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OBJECT SORTER BASED ON COLOR USING RASPBERRY PI

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ABSTRACT

For industrial applications, objects sorting is a tough task that requires continuous labour. It is advantageous to design a machine that spots the objects and rearrange them when a product matches predefined standards. This paper approach is proposed to sort the objects by using color identification with TCS3200 sensor. Identification of color is based on the frequency analysis from output of sensor. Servo motors are used to place the product for color identification and for moving the slider. Raspberry Pi controls the process of sorting with color identification. This system sorts colored objects and differentiate the objects to separate bins. Cost effective implementation of the system and size scalability makes the proposed system easier to implement in small scale industries minimizing the manual power.

Keywords- Raspberry Pi, Servo Motors, Python, TCS 3200 color sensor, etc.

1. INTRODUCTION

Color Based Object Sorting has a wide usage in fruit sorting as well as candy sorting industries. This system puts forward a mechanism to detect color and sort items through image processing. Once identified a mechanism is used to sort the candies into particular bins baskets. We here demonstrate this mechanism using with electronic circuitry along with sorting mechanism using 3 bins. The system uses raspberry pi connected to a controller circuit to achieve this task. A motor is used to feed an object to the TCS 3200 color sensor chamber. As soon is the color is detected a signal is sent to the sorter mechanism which uses a motor to position the sorting tube towards respective section. Thus, we achieve a completely automated IOT based sorting system.

2. METHODOLOGY AND PROPOSED SYSTEM

This paper aims to study and compare various methods for object sorting based on color. We developed a machine for object sorting based on color using TCS3200 (color sensor) and controlled by Raspberry Pi. Moreover, on the existing system, the existing system was only able to sort three colors i.e Red, Green, Blue by image processing using the live camera. And it was using Arduino as its main processor.

This section explains our proposed approach and system in three steps. First, our machine will be able to sort colors other than Red, Green, Blue. Second, we will be controlling our machine using Raspberry Pi. And third, we'll be having a slider to slide object into the desired bin rather than using a robotic arm to reduce sorting time.

3. PROBLEM STATEMENT

To build object sorter machine using TCS3200 color sensor and Raspberry Pi which will sort the objects based on their color and place the objects in different bins based on their respective colors.

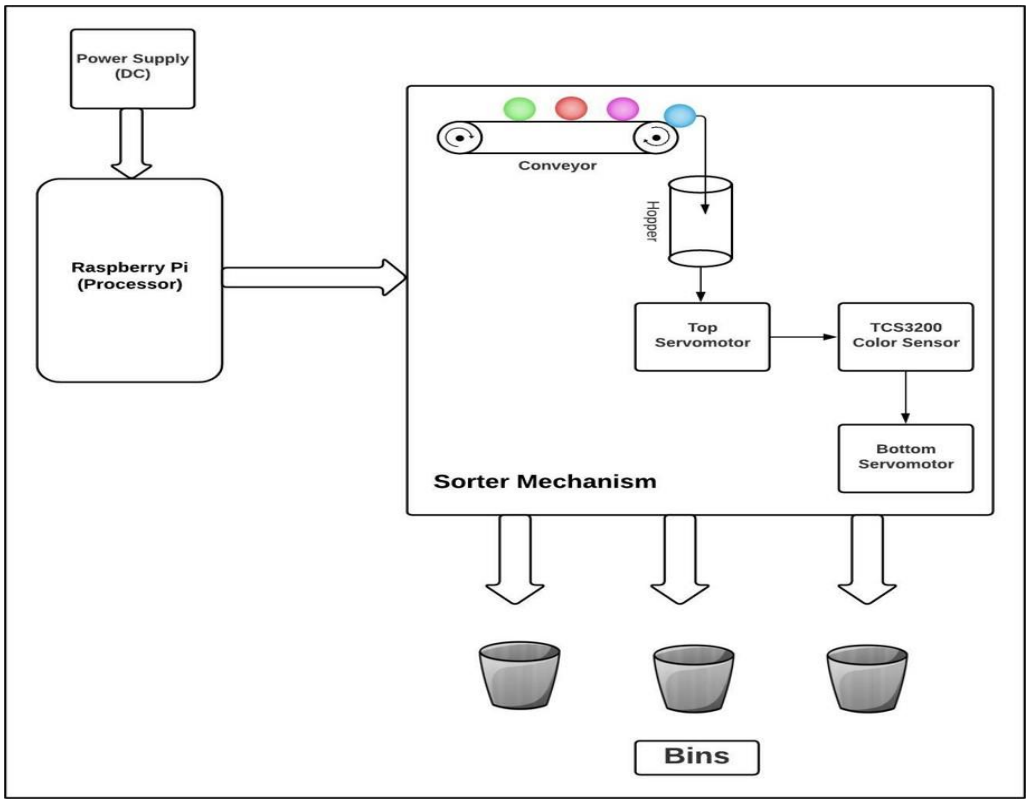
4. LITERATURE SURVEY

K. Murali Chandra Babu, P. A. Harsha Vardhini, "Design and Development of Cost-Effective Arduino based Object Sorting System". As presented, For industrial applications, object sorting is a tough task that requires continuous labor. It is advantageous to design a machine that spots the objects and rearranges them when a product matches predefined standards. This paper approach is proposed to sort the objects by using color identification with the TCS3200 sensor. Identification of color is based on the frequency analysis from the output of the sensor. Chutes are used to place the product for color identification and for moving the container. Arduino nano controls the process of sorting with color identification. This system sorts colored objects and differentiates them objects to a separate case. Cost-effective implementation of the system and size scalability makes the proposed system easier to implement in small-scale industries minimizing the manual power.

S. A. Khan, T. Z. Anika, N. Sultana, M. N. Uddin, "Color Sorting Robotic Arm". As presented, the design and implementation of color sorting robotic arm which can detect the exact position of an object and can pick up the object to place it in designated place. This robotic arm is like human arm which can rotate according to its predefined angles. On the other hand, detecting an object on color basis is done by ultrasonic sensor & color sorting sensor. The heart of this project is microcontroller board ATMEGA328P which controls servo motors used in base, elbow, wrist and grip. The prototype of this project was made and used for picking red, green and blue color objects.

Md. Jamilur Rahman, Deb Prosad Das, Ohidul Islam, Hasan U. Zaman, "A Novel Design of a Robotic Object Sorter Based on Color Differences using Image Processing Techniques". As presented, In the industrial production systems, manufacturers often face difficulties in sorting out colored objects. Human eyes cannot continuously differentiate colors, as they get tired very soon. Using manual sorting, many laborers are needed which can be a huge expense. The aim of this project is to build a robotic sorter, which is capable of detecting and sorting colored objects. It has a robotic arm, which, after detection of color, picks up the object and then place it at a predetermined place as required by the production system. This project is a combination of electrical, mechanical and visual subsystems. A Pixy cam along with the image processing software do the job of color detection. We have used several servomotors for rotating the arms of the robot. The arms can move horizontally from its base and vertically up and down. The gripper is capable of moving quite far for proper gripping of objects. This multi-DOF (Degree of Freedom) robotic sorter can be a very useful tool in fully automating a production process, which uses conveyer belts. The overall improvement in the efficiency of the production process can be significant by using this machine.

5. BLOCK DIAGRAM



6. ALGORITHM

KNN

The k-nearest neighbors (KNN) algorithm is a simple, easy-to-implement supervised machine learning algorithm that can be used to solve both classification and regression problems. We will use this algorithm to classify the color of a new object.

Step-1: Start

Step-2: Initialize the variables for Red, Green, Blue

Step-3: Measure the color values for the selected objects using TCS 3200 color sensor. i.e measure Red component in an object, measure Green component in an object and measure Blue component in an object.

Step-4: By doing step 3, now we get RGB values for an object, store those values in R, G, B variables respectively.

Step-5: Put any object out of selected objects in front of the sensor, now if the detected color value for red==R, detected color value for green==G, detected color value for blue==B then rotate the servo motor by a certain angle to drop and object into the expected bin.

Step-6: If the detected color is out of selected objects, then rotate the servo motor to drop an object in the separate bin kept only for objects out of choice.

Step-7: Stop

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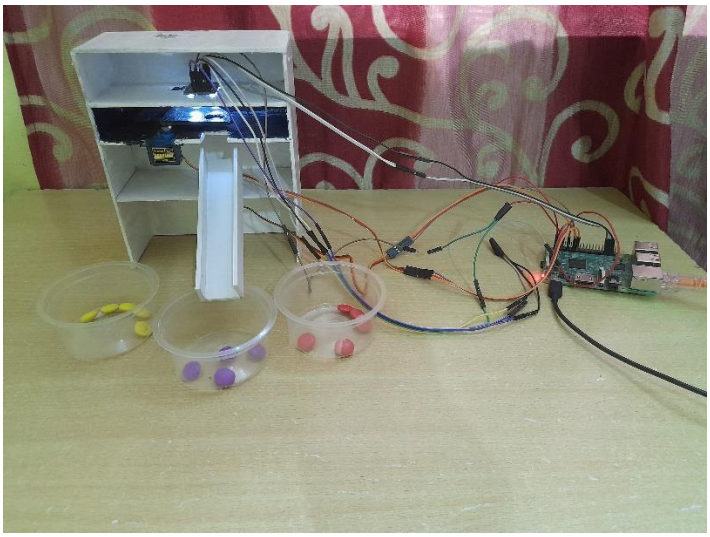
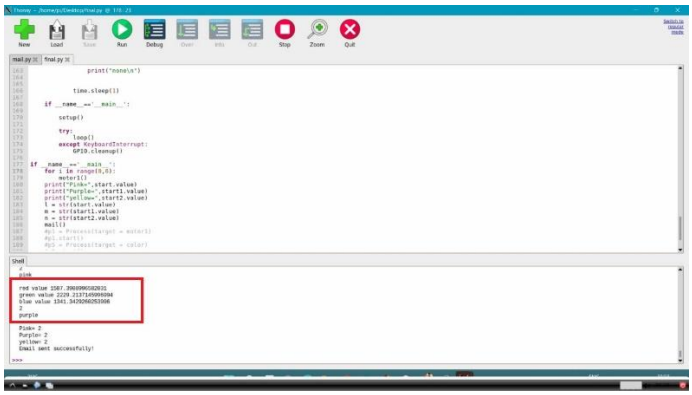
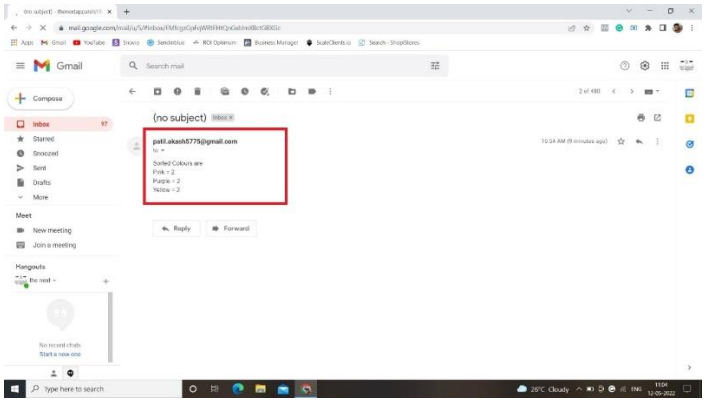
7. DESIGN IMPLEMENTATION



8. RESULTS & DISCUSSION



We have implemented an email feature in this project. Which will send an email to the machine operator automatically, with a detailed report of the operation. This means there is no need for an operator to be present at the location.



9. CONCLUSION

A raspberry pi based object sorting system for industrial applications is implemented that is well suited for industries where sorting of objects is required based on its colors. This system sorts colored objects and differentiates the objects into separate cases. Identification of color is based on the frequency analysis from the output of the sensor.

Cost-effective implementation of the system and size scalability makes the proposed system easier to implement in small-scale industries minimizing the manual power.

10. FUTURE SCOPE

- The load cell can be added for measurement and control of the weight of the product.
- Speed of the system can be increased by accounting for the speed of production.
- The system can be used as a quality controller by adding more sensors.
- The sensor can be changed according to the type of product.
- The DC motor can be replaced with a stepper motor.

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