Tuijin Jishu/Journal of Propulsion Technology
ISSN: 1001-4055
Vol. 45 No. 1 (2024)

An Arduino-Powered Color Sorting Machine Using TCS3200

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Abstract: **-** In the current digital era, color processing across various industries provides us greater leverage to address the consistency issue associated with ongoing manual sorting. This document will present a novel method for consistently identifying, categorizing, and storing things in a designated location. Since color processing may be applied in many areas and has the potential to expand with the aid of current technology, it is a subject of great interest. To research, design, and construct a color sorter, electronic components such as the TCS3200 color sensor, servo motor, Arduino Nano microcontroller, and others are needed. This project uses sensors to identify an object's color and communicate that information to the Arduino. Product sorting is one of the trickiest industrial processes. Consistency is produced by ongoing human sorting. The purpose of this prototype is to automatically arrange objects according to color. The product's color will be detected by the TCS230 sensor, and process control will be handled by the microcontroller. The prototype is expected to meet the demands for increased production and exact quality in the automation industry, based on the experimental findings.

Keywords: *Color sorting, Conveyor belt, TCS3200 color sensor, ARDUINO UNO, Servomotors.*

1. Introduction

Manufacturing performance is a key factor in performance at the cutting edge of competitive manufacturing in the commercial sector. Your miles are critical to cutting labor costs, increasing manufacturing speed, and decreasing downtime of production equipment. Numerous manual production steps that include sorting and handling of goods are labor- and time-intensive[2]. The automatic classification tool that aids in the classification mechanism's color-based classification is covered in this document. For detection, the TCS3200 color sensor was employed. This completes the absolute categorization by color using the frequency readout of the sensor output. The primary objective was to identify the distinctive colors of the article in order to create an inventive project named Article Classification System[1].

Even if each object has a distinct color, gather them all in the hopper and distribute them precisely according to color. A lot of painting locations are dangerous for people to be in, and some are not conducive to hand sorting[3]. Applying paint. Thus, record 22 scenarios to prevent inconsistent labor, time consumption, and sharp colors.

This prototype is a basic digital device that uses servomotors for movement, a microcontroller for processing, and a dyeing sensor to identify unique color devices. The automatic classification tool that aids in the classification mechanism's color-based classification is covered in this document[5]. For detection, the TCS3200 color sensor was employed. The absolute categorization, which is primarily dependent on color, is finished using the sensor output frequency values. The challenge's primary goal was to identify each item's distinctive color and use that information to create an inventive enterprise known as an item classification system. Even more specific to coloring will be the process of removing the objects from the hopper and assigning them to the appropriate location according to their coloration. Because of the complexity of the production process, these machines are excessively expensive. Color identification and detection are frequently needed for color correction. Certain regions are dangerous for persons painting, and many painting situations are not conducive to hand sorting. This project uses servo motors and a microcontroller to operate a colored ball sorting machine[4].

2. Objectives

This project's main goal is to use the TCS3200 color sensor to design and build an automated lemon sorting system that can distinguish between yellow and green lemons. Our goal is to develop a sorting system that best classifies lemons based on their color attributes by defining exact color criteria that are grounded in in-depth study into the color spectrum of lemons. This first stage is essential for the TCS3200 color sensor's future calibration, which guarantees that it will correctly identify and distinguish between the varied hues of yellow and green lemons.

Another important goal is the careful selection and integration of hardware components. This contains a mechanical system to help with the movement and sorting of lemons, an Arduino board for data processing and control, and the color-detecting TCS3200 color sensor. The final lemon sorting machine will have components that are specifically designed to guarantee precision, dependability, and smooth integration. The distinct color profiles of yellow and green lemons will be the primary focus of the TCS3200 color sensor's calibration procedure. The goal of this painstaking calibration is to optimize the sensor's characteristics so that it can distinguish colors during the sorting process with accuracy and consistency.

The careful integration and selection of hardware components is another crucial objective. This has an Arduino board for data processing and control, a mechanical mechanism to assist with moving and sorting lemons, and a color-detecting TCS3200 color sensor. Components of the finished lemon sorting machine will be precisely engineered to ensure accuracy, consistency, and seamless integration.The calibration process for the TCS3200 color sensor will primarily target the different color profiles of yellow and green lemons. Optimizing the sensor's properties to enable precise and reliable color discrimination during the sorting process is the aim of this laborious calibration.

3. Methods

A.Input Unit

Transporting the thing from a designated location to a sensor unit is the primary goal of this project. Due to this component, an item is simultaneously presented to the sensor. This is the crucial unit for statistics. With the aid of a DC motor, Field will gather all the objects that are shaded and drive directly into the sensor unit. Any of the shaded veggies can be used, provided that they meet the mechanical requirements of this apparatus. The primary colored items we will be using in this instance are colored veggies such as lemons, chilies, and so on. This unit's primary function is to move the object to the sensor unit, and as it does so, the sensor unit, the manual rail desires to prevent.

B.Processing Unit

- Arduino Setup: Connecting an Arduino Uno to a computer and to upload code is the process.
- Installing Libraries: Any specific libraries are required, such as libraries for colour sensing to be installed.

Hardware Setup

- Sensor Placement: Describes where to place the colour sensors on the input area for colour detection.
- Conveyor System: Provide instructions for setting up the conveyor system or the mechanism to move items through the colour sensor area.

Coding

- Initializing Sensors: Initialize and configure the color sensors for accurate colour detection.
- Reading Sensor Data: To read data from the sensors and convert it into meaningful colour information.
- Sorting Logic: It implements the sorting logic using conditional statements in Arduino code. It also describes the Arduino decides which items is diverted based on their color.

C.Output Unit

Depending on the object's color, the unit is instructed to use a manipulating unit to move the item from the shipping unit to a certain location. Each color shade is gathered across many devices. For example, every color that falls into the categories of red, green, or blue is saved for future use by the shading sensor. After then, a suitable shading begins to build and the yield of the shading detection becomes apparent. Initially, we lay a piece of inexperienced shading paper over the shading sensor. When this is done, the shading sensor recognizes it and turns on. The process is then repeated for the other two colors.

4. Results

The color sorting machine operated as intended. We were able to successfully separate green and yellow lemons using this equipment, which has a servo motor. In the future, we may modify the Arduino code to segregate various fruits and veggies according to color. We can still distinguish large items even with further upgrades. More advanced color sensors and imaging technologies will probably be included into future systems, allowing for the accurate identification of a larger spectrum of colors and even minute differences within a single color. Color sorting systems will need to keep up with the ongoing acceleration of manufacturing and production processes. Future systems will be built for even greater throughput and sorting rates, which will make them appropriate for high-volume sectors. This will improve color sorting's precision and adaptability. This work examines several research paper formats that utilize color sorting machines or mechanisms. The project's comparative technological approach. The TCS3200 color sensor is the greatest color detecting sensor, and we used an Arduino Uno to build a reasonably priced color sorting machine.

5. Discussion

These days, maintaining a product's integrity of supply from raw materials to completed goods through high-quality manufacturing is more crucial in the fiercely competitive industrial manufacturing sector. It is necessary to declare a product to be of excellent quality and to have precise dimensions. Therefore, the automated color sorting project is a great one due to its broad use and functioning theory. The project's concept may be readily used by the industry to categorize necessary products based on color. Although this notion has certain limits, it may be used to a wide range of situations with some adjustment.

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