NEW HORIZON
COLLEGE OF ENGINEERING
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade.

MINI PROJECT REPORT ON

"COLOR DETECTION TO AID COLOR BLIND"

SUBMITTED BY:

G Nithish Kumar (1NH18EC032)

A Mouneesh (1NH18EC011)

D Praneeth Kumar (1NH18EC028)

Under the guidance of

Ms.Aneeta S Antony

Senior Assistant Professor Dept. of ECE, NHCE, Bengaluru.

NEW HORIZON COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

Certified that the mini project work entitled "**Color Detection To Aid Color Blind**" carried out by **G Nithish Kumar (1NH18EC032), A Mouneesh (1NH18EC011), D Praneeth Kumar (1NH18EC028),**bonafide students of Electronics and Communication Department, New Horizon College of Engineering,Bangalore.The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

ProjectGuide		HOD ECE
Ms.AneetaS Antony		Dr.SanjeevSharma

External Viva

Name of Examiner Signature

with Date

ACKNOWLEDGEMENT

The satisfaction that accompany the successful completion of any task would be, but impossible without the mention of the people who made it possible, whose constant guidance and encouragement helped us succeed.

We thank **Dr. Mohan Manghnani**, Chairman of **New Horizon Educational Institution**, for providing necessary infrastructure and creating good environment.

We also record here the constant encouragement and facilities extended to us by **Dr.Manjunatha**, Principal, NHCE and **Dr. Sanjeev Sharma**, Head of the department of Electronics and Communication Engineering. We extend our sincere gratitude to them.

We sincerely acknowledge the encouragement, timely help and guidance by our beloved guide **Ms.Aneeta S Antony** who supported us to complete the project within stipulated time successfully.

Finally, a note of thanks to the teaching and non-teaching staff of Electronics and Communication department for their co-operation extended to us, and to all those who helped us directly or indirectly to successfully complete of mini project.

G Nithish Kumar (1NH18EC032)

A Mouneesh(1NH18EC011)

D Praneeth Kumar(1NH18EC028)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

In this project we have implemented a color sensor model using a Arduino mega 2560.A color sensor basically functions as a color detecting sensor which can be used in various fields such as food processing unit, help in identifying the color for a blind person etc. in this model the color of an object is identified by the color sensor(TCS 3200)by reading the color concentration of the particular object. The RGB displays the recognized color and the same is displayed in the LCD along with the concentration frequencies of red, green and blue.

The Arduino Mega 2560 isATmega2560 microcontroller board which is an Arduino series. When compared to basic UNO it has reset button and same crystal frequency oscillator of 16MHZ, but in contrast to UNO board it has a greater number of pins, i.e., 54 pins, which is dedicated of input and output. Among the 54 pins provided in the board, 14 pins as a provision of PWM, four of the pins are dedicated for serial communication purposes and finally 16 are used for analogy purpose.

Keywords: Arduino Mega 2560, RGB, TCS3200, color sensor

CHAPTER 1

INTRODUCTION

Sensors are detectors that have the ability to measure some type of physical quality that is happening, such as pressure or light. The sensor will then be able to convert the measurement into a signal that one will be able to read. Most of the sensors in use today are actually going to be able to communicate with an electronic device that is going to be doing the measuring and recording. Today, you are going to be able to find sensors in a wide range of different devices that you use regularly. The touch screen that you have on your phone has sensors, and they use pressure sensors for opening the doors at the market. Sensors are very common in these days and in most of the components.

A color sensor has the ability to determine different colors. They will utilize a means of emitting light and then look at the reflected light to determine an object's color. This will give the machine the actual color of that object. These sensors are in use in quite a few different applications today. You can find them in quality control systems, packaging systems, and more.

Color sensor detect color in two ways, one by reflection of light and measuring the intensity of the reflected light and second method is by directly absorbing the light emitted by the light source.

Project implemented is a simple colour sensor using Arduino Uno R3 and TCS3200 colour sensor module. This project is used for detecting primary colours (red, green and blue, or RGB)—colours that are physically available in LEDs in one package; for example, common cathode or common-cathode RGB LED. We can display primary colours and also generate specific colours by modifying the Arduino code.

CHAPTER 2

LITERATURE SURVEY

In the paper it is explained that Sensor provide a means for gathering information on manufacturing operations and processes being performed. In a lot of instances sensors are used to transform a physical stimulus into an electrical signal that may be analyzed by the manufacturing system and used for making decisions about the operations being conducted. The purpose of sensors is to inspect work in progress, to observe the work-in-progress edge with the manufacturing utensils, and to permit self-monitoring of manufacturing by the manufacturing system's own computer. [1] The proposed system mentioned in [2] is Real time color recognition of an object by using an Arduino Mega 2560, TCS3200 Color Sensor, Bluetooth Module (HC-05) and Android Mobile. The main objective of this project is to recognize a color of an object.Firstly, the program should be uploaded into the Arduino board which is written in the Arduino software. Then we need to pair the mobile app with the Bluetooth module. Next the object is to be sensed with Color Sensor.[3]The proposed system is object sorting based on color by using an Arduino UNO, TCS3200 Color Sensor, Servomotor and LCD Display. The main objective of this project is to recognize a color of an object. Firstly, the program should be uploaded into the Arduino board which is written in the Arduino software. The color sensed from the sensor is displayed on and the LCD display. The servo motor is made to rotate certain angle based on the color sensed.

CHAPTER 3

PROPOSED METHODOLOGY

The Project Color sensor is very useful for blind people and the methodology and the block diagram for the same will be shown below

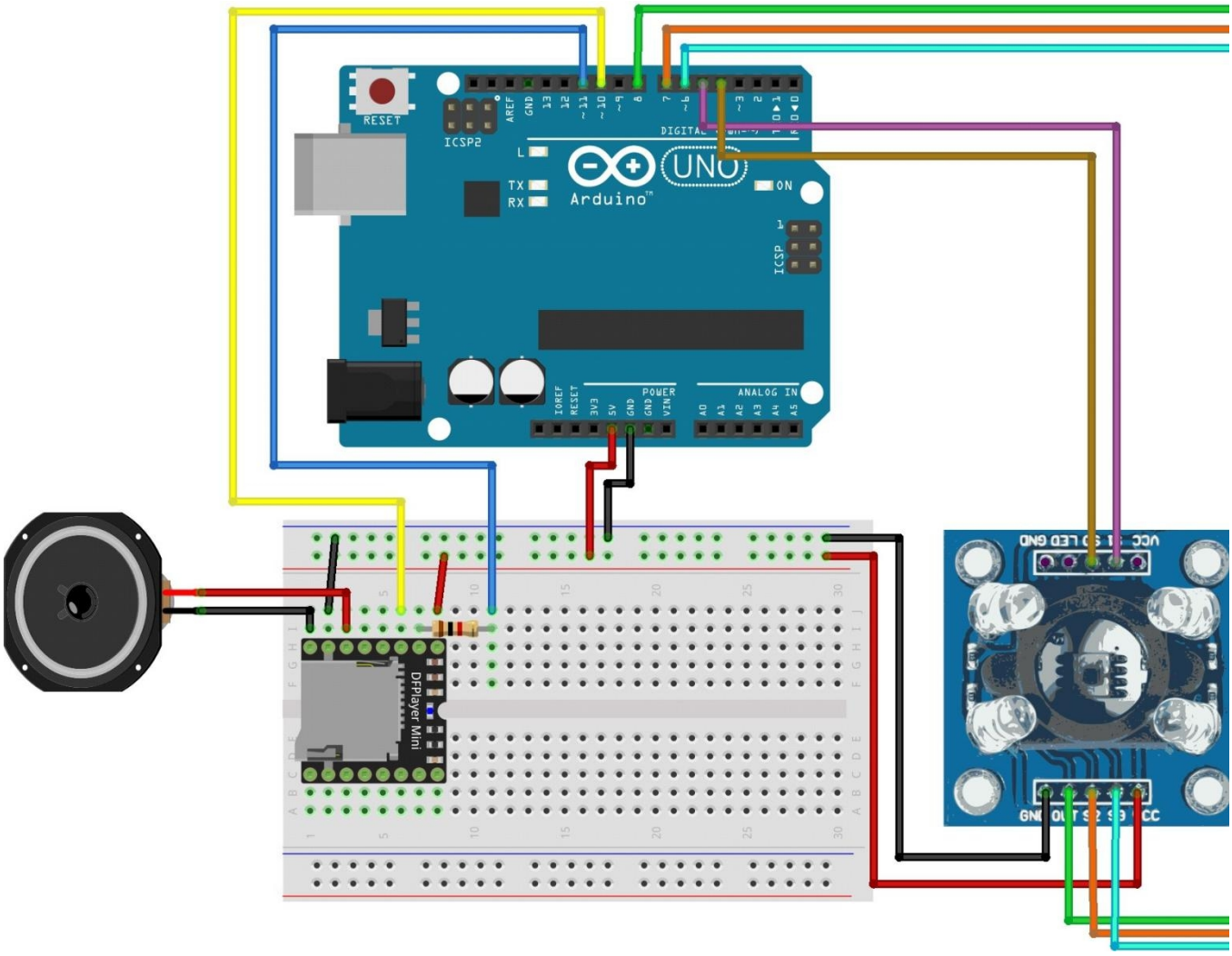

Fig 1.1 Block Diagram

Pin Connection to Arduino

TCD3200 connection

- S0 to 36 Digital pins
- S1 to 37 Digital pins
- S2 to 42 Digital pins
- S3 to 43 Digital pins
- Sensor Out to 4 PSW pin

LED Connection

- R terminal to 5 PSW pin
- G terminal to 6 PSW pin
- B terminal to 7 PSW pin

CHAPTER 4

HARDWARE REQUIRED

- Color Sensor,TCS3200
- External Power Supply for Arduino
- Arduino Board (Arduino Mega2560)
- Few Connecting Cables
- Different Color Papers
- RGB Led (Common Anode)
- And Few Resistors for Connecting RGB Led with Arduino (220Ohm)
- Micro SD card
- External Speaker

HARDWARE DESCRIPTION

TCS3200 COLOUR SENSOR

The Colour Sensor is a complete colour detector. It consists of a TAOS TCS3200 RGB sensor chip and 4 white LEDs. It can detect and measure a nearly limitless range of visible colours to a certain degree.

TCS3200-DB (TCS230) Color Sensor Daughterboard is a complete color detector, including a TAOS TCS3200 RGB sensor chip, white LEDs, collimator lens, and standoffs to set the optimum sensing distance. The TCS3200 has an array of photodetectors, each with either a red, green, or blue filter, or no filter (clear). The filters of each color are distributed evenly throughout the array to eliminate location bias among the colors. Internal to the device is an oscillator which produces a square-wave output whose frequency is proportional to the intensity of the chosen color. The applications of color sensor are Test strip reading, sorting by color, Ambient light sensing and calibration, Color matching.

Fig 1.2 Image of TCS3200

Principle

The color of an object we can see in fact is the chromatic light the object reflects in the white light (sunlight) after it absorbs the rest ones. The white color is a mixture of various visible colors, which means it includes each colored light like red (R), yellow (Y), green (G), blue (B), and purple (P). Based on the theory of three primary colors, any color is made by mixing the three primary colors (red, green, and blue) in a certain proportion. Thus, knowing the proportion you can get the color of the tested object. For TCS3200, when a color filter is selected, it only allows a specific primary color to pass through and blocks the other two colors. With the light intensity value of the three primary colors, by analysis we can know the color of light reflected to TCS3200. The TCS3200 sensor has 4 types of filter: red filter, green filter, blue filter, and clear with no filter. The filter is selected based on the high/low of pin S2 and S3 on the module.

S0	*S1*	*Output Frequency Scaling*
L	L	Power down
L	H	2%
H	L	20%
H	H	100%

S2	*S3*	*Photodiode Type*
L	L	Red
L	H	Blue
H	L	Clear (no filter)
H	H	Green

The module contains a programmable converter which transforms colour light to frequency. When the part of RGB colours in the light reflected by the object passes through the filter selected to the TAOS TCS3200 RGB chip, the built-in oscillator outputs square waves. The frequency of the waves is directly proportional to the light intensity – the more intense the light is, the higher is the frequency. Also, the frequency of the OUT pin on the sensor module is proportional to that of the oscillator; the proportion depends on the high/low of pin S0 andS1.

Features

- A complete colour detector that consists of a TAOS TCS3200 RGB sensor chip and 4 white LEDs. It can detect and measure a nearly limitless range of visible colours to a certaindegree.
- TCS3200 uses an 8- pin SOIC surface mountpackage.
- Working voltage: 3-5V DC; PCB size: 2.4 x 2.8cm.
- Place the colour sensor on the surface of an object and the colour value can be displayed in the Serial Monitor.
- Strong anti-interference ability; the white LED can be controlledon/off.
- Single-Supply Operation (2.7V to5.5V).
- High-Resolution Conversion of Light Intensity toFrequency.
- Programmable Colour and Full-Scale OutputFrequency.
- Power Down Feature.
- Communicates Directly to Microcontroller.
- Support LED lamp light supplement control.

TCS3200 Pin Diagram

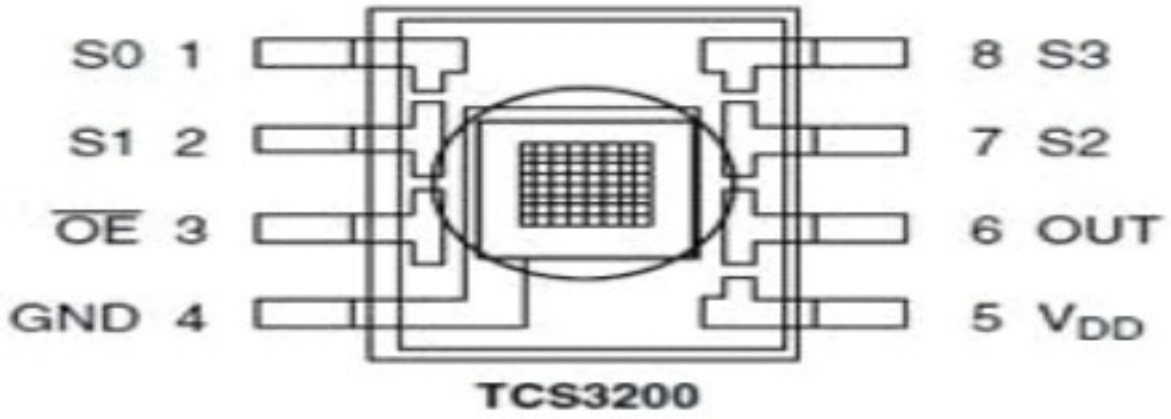

Fig 1.3: Pin Diagram of Sensor

S0, S1	1, 2	Output Frequency scaling selection input.
S2, S3	7, 8	Photo diode type selection input.
Sout (out)	6	Output Frequency.
OE	3	Enable for active low.
GND	4	Power supply ground.
VDD	5	Voltage supply.

Table 2.1: Pin Connection of TCS3200

Types of RGB LED

Common Cathode

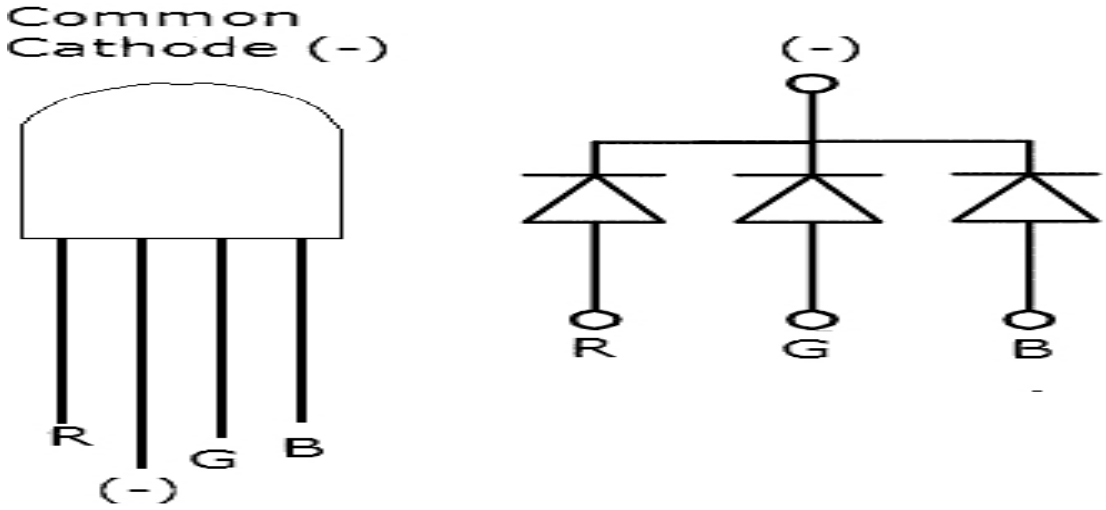

Fig 1.4 Common Cathode

Common Anode

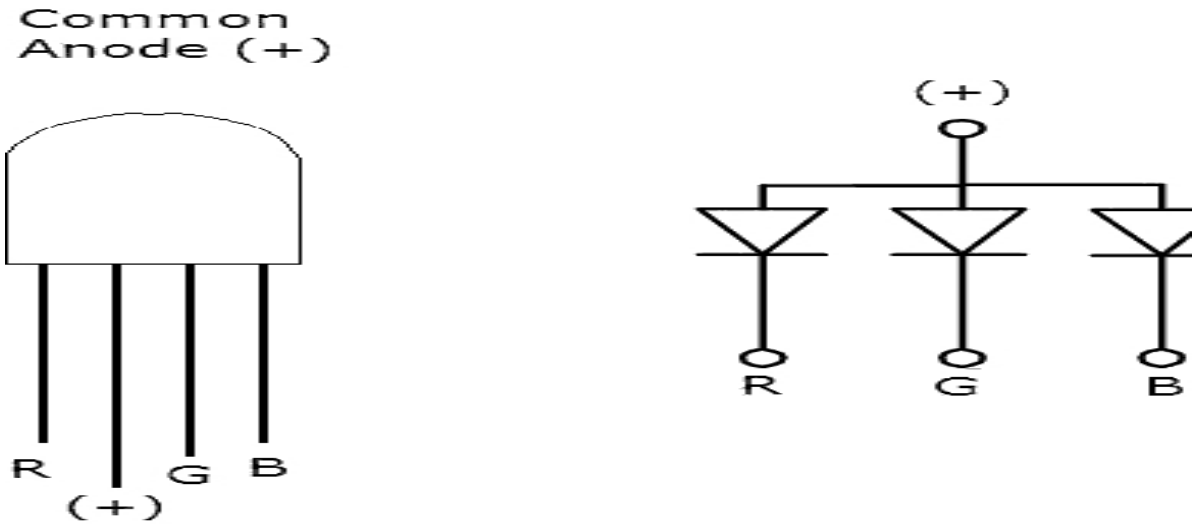

Fig 1.5 Common Anode

SOFTWARE DESCRIPTION

Arduino IDE

Arduino IDE is an open-source software program that allows users to write and upload code within a real-time work environment. As this code will thereafter be stored within the cloud, it is often utilised by those who have been searching for an extra level of redundancy. The system is fully compatible with any Arduino software board.

Main Functions and Uses

Arduino IDE can be implemented within Windows, Mac and Linux operating systems. The majority of its components are written in JavaScript for easy editing and compiling. While its primary intention is based around writing codes, there are several other features worth noting. It has been equipped with a means to easily share any details with other project stakeholders. Users can modify internal layouts and schematics when required. There are in-depth help guides which will prove usefulduring the initial installation process. Tutorials are likewise available for those who might not have a substantial amount of experience with the Arduino frame work.

WORKING

- Color sensor built in LED light source is turned on and the reflection from the target is filtered by the photo diodes
- Based on the filters turned on, the photodiode detects color concentration and send the information according to that to the microcontroller.
- The information obtained from the sensor is scaled to match the frequency of that of the microcontroller crystal oscillator.
- The information is later processed and compared to prestored/preprogrammed value. The lines to the LED are adjusted to obtain the color sensed by the sensor.Hence the concentration output and color detected sound is Audible in the External Speaker accordingly.

CHAPTER 5

RESULT AND DISCUSSION

RESULT

- The sensor was programmed to detect two or three colors.
- The sensed color was detected and Audible in Speaker.

LIMITATION

- The sensor frequency division range is less. i.e., similar colors, frequency sensed output lies close to each other.
- Not able to detect dark color like Brown.
- Most of the light Color had similar scaled frequency range.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

- If certain Modifications are done it can be used in Food processing units.

REFERENCES

[1]. Akriti Kaushik, Aastha Sharama, “RGB Color Sensing Technique"

[2] M.Anil Kumar, Dr. S. A. K. Jilani, Mr. U. Sreenivasulu Mr. S.Javeed Hussain “Automated Color Recognition System for Visually Challenged and Achromatopsia People using Arduino and Mobile App”

[3] TusharG.GaikaiSohamN.ZadokarRajendraS.BhandariSagarS. “Object Sorting using Color Sensor and Arduino “

APPENDIX

PROGRAM CODE

```
#include "SoftwareSerial.h"
#include "DFRobotDFPlayerMini.h"

SoftwareSerial mySoftwareSerial(10, 11); // RX, TX
DFRobotDFPlayerMini myDFPlayer;
void printDetail(uint8_t type, int value);

#define S0 4
#define S1 5
#define S2 7
#define S3 6
#define sensorOut 8

int frequency = 0;
```

```
int color=0;

void setup()
  { mySoftwareSerial.begin(9600)
  ; Serial.begin(115200);

  pinMode(S0, OUTPUT);
  pinMode(S1, OUTPUT);
  pinMode(S2, OUTPUT);
  pinMode(S3, OUTPUT);
  pinMode(sensorOut, INPUT);
  //Setting frequency-scaling
  digitalWrite(S0, HIGH);
  digitalWrite(S1, LOW);

  Serial.println();
  Serial.println(F("Initializing DFPlayer..."));

  //Use softwareSerial to communicate with MP3
  if (!myDFPlayer.begin(mySoftwareSerial)) {
    Serial.println(F("Unable to begin:"));
    Serial.println(F("1.Please recheck the connection!"));
    Serial.println(F("2.Please insert the SD card!"));
    while(true);
  }
  Serial.println(F("DFPlayer Mini online."));

  //Set volume value (From 0 to 30)
  myDFPlayer.volume(30);
}


void loop() {

  color = readColor();
  delay(10);
  switch (color)
    { case 1:
    Serial.println("RED detected!");
    myDFPlayer.play(1);
    break;
    case 2:
    Serial.println("BLUE detected!");
    myDFPlayer.play(2);
```

```
    break;
    case 3:
    Serial.println("GREEN detected!");
    myDFPlayer.play(3);
    break;
    case 0:
    break;
  }
  color=0;
}


//Read-Color Function
int readColor() {

  //Setting red filtered photodiodes to be read
  digitalWrite(S2,LOW);
  digitalWrite(S3,LOW);

  //Reading the output frequency
  frequency = pulseIn(sensorOut, LOW);
  int R = frequency;

  //Printing the value on the serial monitor
  Serial.print("R=");   //printing name
  Serial.print(frequency);  //printing REDcolor
frequency
  Serial.print("  ");
  delay(50);

  //Setting Green filtered photodiodes to be read
  digitalWrite(S2,HIGH);
  digitalWrite(S3,HIGH);

  //Reading the output frequency
  frequency = pulseIn(sensorOut, LOW);
  int G = frequency;

  //Printing the value on the serial monitor
  Serial.print("G=");   //printing name
  Serial.print(frequency);  //printing REDcolor
frequency
  Serial.print("  ");
  delay(50);
```

```
  //Setting Blue filtered photodiodes to be read
  digitalWrite(S2, LOW);
  digitalWrite(S3, HIGH);

  //Reading the output frequency
  frequency = pulseIn(sensorOut, LOW);
  int B = frequency;

  //Printing the value on the serial monitor
  Serial.print("B=");   //printing name
  Serial.print(frequency);  //printing REDcolor
frequency
  Serial.println("  ");
  delay(50);

  if(R<260 & R>230 & G<860 & G>800){
    color = 1; // Red
  }
  if(G<420 & G>370 & B<350 & B>305){
    color = 2; // Blue
  }
  if(R<450 & R>420 & G<420 & G>390){
    color = 3; // Green
  }
  return color;
}
```