



Designing of RGB Color Detector

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Abstract— This paper describes the new technique used for the RGB color detection. The proposed technique illustrate the new methodology that can be used for the primary color detection and applications in various industries. It is color sensor that sense mainly red green and blue colors. This color sensor is designed by basic elements like primary color LED and light sensing device like LDR or photo diode. Basic principal of working are reflectivity of the light emitted by the LEDs from the object under test.

Keywords— RGB, LDR, LED, CdS, LCD

I. INTRODUCTION

Most sensors are electrical or electronic, although other types exist. A sensor is a type of transducer that converts one form of energy into another form. Sensors are either direct indicating (e.g. a mercury thermometer or electrical meter) or are paired with an indicator (perhaps indirectly through an analog to digital converter, a computer and a display) so that the value sensed becomes human readable. In addition to other applications, sensors are heavily used in medicine industry and robotics.

A common requirement in the field of color sensing is that of color identification, or sorting of objects by color. Typically this type of application is simpler than a general-purpose color measurement application. A common task in color sensing is to identify an unknown color as falling into one of these general categories. Now a days there are various fields where the sorting of two different objects on the basis of their color nature is mandatory. To do the task very effectively the various color sensor are developed .Normally the color sensor are developed on the basis of the identifying the wavelength of that particular color. This color identification are available for the visible light range approximately 380nm to 780nm.

Current Manual Color Detection Techniques are not Efficient:-

The present technique used in industry are based on the image processing of particular object. For capturing of the image of object digital camera is required which is very expensive. The algorithm used for such type of sorting become complex.

Another technique detects the color on the basis of wavelength. As the range is variable there is lots of variation in the color identification. Related these sorting technique the most probable issue is the cost of the sensor. To overcome the drawback a sensor is invented which mainly works on the measuring intensity of light. The sensor basically consist of the primary LEDs (i.e. .red, green and blue) and the light sensing device that may be LDR (light dependent register) or Photodiode. The overall sensor is controlled by the microcontroller unit, the detected color is displayed on LCD. The overall color detector unit consist of the two subunits, mainly called sensor and display subunits.

II. PREVIOUS WORK

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A. History

There are eleven basic colors names have been identified such as white, gray, black, red, yellow, green, blue, orange, purple, pink and brown .Most or all colors can be described in terms of variations and combinations of these colors. Due to the fact that human color vision is accomplished in part by three different types of cone cells in the retina, it follows that three values are necessary and sufficient to define any color.

B. Color and Light

A color is an interaction between a very small range of electromagnetic waves and the eye and brain of a person. What people call red, green or blue are just ways of categorizing what their brain experiences. The spectrum of light that can be visible to eyes given in Fig.1. Light is form of energy, which makes up a small portion of electromagnetic spectrum. Visible light expressed the wavelength in nanometers (10^{-9} meters).The region of visible light with a wavelength between approximately 380 nm to 780 nm .The color and there corresponding wavelength given in Table I.

TABLE I
Wavelength Ranges

Color	Range
Violet	380~410
Indigo	410~450
Blue	450~510
Green	510~560
Yellow	560~600
Orange	600~630
Red	630~780

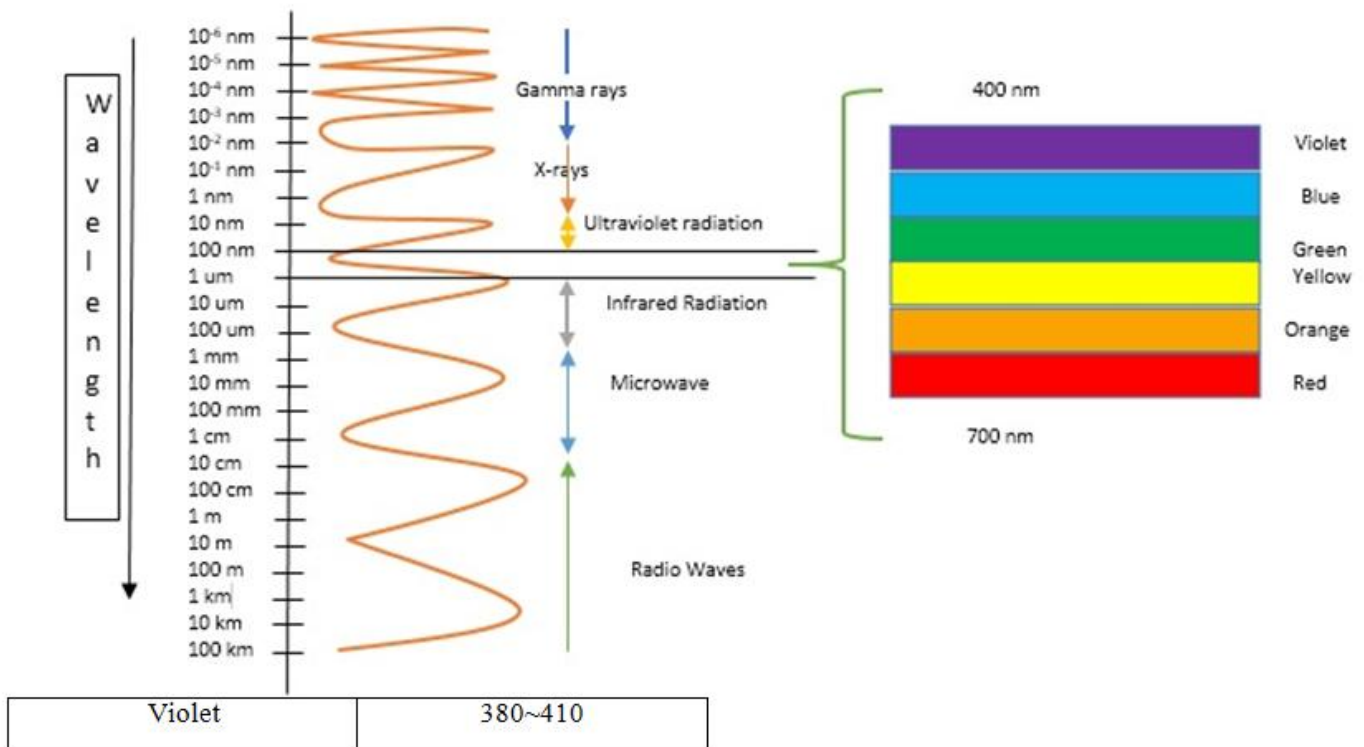


Fig.1. Electromagnetic Spectrum With visible light range

III. DESIGNING OF SENSOR

Color sensor arrangement consist of the LDR (Light dependent resistor) and LED (Light emitting diode). Nine led's are connected in circular order. Each led of color (red, green, blue) followed one after another in circular order in three sequences.

Specific delay is provided in such a way that same color led's set glows one after another. The delay should be greater than the response time of LDR. The sensor mainly consists of LDR and LED's. Arrangement of color sensor given in Fig.2.

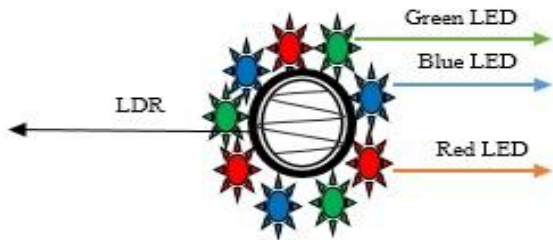


Fig.2.Sensor Arrangement

A. LDR (Light Dependent Resistor)

LDRs or light dependent resistor are very useful especially light or dark sensor circuit. Normally the resistance of LDR is very high, sometimes as high as 1000000 ohms, but when they are illuminated with light resistance, drops dramatically. A photo resistor are light dependent resistor (LDR) is resistor whose resistance decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. It can also be referred to as photoconductor or CdS device, from “Cadmium Sulphide”, which is material from which the device is made and that actually exhibits the variations in resistance with light level.

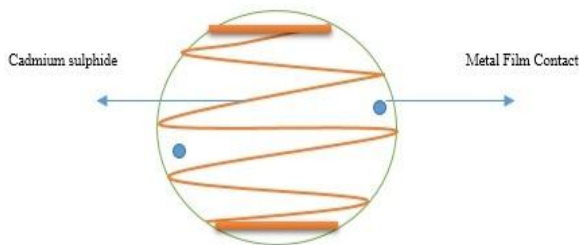


Fig.3.Basic Structure of LDR

IV. WORKING OF SENSOR

When the light level is low, the resistance of the LDR is high this prevents the current flowing through circuit. It indicates that the voltage level increases. As given in sensor the LED are connected in circular order around the LDR. One terminal of each LED and LDR are connected together to act as ground for sensor module. The LED's glows according to delay provided to each set i.e. First Red set of LED then Green and then Blue. Intensity of light for each set of LED given by the LDR in terms of voltage. By comparing value of voltage level for each set color of object can be determined.

Whichever set is having low voltage level that should be the color of object. The delay provided for each set should be greater than response time of LDR.

Delay of each set of LED > Response time of LDR.

The snapshot of working of color sensor is as shown in above Fig.4

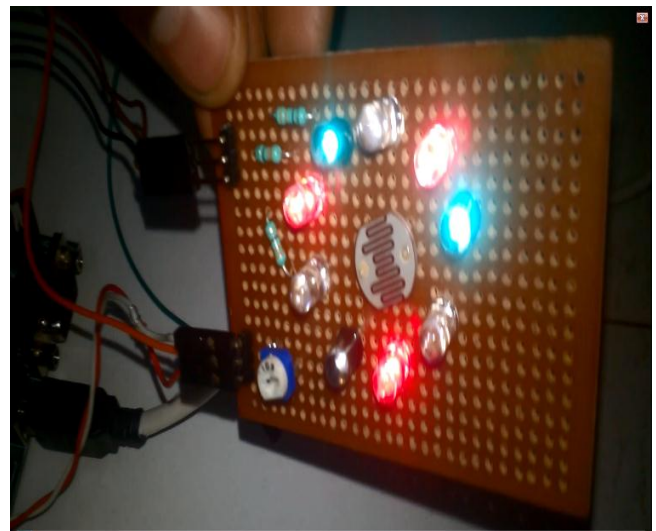


Fig.4.Hardware Design

V. APPLICATION

Historically, components used for color sensing were considered expensive and required precision support circuitry, limiting their application mostly to specialized instrumentation. However, new technologies of color sensors with higher levels of integration are becoming available, allowing for more cost-effective solutions. As the cost of color sensing comes down, the number of applications using color sensing is increasing. Soloman (2004) explain several example applications using color sensor.

Jones et al (1989), brief about color sorting system and method. Color sorting system and method is applied to sort fruits and vegetables. The objects to be sorted are scanned with a color video camera and the signals from the camera are digitized and utilized to addresses for colors to be rejected. In this system the data collected by camera will sent to color sorter processor to finalize the good or bad fruits or vegetables. If the objects are rejected, means the object only have a certain number or sequence of unacceptable colors.

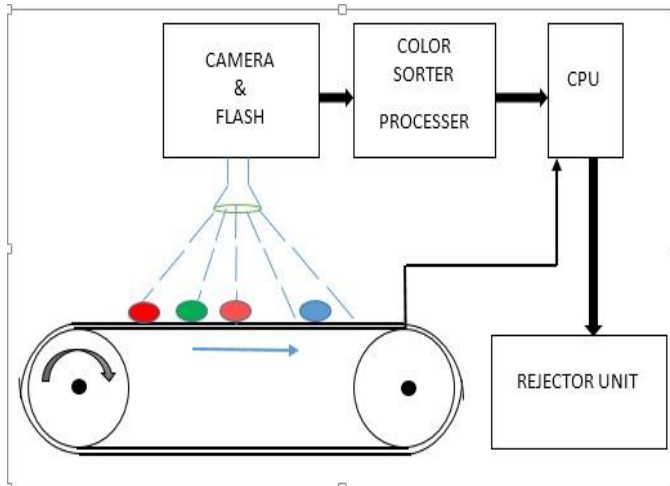


Fig.5. Block diagram of items on conveyor belt being sorted by the apparatus

Soloman (2004) explain several example applications using color sensor. The following are five examples of unique situations requiring innovative solution.

1) Sorting of automotive parts with different colors.

A manufacturer of automotive parts needs to differentiate parts whose only visible difference is a slight variation in color. One part is black, the other a dark grey. Because efficiency demands that the part be sorted at a high rate of speed, the opportunity for mistakes is extremely high. By using advance color sensing technology, the manufacturer can sort these parts at an enhanced rate of speed, saving time and virtually eliminating errors.

2) Assembly of medical closures with different color component.

In this situation, containers of liquid medications consist of an aluminium cap with a plastic cover. A complete closure assembly requires the assurance of proper color combination of two components. Because of this absolute necessity of color accuracy, color sensing technology proves invaluable.

3) Lumber sorting by color.

Color cording has become a standard method of differentiation in the lumber industry. Not only different types of lumber but the grade, quality and intended purpose of the lumber is indicated by color. Because the environments in which lumber is sorted can be highly abusive, it is recommended that protective covers be employed to protect the fiber optics used for this process.

4) Color sensing in food industry.

Sensing a white target on a white background is challenging using conventional photoelectric sensors. A manufacturer who needs to insure the presence of the white cap on a jar of mayonnaise improves accuracy with a color sensor that employs the RGB color concept.

VI. CONCLUSION

A simple design of RGB color detector is introduced in this paper which based on LDR. For controlling Microcontroller is used which creates proper delay for the LEDs .The RGB color get detected properly also the name of color display on LCD.

At present whole the prototype system of sensing module and controller section works normally. The color sensing module is very efficient and user friendly as well as cost effective. The project provides wide range of applications in industries.

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