaN LEDs appropriate for business applications (Nakamura Set al 1994; 1997), which made it conceivable to utilize LEDs for general lighting. The activity of LEDs depends on unconstrained light outflow in semiconductors, which is because of the radiative recombination of abundance electrons and openings that are created by the infusion of current. Subsequently, LEDs are not restricted by the essential factors that still existed in traditional brilliant light and conservative fluorescent light (Schubert E. F et al 2005). Accordingly SSL offer exceptional guarantees that incorporate three significant advantages: (I) Tremendous vitality reserve funds empowered by proficient change of electrical vitality to optical vitality (ii) Substantial positive commitments to manageability through decreased outflows of worldwide warming gases, corrosive downpour gases and dangerous substances, for example, mercury (iii)

The making of new standards in lighting driven by the special controllability of strong state lighting sources. Because of the amazing idea of these advantages, the change from traditional lighting sources to SSL is for all intents and purposes guaranteed.

Color Rendering Index (CRI):

CRI is a proportion of how much the apparent shades of articles lit up by the source fit in with those of similar items enlightened by a reference hotspot for determined conditions (Kaufman 1. E et al 1972). It demonstrates how well a light source renders hue on a size of 0 - 100, contrasted with a reference light source. The test method built up by the International Commission on Illumination (CIE) includes estimating the degree to which a progression of eight institutionalized shading tests vary in appearance when enlightened under a given light source, comparative with the reference source. The normal move in those eight shading tests is accounted for as Ra or CRI. Notwithstanding the eight shading tests utilized by show, some lighting producers report a R9 score, which demonstrates how well the light source renders a soaked dark red shading. A CRI of 100 would speak to that all shading tests lit up by a light source being referred to would seem to have a similar shading as those equivalent examples lit up by a reference source.

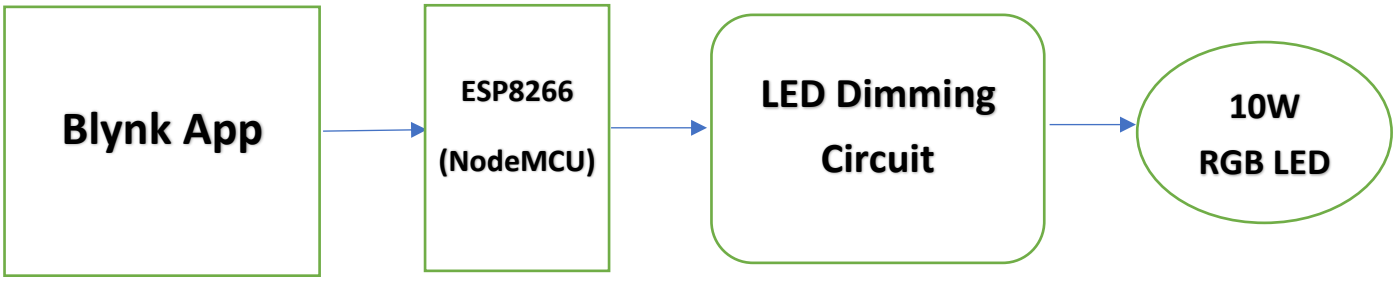
Luminous Efficacy :

Brilliant adequacy is a figure of legitimacy for light sources. The radiant adequacy of a light source is characterized as the proportion of the complete iridescent motion (lumens) to the power (watts or equal) (Kaufman J. E et al 1972). Contingent upon setting, the power can be either the brilliant motion of the source's yield or the absolute electric power devoured by the source. The lumen is characterized as 1/683 W of monochromatic green light at a recurrence of 540 x 1012 Hz (comparing to a wavelength of around 555 nm where the human eye is generally delicate). This implies the hypothetically achievable most extreme worth accepting total transformation of vitality at 555 nm would be 683 lm/W. The brilliant efficacies that can really be accomplished shift contingent upon the lights, yet consistently stay far underneath this perfect worth. The radiant adequacy is consistently in logical inconsistency with CRI, in light of the fact that a high CRI worth requires appropriate unearthly scattering over all the unmistakable range which would make the iridescent adequacy far beneath 683 lm/W. In this manner adjusted estimations of these two parameters are embraced for various lighting events.

CHAPTER 3:

Proposed System Design:

Block Diagram:



SCHEMATIC:

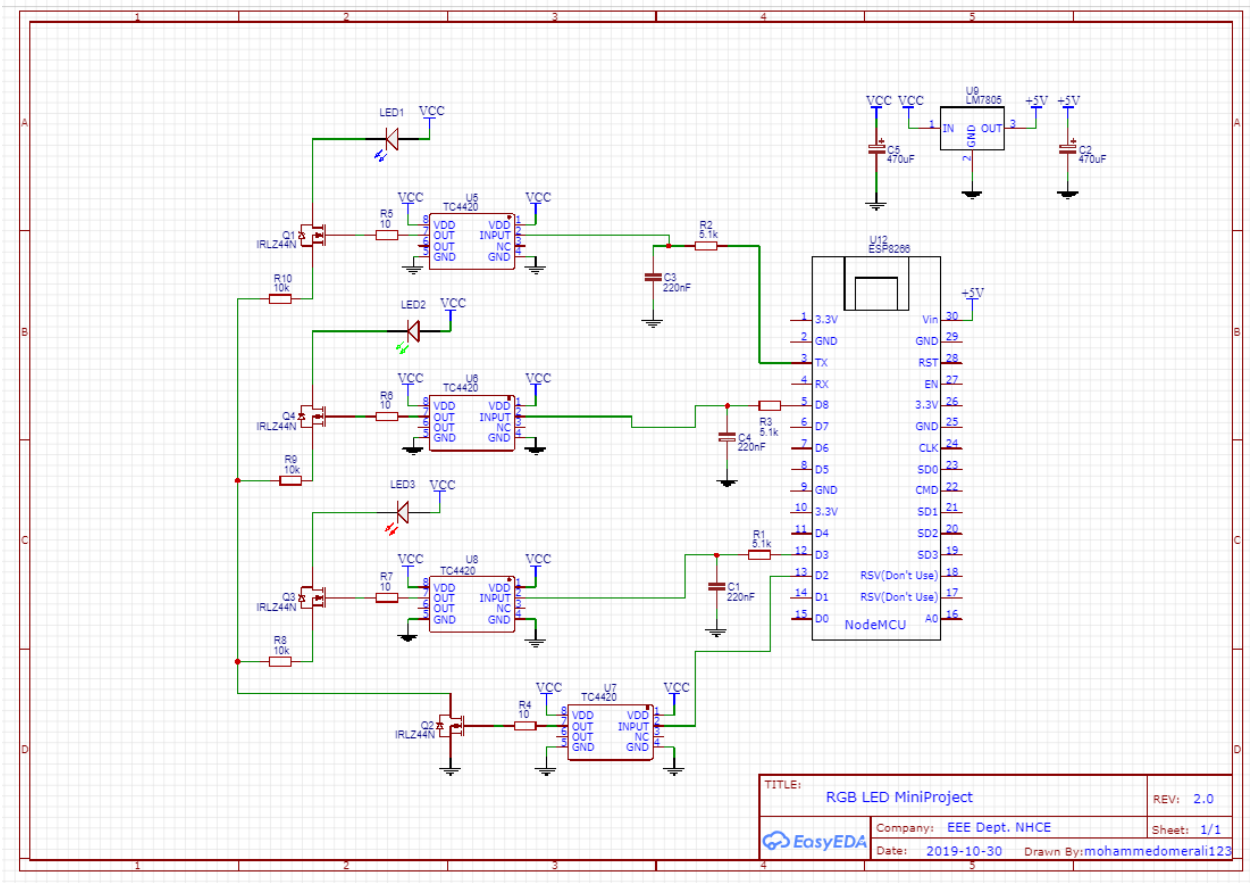


Fig 3.1

The circuit designed for the LED has a main role in controlling the dimming of the LEDs. In the schematic the GPIO pins of the ESP8266 are connected to a MOSFET driver IC (TC4420) through a RC low pass filter to eliminate a particular frequency of the digital cycle. Then form the MOSFET driver to the gate of the MOSFET (IRLZ44N). this MOSFET is a logic level MOSFET where 5V supply is to be given to TRIGER the switching mechanism of the FET. The gate terminal of the MOSFET drivers the drain terminal across source which is connected to the ground. Then this same process the again given for all the three colors of the LED.

The circuit is now complete and we have a proper working LED dimming circuit. We now need a switch to turn ON/OFF our LED. Thus, to create a switch we take another MOSFET and connect all the source terminals of the remaining three MOSFETs. Then the source of this MOSFET is now grounded. As we now have a switch our RGB LED module is ready to be powered. But however, we need to power up our reference voltage to drive the gate. Which in this case is the ESP8266. To power up the MCU we use a voltage regulator module. The output of the VRM is 5V which is sufficient to power our NodeMCU. The output of VRM goes to the Vin of the MCU. Now the circuit is fully complete and functional.

Now by designing this circuit I have learned that high power LEDs can be powered through a normal power supply according to its rating but they need a suitable heatsink cause the life of an LED is limited according to its thermal conductivity. And also, we got to know that not only LEDs but other light sources can be switched by just using simple logic level MOSFETs.

Here in this circuit we are using the IC TC4420 to charge and discharge the CIS(Gate capacitance across source). And now we also know that the LED starts to flicker if it does not get sufficient power supply. Therefor the above circuit can be termed as a “Constant current driver dimming circuit” of LED dimming.

CHAPTER 4:

ESP8266:

The ESP8266 is the name of a smaller scale controller planned by Espressif Systems. The ESP8266 itself is an independent Wi-Fi organizing arrangement offering as an extension from existing miniaturized scale controller to Wi-Fi and is likewise fit for running self-contained applications. This module accompanies a worked in USB connector and a rich combination of pinouts. With a miniaturized scale USB link, you can interface NodeMCU devkit to your PC and glimmer it without any issue, much the same as Arduino. It is additionally right away breadboard well disposed.

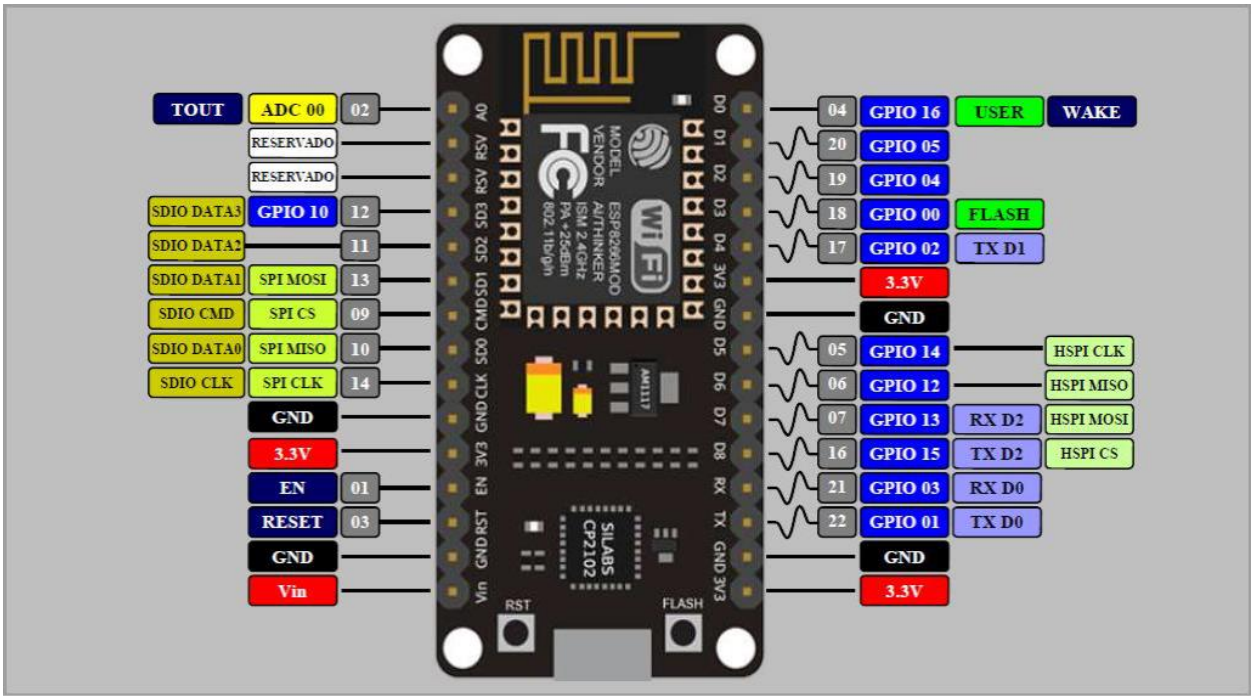


Fig 4.1

The most fundamental approach to utilize the ESP8266 module is to utilize sequential directions, as the chip is essentially a WIFI/Serial handset. Be that as it may, this isn't helpful. What we suggest is utilizing the cool Arduino ESP8266 venture, which is an altered variant of the Arduino IDE that you have to introduce on your PC. This makes it helpful to utilize the ESP8266 chip as we will utilize the outstanding Arduino IDE. Following the beneath venture to introduce ESP8266 library to work in Arduino IDE condition.

The GPIO(General Purpose Input/Output) enables us to access to pins of ESP8266 , every one of the pins of ESP8266 got to utilizing the direction GPIO, all the entrance depends on the I/O list number on the NoddMCU dev packs, not the inside GPIO stick, for instance, the stick 'D7' on the NodeMCU dev unit is mapped to the inward GPIO stick 13, in the event that you need to turn 'High' or 'Low' that specific stick you have to called the stick number '7', not the inner GPIO of the stick. At the point when you are modifying with conventional ESP8266 this disarray will emerge, which stick should be called during programming, in the event that you are utilizing NodeMCU devkit, it has come arranged for working with Lua mediator which can undoubtedly program by looking the stick names related on the Lua board. In the event that you are utilizing conventional ESP8266 gadget or some other merchant sheets please allude to the table beneath to know which IO list is related to the inward GPIO of ESP8266.

ESP8266 Pin	Description
CH_PD	Pull high, connect to Vcc +3.3V
Vcc	Power Supply +3.3V
TXD	Connect to RXD (white) of PL2303HX USB-Serial converter cable
RXD	Connect to TXD (Green) of PL2303HX USB-Serial converter cable
GPIO0	Pull low, connect to GND pin
GND	Power Supply ground

Table 4.1

Features

- ✓ 802.11 b/g/n
- ✓ Integrated low power 32-bit MCU
- ✓ Integrated 10-bit ADC
- ✓ Integrated TCP/IP protocol stack
- ✓ Integrated TR switch, balun, LNA, power amplifier and matching network
- ✓ Integrated PLL, regulators, and power management units
- ✓ Supports antenna diversity
- ✓ WIFI 2.4 GHz, support WPA/WPA2
- ✓ Support STA/AP/STA+AP operation modes

- ✓ Support Smart Link Function for both Android and iOS devices
- ✓ SDIO 2.0, (H) SPI, UART, I2C, I2S, IR Remote Control, PWM, GPIO
- ✓ STBC, 1x1 MIMO, 2x1 MIMO
- ✓ A-MPDU & A-MSDU aggregation & 0.4s guard interval
- ✓ Deep sleep power <10uA, Power down leakage current < 5uA
- ✓ Wake up and transmit packets in < 2ms
- ✓ Standby power consumption of < 1.0mW (DTIM3)
- ✓ +20 dBm output power in 802.11b mode
- ✓ Operating temperature range -40C ~ 125C
- ✓ FCC, CE, TELEC, WIFI Alliance, and SRRC certified

CHAPTER 5:

Blynk IoT Platform:

Blynk was intended for the Internet of Things. It can control equipment remotely, it can show sensor information, it can store information, visualize it and accomplish numerous other cool things.

There are three significant segments in the stage:

Blynk App - permits to you make stunning interfaces for your ventures utilizing different gadgets we give.

Blynk Server - answerable for every one of the interchanges between the cell phone and equipment. You can utilize the Blynk Cloud or run your private Blynk server locally. It's open-source, could undoubtedly deal with a huge number of gadgets and can even be propelled on a Raspberry Pi.

Blynk Libraries - for all the well-known equipment stages - empower correspondence with the server and procedure all the approaching and out-coming directions.

Presently envision: each time you press a Button in the Blynk application, the message goes to the Blynk Cloud, where it mysteriously discovers its way to your equipment. It works the equivalent the other way and everything occurs in a Blynk of an eye.

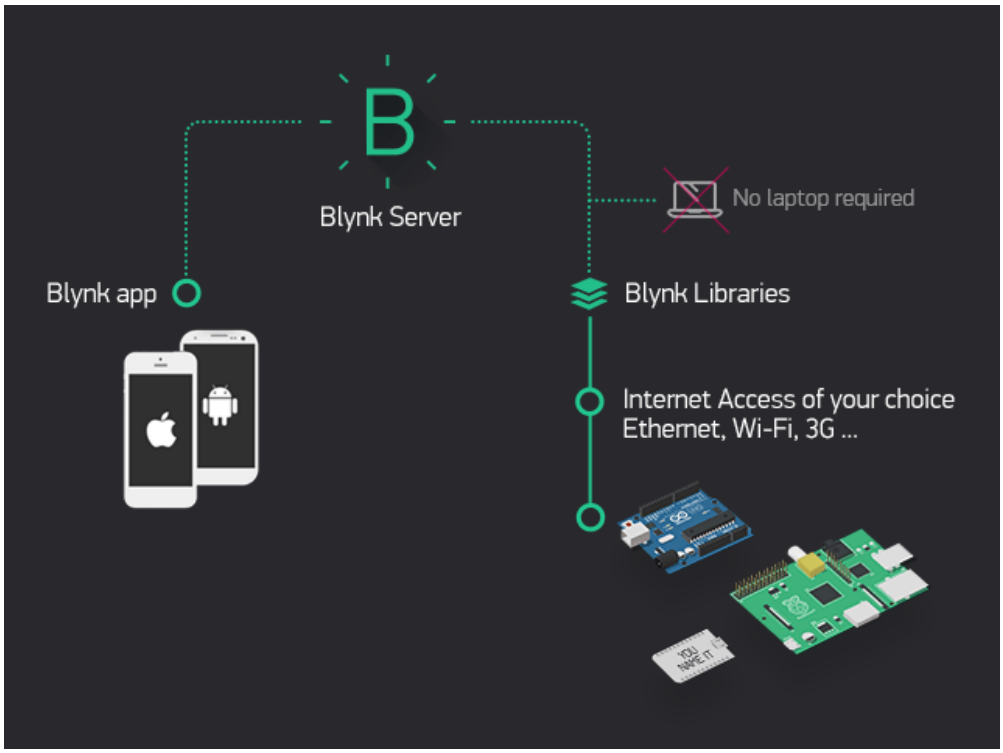

B
Blynk Server
No laptop required
Blynk app
Blynk Libraries
Internet Access of your choice
Ethernet, Wi-Fi, 3G ...

Fig 5.1

Program Written in Arduino IDE:

Fig 5.2

CHAPTER 6:

Conclusion:

By this project we can able to generate the multiple color using the primary colors RED, GREEN, BLUE. RGB LED is used for generating multiple colors. An RGB LED is basically three separate LEDS packed into a solitary 5 mm LED bundle. RED, GREEN, and BLUE can be combined in various proportions to obtain any color in the visible spectrum, using micro-controller. This project is also enabling the easiness of controlling home lighting system through any smartphone from anywhere and anytime. This project also focuses on environment friendly lighting system which in layman terms reduces the average light consumption throughout the house and also at the same time act as a multicolor light.

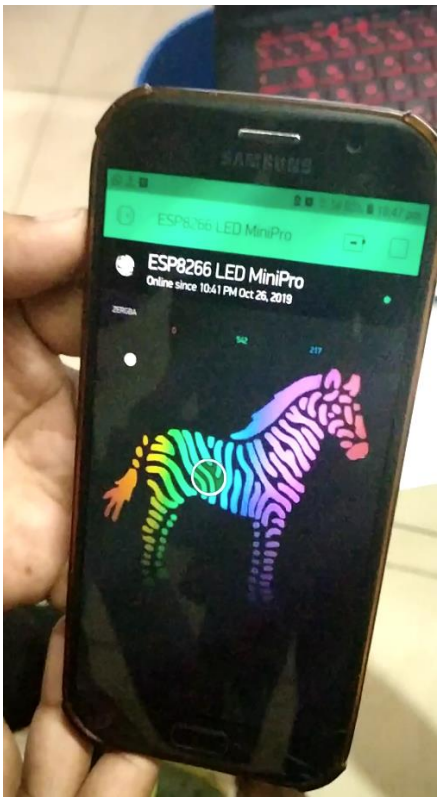


Fig 6.1(a)

Fig 6.2(b)

Future Scope of the Project:

RGB LEDs are the following enormous jump forward in light innovation. They beat brilliant bulbs, halogen bulbs and vitality sparing bulbs no matter how you look at it. They utilize fundamentally less vitality, last any longer and come in each shading possible.

RGBW LEDs are helpful for setting beautiful light accents to improve your living spaces and, gratitude to the extra diode, can too enlighten rooms equally with unadulterated white light. Capitalize on this advanced lighting innovation for your ventures now.

When progressive, LED innovation is currently settled and simple to-utilize. The mechanical division has since quite a while ago exploited the efficiencies of LED innovation and now the residential use can as well. RGB LED lights have gigantic degree and adaptability in structuring lighting plan in the home. For instance, you can utilize the shades of prudent RGB LED lights to program hues to coordinate your dispositions and for explicit circumstances. What's more, on account of cell phone innovation, the frameworks are a breeze to control. Interchange brilliant light or darkened light – RGB LED strips are flexible to the point that they can be customized to make whatever lighting atmosphere you wish. Notwithstanding bulbs with RGB abilities, RGBW lights can give an especially warm white light. They are not only a substitute for customary lighting innovation, they are an in all cases improvement as far as usefulness and administration life.

Appendix

The degree for utilizing RGB and RGBW LED lights is practically boundless. The innovation requires almost no space and is frequently housed in bulbs a similar size as ordinary glowing, halogen and fluorescent valve models. Accepting the correct retrofit attachment, they will likewise fit into many light attachments: from recessed spotlights to encompassing lights, way lighting in the nursery or work area lights. Use RGB LEDs for successful lighting in kitchens, examines, yards/doors, pathways and carports.

They are likewise perfect for air lighting all through the home. The straightforward decision of shading enables you to modify the lighting to suit your disposition, regardless of whether you are unwinding and getting a charge out of music, need an invigorating light for a night with visitors, or a quieting light for slowing down from work. RGBW LEDs additionally can give an amicable, uniform lighting for understanding corners, studies or pastime rooms, or anyplace else you have to limit eye strain or exhaustion.

The Indian Home Automation industry is relied upon to be over INR 30,000 crore by 2020. India stays an underserved showcase for home computerization items to a great extent because of significant expense of items and constrained brands and administration alternatives. Home Automation, till a couple of years back, stayed constrained to the well-to-do portion of the general public. The development and acknowledgment of innovation, new item configuration dependent on wi-fi network and innovation new companies reclassifying item highlights to make them increasingly moderate has opened a totally different undiscovered market for home Automation items in India. There has been an enduring development over the most recent couple of years yet significant metros like Mumbai, Delhi Bengaluru still remain the top areas as far as acknowledgment of this innovation.

The main target of this product is that it is very cost effective as it is well under 1000 INR and it is made if components that are readily and vastly available in INDIAN illumination markets.

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   Publisher. IEEE

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