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COLOR SORTING ROBOTIC ARM USING ARDUINO

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ABSTRACT

The paper presents a robotic arm with a smart approach to implement sorting of objects on the basis of color. Here, we have a robotic arm which sorts small spherical objects after which it picks and places them in different boxes. The color detection is done by color sensors which use light intensity to ***frequency conversion method****. In our system the TCS34725 (color sensor) is interfaced with the Arduino board. The robotic arm is controlled by a microcontroller based system which further controls DC servo motors through a motor driver L293D. This is a low cost system with simplest concepts to implement sorting effectively saving manual time and work.*

Keywords: Color Sensors, DC Motors, frequency conversion method, gripper, RGB color model.

I. INTRODUCTION

In the era of robotics and automation, all the industries are becoming automated for faster development and growth. A robot is an electro-mechanical machine which reduces human efforts and increases efficiency. It is a real time machine which completes its given tasks in given time, with the help of computer programming.

The paper presents the design and development of a robotic arm with the application of color sorting of spherical objects using advanced sensors. Basically the robotic arm is programmed to pick the spherical object from one place and drop accordingly into the respective colored box. Here, the **color sensors** are used to sense the color of the object to be picked and dropped, and the voltage i.e. the intensity of the color sensed is converted into frequency which is given as input to the microcontroller. The microcontroller enables motor driver circuit which drives the motors of the robotic arm to grip the objects and drop them in the specified location according to the color.

II. LITERATURE REVIEW

NAME SR.NO	TITLE	AUTHOR NAME	METHODOLOGY USED	DISADVANTAGES
1.	"Design And Operation Of Synchronized Robotic Arm" (Aug 2013)	Goldy Katal, Saahil Gupta, Shitij Kakkar (Aug 2013)	Digital Image Processing.	It is a costly approach since a camera is used & no sensors are used.
2.	"youbot arm" (2010)	Nathaniel Pinckney	Digital Image processing.	The processing takes time. Also as a camera is used, a special software has to be developed.
3.	"Design a color sensor: Application to robot handling radiation work", Vol. 56, No.10, pp. 365-368, 2007	Sagar T. Payghan1	Image processing procedure by a webcam	The processing takes time. Also as a camera is used, a special software has to be developed.

III. METHODOLOGY

PROPOSED METHODOLOGY:

1. Sense the object to be color sorted.
2. Identify the color of the object.
3. Pick the object & place it in the respective color box.

BLOCK DIAGRAM

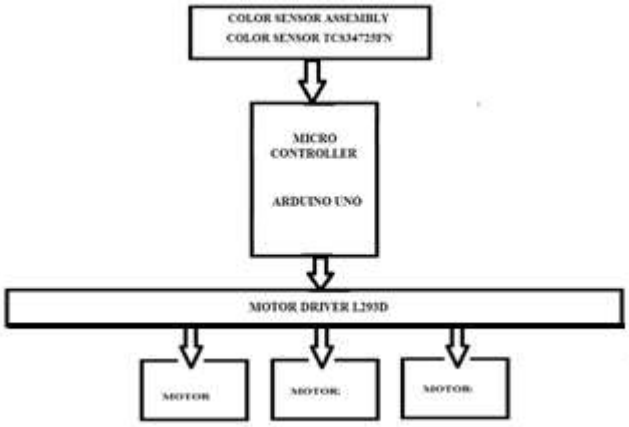


Fig.No.1 BLOCK DIAGRAM OF AUTOMATIC COLOR SORTING ROBOTIC ARM USING ARDUINO

COMPONENTS USED TO IMPLEMENT IDEA

- Color senser-TCS34725FN
- IR Phototransistor
- Servo motors
- Stepper motor
- Arduino
- Comparator LM324
- motor-driver IC, L293D.

IV. WORKING

The sorting criterion of the system is color and so a photodiode is used as a color sensor. The sensor color detection is based on the **RGB color model** which includes a wide range of colors. The microcontroller is an integral part which controls the rest of the blocks of the unit. The output of the photo sensor is given as input to the microcontroller which analyzes the intensities & controls the functions of rest of the blocks of the system.

After sensing the color of the object, picks the object using a **gripper**. This requires controlling the gripper motor. The controller now moves the arm to the dropping location where the gripper motor is again controlled to drop the object.

Motor driver is used to interface motors with the microcontroller unit since the o/p voltage of the microcontroller unit is very less than that required for driving the motors. The whole system operates on **3 DC motors**.

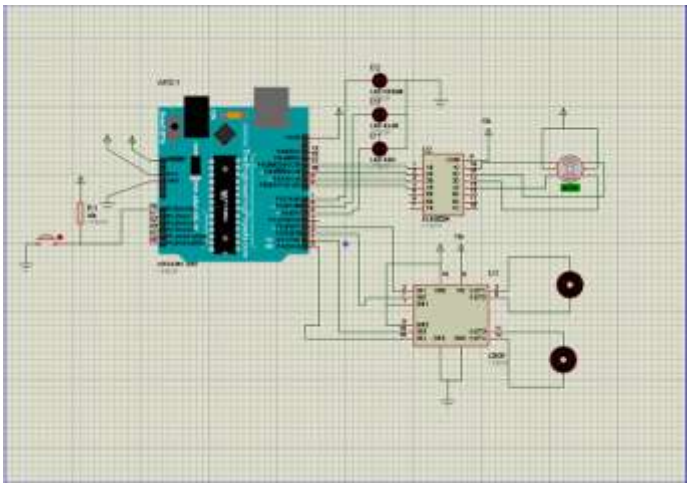
COLOR SENSING

The color sensor detects primary RGB colors and then checks for reflected color intensities which convert the intensity value into 8 bit value for each primary color. The RED color object reflects RED color with high intensity similarly for GREEN and BLUE. The three primary RGB colors are mixed to create remaining colors. After knowing fixed values of primary color it is easy to determine the color of tested object. The corresponding **light intensity** is reflected on sensor, and each color is having a particular value accordingly sensor will produce the output.

PICK AND PLACE CONTROL

Pick and place control operation is operated with the help of 3servo DC motors. The **PWM pulses** are taken from servo motor for varying and maintaining the position. The mechanical part consists of **gripper** and arm is made up of PVC & acrylic material which will help to reduce the weight of model. The color of the object is sensed by sensor, picks the object using a gripper. This requires controlling the gripper motor. The controller now moves the arm to the dropping location where the gripper motor is again controlled to drop the object.

V. SIMULATION RESULTS



VI. APPLICATIONS

The system has a number of applications in various fields, as it provides color sorting of objects. This project is successful if it separates different objects according to their color. It is a sensor based system which sorts an object according to its color and then performs the pick and place functions for the object. An application to the system is also object detection and color recognition, which are the two main steps in the sensing part. For human beings it is a tiresome task to sort the objects with efficiency and high quality, which leads in lack of accuracy in the job.

The system has an important application in the agriculture field. Here the different types of fruits can be sorted and segregated and then pick and place function can be performed to place them in their respective places. Products like grains, apples, lemons, oranges, almonds, bananas, grapes, and different kind of fruits are sorted efficiently. Also in industries sorting of various objects and tools is an important application.

VII. CONCLUSION

The paper presents the design and development of a **pick and place** robotic arm with the application of color sorting of spherical objects using advanced sensors. The different colors are identified by the advanced color sensor TCS34725FN. After the color is identified the objects are picked and dropped by the gripper in the respective position in an efficient manner. Finally, this is a low cost system with simplest concepts which saves manual time and work.

VIII. REFERENCES

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