Retraction

Retraction: A Survey Paper on Colour Detection System for Industrial Applications Using Arduino (IOP Conf. Ser.: Mater. Sci. Eng. 590 012037)

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It has come to the attention of IOP Publishing that this article should not have reached publication because of its inclusion of nonsensical content and replication without citation of an earlier source: ‘TCS230 PROGRAMMABLE COLOR LIGHT-TO-FREQUENCY CONVERTER TAOS046Q’, (2008), Texas Advanced Optoelectronic Solutions, https://www.mouser.com/datasheet/2/588/cs230-e33-1214740.pdf. Consequently, this paper has been retracted by IOP Publishing. The authors have not confirmed whether they agree or disagree with this retraction.

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A SURVEY PAPER ON COLOUR DETECTION SYSTEM FOR INDUSTRIAL APPLICATIONS USING ARDUINO

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Abstract. A Colour Sensor, as the name recommends, is a gadget that faculties or recognizes hues. A shading sensor makes utilization of an outer wellspring of discharging light (a variety of four light transmitting diodes to be exact) and afterward breaks down the light reflected over from the protest with a specific end goal to decide the question's shading. Shading sensors will give a precise shade of the question. An extensive variety of uses can be done utilizing shading sensors like arranging of items in light of their shading, quality evaluation frameworks, shading improvement in printers and so on. In this project, we intend to design an Arduino Colour Sensing and detection application, which has the capability to detect distinct colours. We have utilized TCS3200 shading sensors for this reason. Prologue to shading sensor, circuit chart and working of the Arduino Colour Sensor venture are clarified further.

keywords: Arduino Mega-R3; TCS3200 colour detection sensor; Quality Control; Colour based Sorting.

1. Introduction

The color detection system utilizes Arduino in intriguing and prestigious ventures for techies who might want to consolidate electronics, industries and programming. These sorting machines are utilized mostly for sorting RGB hues. The TCS3200 is utilized with the system. This sensor goes about as an immaculate shading sensor for the proposed system. The TCS3200 PCB module joins a TAOS (4 numbers), LED control circuit with some basic portions. The core of this proposed framework is the Arduino microcontroller. Each one of the relationship in the circuit is made through the Arduino board. This will cut back the affiliation complexities and help in the general execution of machines. The RGB sensors and different parts are related with Arduino and a 9 to 12 V of voltage is used for driving the component. This framework is an ongoing running framework according to the programming code.

Shading is a particular normal for a protest, be it of any sort. Along these lines, it has been used as the establishment for numerous explores and related works. It has been the fundamental aspect of
study for various skin pigmentation prospects. M. Wimmer et al.[2] and A. Albiol et al.[3] have worked extensively in this field to present various avenues where color identification can play a significant role. Gang Li et al.[4] and H. Fleyeh[5] have researched its various implementations in traffic control and roadways utility. Here, we intend to utilize the objects’ colors for industrial applications such as sorting and quality control.

The premise of the color detection system is based on the fact that various industries are centered on products with their colors as a distinctive feature. Industries manufacturing multi-colored light bulbs, glass bottles, food products etc. Apart from these, shading assumes a critical part in deciding the quality of products in almost every manufacturing industry. Color detection serves as the basis for further processing such as sorting of products and quality assessment.

The proposed system intends to utilize this ability of the color sensor in order to automate further processing tasks such as sorting & arrangement of products and quality assessment. The entire system comprises only of the Arduino Mega R3 and the TCS3200 color sensor. This enables the system to be very efficient and simple to implement.

2. Related Work

P. Sebastian et al [1].This paper contemplates the impact of shading space on the execution of following calculations. The shading spaces that were researched were grayscale, RGB, YCbCr and HSV. The execution of a standardized cross connection following calculation was estimated to decide vigor and exactness in the distinctive shading spaces.

M. Wimmer et al [2].An approach that uses an abnormal state vision module to identify a picture particular skin shading model. This model is then used to adjust parametric skin shading classifiers to the handled picture. This approach is proficient to recognize skin shading from to a great degree comparative hues, for example, lip shading or eyebrow shading.

A. Albiol et al [3].The target of this paper is to demonstrate that for each shading space there exists an ideal skin locator plan with the end goal that the execution of all these skin identifiers plans is the same.

Gang Li et al [4].A yellow license tag area calculation utilizing RGB model of shading picture and dark white surface investigation of the plate specifically to extricate vehicle tag from a confused foundation picture.

H. Fleyeh [5].This paper intends to display three new techniques for shading recognition and division of street signs. The pictures are taken by an advanced camera mounted in an auto. The RGB pictures are changed over into IHS shading space, and new strategies are connected to remove the shades of the street signs under thought.

2.1 PROBLEM DESCRIPTION

In manufacturing industries, where color plays a significant role, such as glass bottle and light bulb manufacturers; the task of organizing and packaging end products could turn hectic and complicated. Apart from these, industries focused on food products, such as fresh food packaging industries and large scale food products manufacturers often suffer from decayed items spread among the raw materials. This problem may seem trivial in the lower levels but in the broader scheme, it costs a substantial amount of capital to the industries and brings about the loss of the most important resource; time. Although many of these industries have adopted relevant technologies to tackle such...
impediments, these methods usually tend to be very sophisticated and expensive. Here, we propose a generally straightforward and financially savvy answer for this issue. The proposed framework consolidates an Arduino microcontroller board and a TCS3200 shading sensor to adequately recognize hues and mechanize the assignment of association and quality evaluation.

3. IMPLEMENTATION

The implementation of the system is relatively simple. It requires only an Arduino Mega R3 board and a TCS3200 color sensor. The technical description of these hardware are given ahead. The connections between the color sensor and Arduino is made through jumper wires which enable them to communicate. This setting is further installed in a support frame thus unifying the system. An additional LCD screen can be used if required.

The entire functioning of the system is partitioned into 3 phases:

1. Calibration.
2. Color detection.
3. Application.

The entire process follows a linear sequence. The first part deals with the installation and calibration of the components. The initial values are assigned to the components. After each component is installed and tested the system can start its operations. We move to the next stage of the process. In the second stage, viz. color detection, the TCS3200 determines the color of the incoming objects through the use of LEDs and the photodiode. Then the final stage of the process approaches. Here, the RGB values are compared with the standard values stored in the system to carry out further applications such as sorting & organization and quality assessment.

3.1 Calibration

This phase deals with the installation of the components. All the components are connected and incorporated into a frame. The connections are made and the system is booted up. Initially, all the coding has to be fed to the Arduino so it is connected to a computer. Using the Arduino IDE, all the required code is written and uploaded to the board. The results can be viewed through the serial monitor present in the IDE. The key functionality in this phase is provided by the setup() function of the Arduino IDE. It is used to initialize the fundamental values of all the components to ensure that everything proceeds seamlessly. The setup() function utilizes two pre-defined functions, that are provided by the IDE. They are:

- pinMode() – It is utilized to dole out a usefulness of either info or yield to the pins of the shading sensor.
- digitalWrite() – It is utilized to decide the voltage that must be provided to the pins of the shading sensor.

This phase is essentially a one-time process. After the calibration is complete, the process moves to the next stage.

3.2 Color detection

This phase deals with the objects that need to be processed. After the calibration is done, the 2nd and 3rd phase are carried out simultaneously over and over again, until all the objects are processed. This phase, along with the 3rd phase, is carried out through the loop() function. In this function, the
TCS3200 is used to identify the colors of incoming objects and subsequently process them as per the requirement. The TCS3200 comprises of a configurable photodiode which changes over light to electric signs and an extra current to recurrence converter is incorporated which yields square waves. The recurrence of the waves is specifically relative to the light force, in this manner diverse hues with differing powers can be recognized. The loop() function utilizes the following built in functions:

- `digitalWrite()` - It is utilized to decide the voltage that must be provided to the pins of the shading sensor.
- `pulseIn()` – It is utilized to decide the shade of the protest by the yield recurrence gave by the shading sensor.
- `map()` – It is used to normalize the output value provided by the pulseIn() function.
- Right after the identification of the color, the final processing is done within the same loop() function.

3.3 Application

This phase deals with the application part which is usually guided by the primary requirement of the user. The algorithms used in this phase shall differ depending on the purpose. Here, the two main applications are

- Product sorting and arrangement
- Product quality assessment

The operating algorithm for both these purposes is similar. In sorting applications, the value returned in the 2nd phase will be matched with the respective values and the product will be categorized accordingly. In quality assessment applications, it is checked whether the returned value falls under a certain bracket; if it does then it is accepted, if not then it is discarded.

4. Procedure

1. The components are connected and incorporated in a frame work.
2. The system is then powered up and every component is tested.
3. The initial setup is done; all the initial values are assigned and every component is calibrated.
4. The objects are now fed to the system. The color sensor detects their colors.
5. The color is identified through the reflected light from LEDs and the frequency determines their intensity.
6. The value is returned, which is then normalized to obtain the final value.
7. Thus, the color obtained is used to perform the required task
8. The objects are sorted by comparing the obtained and standard values. Quality assessment is also carried out similarly.

4.1 Architecture Diagram
Fig 1. Architecture Diagram

4.2 Circuit Diagram

Fig. 2 Circuit Diagram
The key components used in this system are the Arduino Mega R3 microcontroller and the TCS3200 color sensor. The technical details of these components are described below.

4.3 Arduino Mega R3

The Arduino Mega 2560 is a microcontroller board in light of the ATmega2560. It has advanced info/yield pins from 0 to 53 (15 can be used as PWM yields), simple information sources from A0 to A15, 4 UARTs (equipment serial ports), a 16 MHz crystal oscillator, a Universal Serial Bus link, a power line, an ICSP header, and a reset catch. It contains everything expected to help the microcontroller; essentially interface it to a PC with a USB link or power it with an AC-to-DC connector or battery to begin.

4.4 TCS3200 COLOR SENSOR

- High-Resolution Conversion of light intensity to frequency.
- Programmable color to full-scale output frequency.
- Communicates directly with a microcontroller.
- Single supply operation (2.7V to 5.5V).
- Power down feature.
- Nonlinearity Error Typically 0.2% at 50 kHz.
- Stable 200 ppm/°C Temperature Coefficient.
- Low-Profile Lead (Pb) Free and RoHS Compliant Surface-Mount Package.

The TCS3200 is a programmable shading light-to-recurrence converter that consolidates configurable silicon photodiodes and a current-to-recurrence converter on a solitary solid CMOS coordinated circuit. The yield is a square wave (half obligation cycle) with recurrence straightforwardly relative to light force (irradiance). Advanced data sources and computerized yield enable direct interface to a microcontroller or other rationale hardware.

All photodiodes of similar shading are associated in parallel. Pins S2 and S3 are utilized to choose which gathering of photodiodes (red, green, blue, clear) are dynamic. Photodiodes are 110 μm x 110 μm in size and are on 134-μm centers.

Fig 3. TCS3200
4.5 Terminal Functions

| TERMINAL | I/O | DESCRIPTION |
|----------|-----|-------------|
| GND      | 4   | Power supply ground. All voltages are referenced to GND. |
| S0, S1   | 1, 2| Output frequency scaling selection inputs. |
| OE       | 3   | Enable for f_o (active low). |
| VDD      | 5   | Supply voltage. |
| OUT      | 6   | Output frequency (f_o). |
| S2, S3   | 7, 8| Photodiode type selection inputs |

4.6 Selectable Options

| S0 | S1 | OUTPUT FREQUENCY SCALING (f_o) | S2 | S3 | PHOTODiode TYPE |
|----|----|-------------------------------|----|----|-----------------|
| L  | L  | Power down                    | L  | L  | Red             |
| L  | H  | 2%                            | L  | H  | Blue            |
| H  | L  | 20%                           | H  | L  | Clear (no filter) |
| H  | H  | 100%                          | H  | H  | Green           |

5. Conclusion

The proposed framework presents a genuinely straightforward and financially savvy answer for the issue of modern warehousing and bundling and item quality appraisal. As more and more processes are being automated in industries, this system presents a very efficient alternative to the task of colour based sorting and storage. Although some industries have already adopted such technologies, they have to pay a heavy price for it as the systems present currently are very complex and sophisticated. Consequently, the proposed framework is an exceptionally basic approach to complete the insignificant yet critical errand of warehousing. The quality assessment process in industries can also be done through this system.

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