

Color Object Sorting By Using Pick and Place Robot

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Abstract

Sorting of an object is a very vital mission inside the discipline of enterprise. Sorting is generally carried out by human labor. Nonstop manual sorting creates quality consistency problems and also, weight is greater than a human can carry. This is once automation plays a significant role. This paper presents an efficient method to type the item by the use of pick out and place robot. Robotic arm picks the object from an exact position and detected object placing it in a pre-programmed position. This robotic arm is like a human arm which might rotate in keeping with its predefined angles. On the alternative hand, detecting the color of an object that is red, green, and blue by color sensor. The heart of this project is ATMEGA328P which controls servo automobiles utilized in base, elbow, wrist, and grip.

Keywords- ATMEGA328P, TCS230, DC servo motor, Robotic arm

INTRODUCTION

In industries, Object sorting is very hard work because detecting a particular color object and place it in pre-programmed place is very tiring work. Also, sort of Objects carry through human labor. In the sorting process speed and accuracy achieved by labor is very less. This is because human labor needs to handle hundreds or thousands of objects. Also, weight is greater than humans carry. This is due to the limitation of latency for a personality's eye. The eyes can continually take a while to examine a picture and project this to the brain to initiate sensation. When the brain has received the image, it'll take a while for the brain to work out the color of the item too [1]. However, this limitation is often lined by color object sorting by pick and place robot.

Nowadays, the color device is wide being employed in most of the main industries for product classification and sorting, error detection and additionally quality scrutiny of the merchandise. To reduce time, to carry high weight.

Objectives of the project:

1. Develop the algorithm to sort the given color object.
2. Develop an automated mechanism as the robotic arm for sorting the color object.
3. To layout easy and simplified operational gadget

LITERATURE REVIEW

In the paper "Color Sorting Robotic Arm" the authors Khan, S. A., Anika, T. Z., Sultana, N., Hossain, F., & Uddin, M. N. design associated implementation of color sorting robotic arm that will observe the actual position of an object and will choose up the object to place it in styled place.[1]

The method proposed by author's Tuong Phuoc Tho, & Nguyen Truong Think in a paper "Using ANFIS to predict picking position of the fruits sorting system" is visual line chase system will determine and positioning the objects area unit moving on a conveyer and might mix with different mechanism perform the choose

and place cycles within the packing line or sorting product.[2]

Bhargava, A., & Kumar, A. has designed "Arduino controlled robotic arm" A five DOF decide & place Robotic arm has been developed. the driving force mechanism comprising of Associate in Nursing Arduino microcontroller in conjunction with a group of potentiometers has been with success won't to management the arm as per the inputs given by the user.[3]

The authors Panie, G. I. E., & Mutiara, A. B. in the paper "Development of Robotic Arm for Color Based Goods Sorter in Factory Using TCS3200 Sensor with a Web-Based Monitoring System" In this paper, they developed robotic Arm merchandise of products Sorter in plant supported Color victimization TCS3200 detector With observation System primarily based on the net is designed to improve the accuracy in choosing and sorted goods supported the colors.[4]

Tushar G. Gaikar, Soham N. Zadokar have designed Object Sorting using Color Sensor and Arduino -this gives using conveyor belt object are moving, the color sensor detects the color and signal given to microcontroller .microcontroller reads the signal and decide which color is detected and given to LCD for display and voice recorder that record the signal and it generates output through the speaker.[5]

S. V. Ratio, A. P. Shinde in this paper author presents Sorting of Objects Based on Color, Weight, and Type on A Conveyor Line Using PLC –they developed the system would segregate objects supported their kind i.e. metal or non-metal, weight and color required by the user. The system rejects and discards objects that aren't of needed characteristics by pushing them out of the conveyor line employing a flipper mechanism. [6]

PROPOSED SYSTEM

The block diagram shown in fig 1 consists of Microcontroller, object box, power supply, robotic arm, LCD's and color sensor. First, Three different keys are used for the detection of three primary colors which are red, green and blue. When any key is getting pressed, the signal is given to a microcontroller. Color sensor detects that particular colored object. TCS34725.Colour sensor TCS230 are used for this project because of they are shining a white light by LED on an object and detect the particular color. By using the color sensor that detects the intensity of the color. The sensor detected color given to the microcontroller.

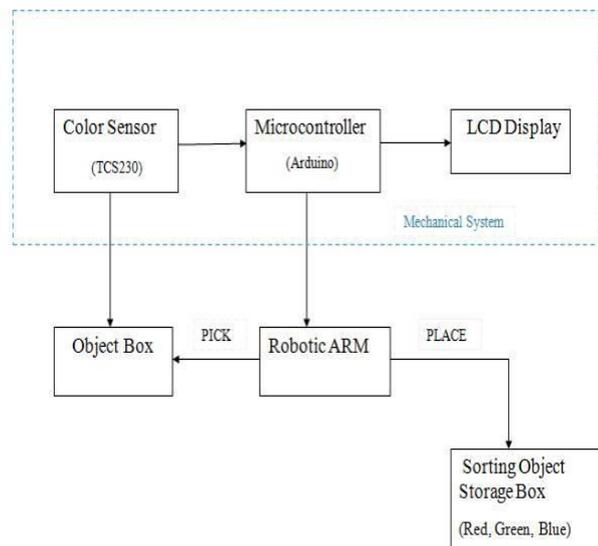


Fig 1: Proposed Block Diagram

The detected object the color display on LCD. Color sensor of the object and signal are given to the microcontroller as shown in fig 1. The signal sensed by the color sensor is given to the robotic arm. As soon as the robotic arm receives the signal from the controller, it picks the object with end effectors and places in their respective positions with the help of a gripper motor.

Hardware Implementation

To develop color object sorting by using pick and place robotic arm required a different type of following components

A. Color sensor

The TCS3200 has an array of photodiodes with four completely different filters. A photodiode is just a conductor that converts light-weight into the current. The 16*16 photodiode array of a color sensor in that 16 for red filter and it is sensitive to red wavelength respective other 16 for blue and green, other 16 for no filter. The device includes a current-to-frequency converter that converts the photodiodes' readings into an square wave with a frequency that's proportional to the sunshine intensity of the chosen color. This frequency is then, scan by the Arduino.

Specification-

- Power- 2.7V to 5.5V
- Size:-28.4 x 28.4mm
- Interface- digital TTL
- High resolution (light to frequency)



Fig 2 Color Sensor

B. Arduino UNO

Arduino Uno is a microcontroller board primarily based on the ATmega328P. It is the brain of the system. It has an operating voltage is 5V. It has fourteen digital input/output pins of that used as PWM outputs, 6 analog inputs, 16 rate quartz, a USB association, a strength jack,

ICSP header, and a button. For a movement of a robotic arm. PWM signal is given to servo motor from an Arduino that is used for a robotic arm.

Specification-

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage: 7-12V
- SRAM: 2 KB

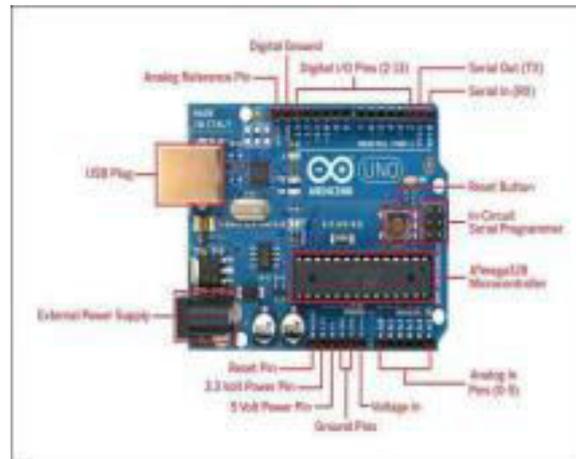


Fig 3 Arduino Uno

C. Robotic Arm

The robotic arm will be operated in two modes of operation viz. Manual management and Autonomous management. Within the manual management mode, the robotic arm is moved and managed through the manual management panel that consists of four control knobs. The autonomous management mode, the coordinates of the placement of an object area unit entered in the graphical user interface application in the PC. A 4-axis robotic arm used for the project.

The Robotic arm will do Left-Right, Up-Down whereas keeping gripper parallel to surface, Twist motions and fascinating action.

Specification-

- Number of axis-4
- Operating Voltage-5V to 6V

- Gripping jaw length- 43mm
- Gripping jaw width-60mm

D. Servomotors

Servomotors are unit nothing however DC motors. Servomotors have an inbuilt gears system and electric circuit management electronic equipment. These motors don't need any kind of driver's electronic equipment. A servomotor could be positioned that allows for precise management of spatial relations. They consist of a motor coupled to a detector for position feedback, through a discount casing. Servo motor conjointly needs a comparative microcontroller, typically an ardent module designed specifically to be used with servomotors. A servomotor may be a closed-loop mechanism that uses position feedback to manage its motion and final position. The input to its management may be a signal that is representing the position commanded for the output shaft. 4 servo motor used for the robotic arm.

Specification-

- 3 pole ferrite, all nylon gear
- Top ball bearing
- Operating Voltage- 4.8V~6.0V
- Operating speed- 0.12sec/60 degree
- Output torque-1.6kg/cm 4.8V
- Dimension-21.5 x 11.8 x 22.7mm
- Weight: 9g



Fig 4 Servomotors

E.LCD

Liquid Crystal Display These displays square measure in the main most popular for multi-segment light-emitting diodes and 7 segments. the most edges of victimization this module square measure inexpensive; merely programmable, animations, and there are not any limitations for displaying custom characters, special and even animations, etc.

Specification-

- Voltage-4.7v to 5.3v
- Current-1mA
- Alphanumeric LCDs alphabets & numbers
- Display 2 mode-4 bit
8 bit



Fig 5 LCD Display

G.Robotic Arm

The robotic arm will be operated mistreatment 2 modes of operation viz. Manual management and Autonomous management. within the manual management mode , the robotic arm is moved and management led through the manual management panel that consists of four control knobs. The autonomous management mode, the coordinates of the placement of object area unit entered in the graphical user interface application on the computer.

Fig 6.shows 4 axis robotic arm used the project. This is used for the detecting a particular colored object and placed a particular position. There are 3 servo motors used for the robotic arm. Two servo motor used for up-down of robotic arm and one used for the gripper.

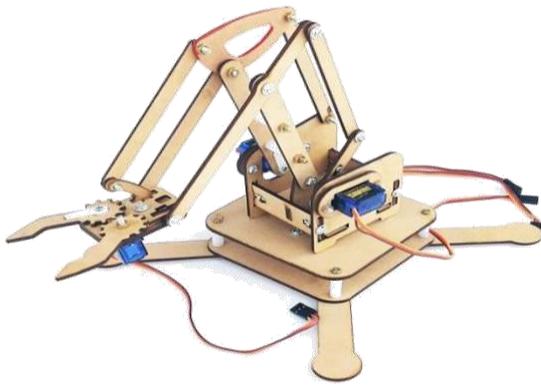


Fig 6 Robotic Arm

Specification-

- Number of axis-4
- Operating Voltage-5V to 6V
- Gripping jaw length- 43mm
- Gripping jaw width-60mm

Flowchart Of System

The following are the flowchart and algorithm designed for the project.

Algorithm-

1. Start
2. Initialization of color sensor, servomotor and LCD.
3. If the red color key pressed then color sensor starts detecting red-colored object in object box.
4. Detected signal given to the microcontroller and also display on LCD.
5. According to Arduino information position of roboarm is adjusted.
6. This roboarm grips that colored object and places it at a particular position in a sorted box.
7. If another key pressed for color repeat the process from 3 otherwise stop.

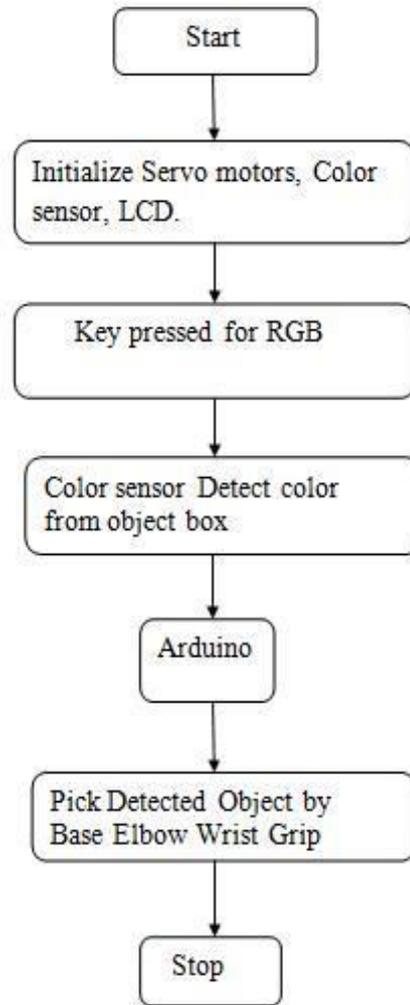


Fig 6 flow of a system

RESULTS AND DISCUSSION

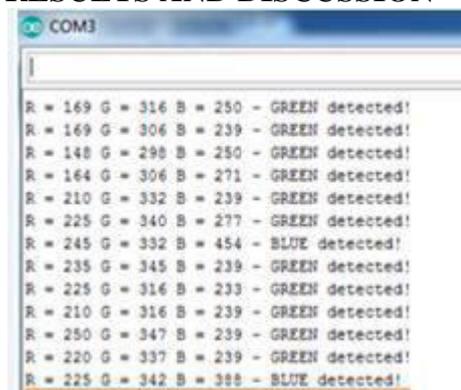


Fig 7 Serial monitor of Arduino that shows the detected various color by using color sensor TCS3200

It can be seen in fig 7. That shows if green color detected by color sensor then value shows on serial monitor of Arduino display is from 300 to 370 and if blue the color is detected value greater than 370

.The Red color value is a display from 250 to 300.

Light Intensity Test

The light intensity test of color sensor TCS3200 is taken indoor and outdoor.RGB values are in indoor is less or greater or approximately equal to outdoor.

Test is taken in indoor as shown in Table 1 and outdoor test taken into as shown in Table 2.

Table 1 Color sensor test taken in indoor

Colour	Average Filter Value		
	Red filter (R)	Blue filter (B)	Green Filter (G)
Red	265	183	219
Blue	230	376	314
Green	362	260	381

Table 2 Color sensor test taken in outdoor

Colour	Average Filter Value		
	Red filter (R)	Blue filter (B)	Green Filter (G)
Red	270	258	237
Blue	327	392	385
Green	317	334	382

The color sensor TCS3200 is used for the test. In the indoor test if the red color is in

front of the color sensor then the value of red filter and other color filter is greater the same as blue color and green color. But if we have seen in an outdoor test if we tested with red color then blue color and the green color value are near to red color value. This cause system failed in detecting a particular color.

To get an accurate result, a testing result good in indoor so need to avoid outdoor test to prevent from undesirable light. Also, we need only one light present when testing the light.

CONCLUSION AND FUTURE WORK

The fully functional system is recognized colors and sort objects through pick and place robotic arm. The main task of this robotic arm is to notice object betting on color and place it during a programmable predefined place and sense of an object done by color sensor TCS230.

The system can be extended further by using different sensor pH sensors used for the freshness of food, the inductive sensor used for divided metallic and non metallic object, load cell is used for divided on weight. The sensor can be replaced by digital processing.

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