Color Sensor
(Technical Note)

What is Color Sensor?

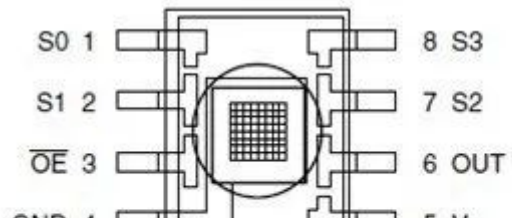
A color sensor has the ability to detect the color of an object in its proximity. The detection of the colors takes place in RGB scale where the intensity of Red, Green, and Blue color components of the light reaching the sensor are measured. The light intensity for each color is measured through sensors with different R, G, & B color filters that are evenly distributed throughout the sensor. There are also sensors without any filter to measure gross light intensity.
Pins S0 & S1 enable choice of output frequencies to match different readers. S2 & S3 Pins select the color filter or no filter for measurement.

Applications

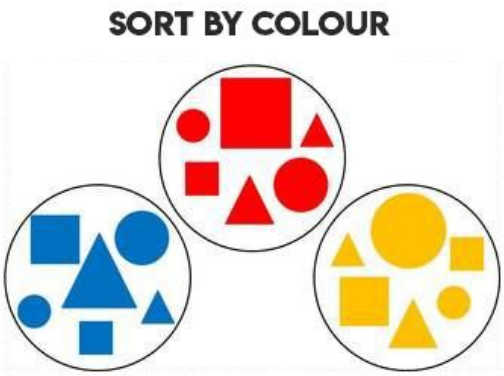
The color sensor (TCS230 or TCS3200) has a photodiode array of 8X8 matrix. This matrix is further divided into color specific photodiodes, which are
16 photodiodes have blue filters,
16 photodiodes have green filters,
16 photodiodes have red filters,
rest 16 photodiodes have no filter ie those are clear in nature.

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



TCS3200



Applications:

Farming

Sorting fruits by its ripeness by sensing color and separating into different bins for packaging.

Medicine

Doctors use multi spectral color sensor to determine the color related skin condition accurately. The result of these measurements can be used for evaluating the skin disease as well as for preparing the treatment.

Reference:

1. https://howtomechatronics.com/tutorials/arduino/arduino-color-sensing-tutorial-tcs230-tcs3200-color-sensor/
2. https://randomnerdtutorials.com/arduino-color-sensor-tcs230-tcs3200/

Color Sensor
(Application Note)

Project

To check the color frequency by using color sensor with Arduino.

Components Required

Component	Part No.	Qty
Arduino UNO	EMX-00001-A	1
Color Sensor	EMS-00012-A	1
Jumper Wires - M-F	EDA-00001-A	7

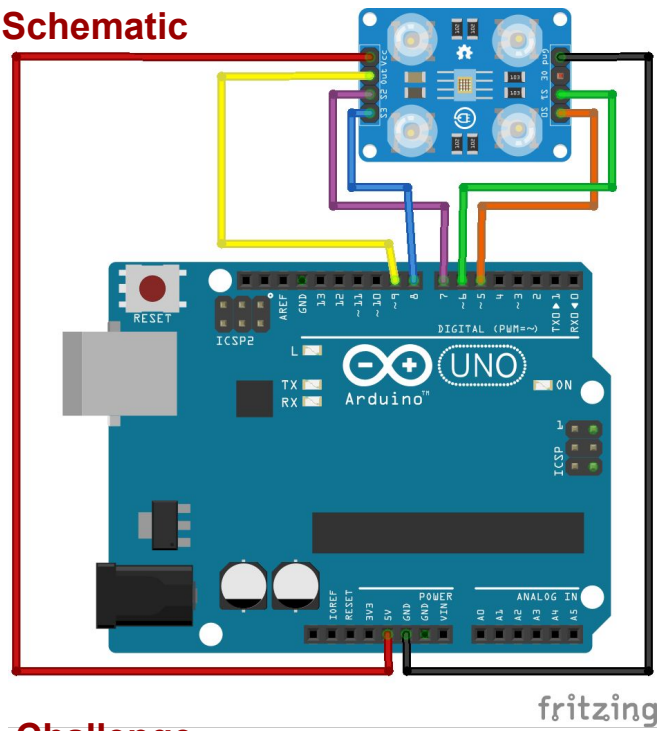
Procedure

Color Sensor Module:

- Connect **Vcc** pin of sensor to **5V** of Arduino
- Wire **GND** pin of the sensor to **GND** of the Arduino
- Connect **OUT** pin of sensor to **9th** pin of the Arduino
- Connect **S0** pin to **5th** pin of Arduino
- Connect **S1** pin to **6th** pin of Arduino
- Connect **S2** pin to **7th** pin of Arduino
- Connect **S3** pin to **8th** pin of Arduino

Please note that a lower value is reported when a specific color is detected. (eg. R = 32; G = 90, B = 90) if a red object is detected.

Schematic



Challenge

1. Design object color detection machine that lights up RGB LEDs to match the color detected
2. Make a model for vision centre to build a test for color blind people

Code

```
#define S0 5/*Connecting S0 pin of sensor to 5th pin
of Arduino*/
#define S1 6/*Connecting S1 pin of sensor to 6th pin
of Arduino*/
#define S2 7/*Connecting S2 pin of sensor to 7th pin
of Arduino*/
#define S3 8/*Connecting S3 pin of sensor to 8th pin
of Arduino*/
#define sensor 9/*Taking Input from sensor from 9th
pin of Arduino*/
int frequency = 0;/*Initially setting the frequency
integer of color input to be 0*/
void setup() {
  pinMode(S0,OUTPUT);
  pinMode(S1,OUTPUT);
  pinMode(S2,OUTPUT);
  pinMode(S3,OUTPUT);
  pinMode(sensor,INPUT);

  /*Setting frequency-scaling to 20%, we can learn
this from the table*/
  digitalWrite(S0, HIGH);
  digitalWrite(S1, LOW);

  Serial.begin(9600);/*Setting the baud rate of serial
communication to be 9600*/
}
void loop() {
  /* Setting RED filtered photodiodes to be read by
the Arduino*/
  digitalWrite(S2, LOW);
  digitalWrite(S3, LOW);
  /* Reading the output frequency*/
  frequency = pulseIn(sensor, LOW);/*counting the
frequency of signal to go from HIGH to LOW*/
  /* Printing the value on the serial monitor*/
  Serial.print("R = ");/*printing name of color*/
  Serial.print(frequency);/*printing RED color
frequency*/
  Serial.print("  ");
  delay(100);
  /* Setting GREEN filtered photodiodes to be read by
the Arduino*/
  digitalWrite(S2, HIGH);
  digitalWrite(S3, HIGH);
  /* Reading the output frequency*/
  frequency = pulseIn(sensor, LOW);/*counting the
frequency of signal to go from HIGH to LOW*/
  /* Printing the value on the serial monitor */
  Serial.print("G = ");/*printing name of color*/
  Serial.print(frequency);/*printing RED color
frequency*/
  Serial.print("  ");
  delay(100);
  /* Setting BLUE filtered photodiodes to be read by
the Arduino*/
  digitalWrite(S2, LOW);
  digitalWrite(S3, HIGH);
  /* Reading the output frequency*/
  frequency = pulseIn(sensor, LOW);/*counting the
frequency of signal to go from HIGH to LOW*/
/* Printing the value on the serial monitor*/
  Serial.print("B = ");/*printing name of color*/
  Serial.print(frequency);/*printing RED color
frequency*/
  Serial.println("  ");
  delay(100);
}
```