



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VI **Month of publication:** June 2022

DOI: <https://doi.org/10.22214/ijraset.2022.44358>

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Colour Detecting and Sorting Robot

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Abstract: *In this digital world, color processing in numerous industries gives us more leverage to unravel the consistency problem of continuous manual sorting. This document are a replacement approach to continuously detect and classify objects and keep them in a very specific place.*

Color processing attracts plenty of attention since the assistance of contemporary technology results in the likelihood of expanding the scope of its application in various areas.

The Arduino Nano microcontroller, TCS3200 colour sensor, servo motor, and other electronic components are wont to study, develop, and build a color sorter.

This work involves sensors that detect the colour of the item and send the signal to the Arduino.

The microcontroller sends a proof to the circuitry that drives the varied motors to activate the thing and place it within the specified location. supported the detection, everything moves to the required position releases the thing, and returns to the first position.

The system is in a position to quickly classify the article supported its color at the respective color station. Sorting objects is an essentially mechanical process that needs difficult work.

The chronically manual layout ends up in consistency problems. Above all, machines can do boring tasks that humans are superior to. Worker burnout in sequential production structures can result in reduced execution and purpose issues in maintaining the article.

Recognize the colour of the article but in no way a machine. during this article, a compact registration near the arrangement of things supported color was implemented using the TCS3200 color sensor with servo motors in conjunction with Arduino Nano.

I. INTRODUCTION

In the cutting-edge-day scenario of competitive manufacturing in commercial zone performance of producing holds the important component for achievement.

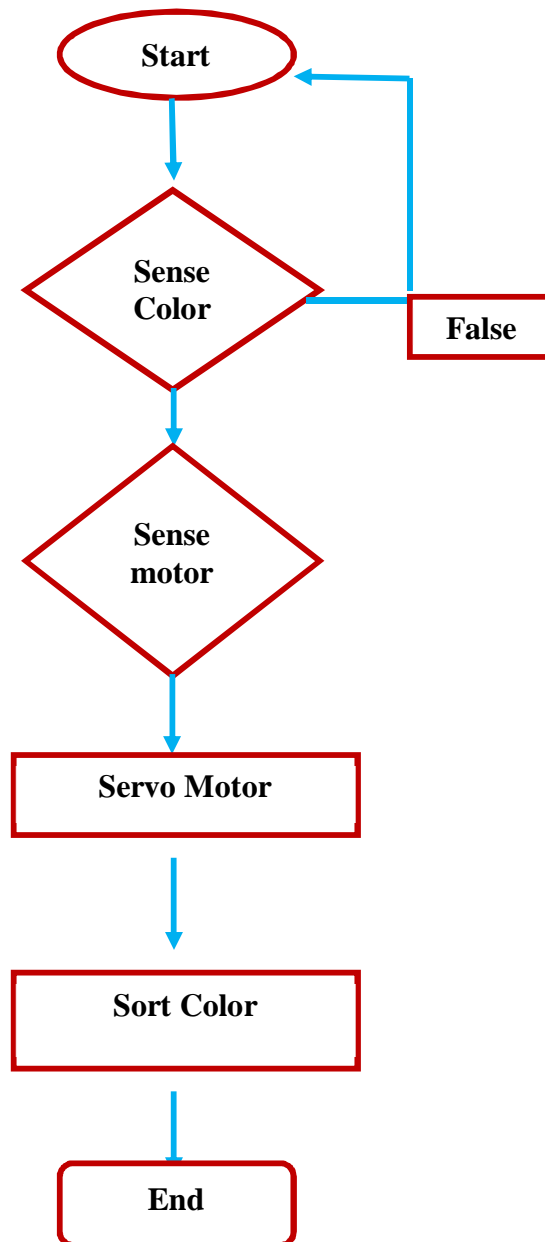
It's miles essential to beautify manufacturing pace, lower the labour charge and reduce the breakdown time of production gadget. Merchandise should be taken care of in numerous ranges of producing and manual sorting is time consuming and labour extensive. This paper discusses about the automated sorting tool which helps the sorting mechanism to kind based at the coloration. For sensing TCS3200 coloration sensor has been used.

With the help of reading the frequency of the output of the sensor, color based absolutely sorting is completed. Layout of a innovative venture cited as item sorting system by means of spotting the sole of a sort reminder the item has been leader goal of the challenge. Accumulating the objects from the hopper and distributes those objects to their accurate area supported their coloration even they'll be unique in coloration.

Many paintings environments aren't suitable for manual sorting and some areas are risky for humans to paintings on. Consequently to avoid the unstable work, time consumption and hard paintings catch 22 situation.

This prototype is made as a straightforward digital gadgets like microcontroller for processing, Servo motors for actions and color ratio.

II. FLOWCHART



III. HOW TCS230 / TCS3200 COLOR SENSOR WORKS

The TCS230 senses color light with the assistance of an 8 x 8 array of photodiodes. Then employing a Current-to-Frequency Converter the readings from the photodiodes are converted into a square wave with a frequency directly proportional to the sunshine intensity. Finally, using the Arduino Board we will read .If we take a better examine the sensor we will see how it detects various colors. The photodiodes have three different color filters. Sixteen of them have red filters, another 16 have green filters, another 16 have blue filters and therefore the other 16 photodiodes are clear with no filters.he sensor has two more control pins, S0 and S1 which are used for scaling the output frequency. The frequency may be scaled to a few different preset values of 100%, 20 % or 2%. This frequency-scaling function allows the output of the sensor to be optimized for various frequency counters or microcontrollers. Now we are able to progress and connect the TCS230 sensor to the Arduino board. Here's the circuit schematics.



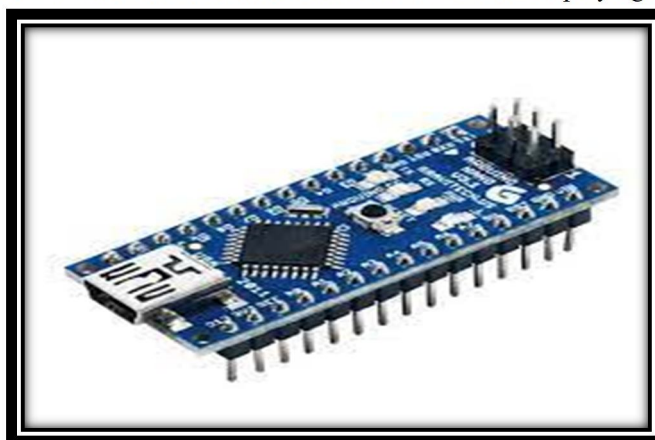
IV. FEATURES OF TCS3200 COLOR SENSOR

- 1) Single-Supply Operation (2.7V to 5.5V).
- 2) High-Resolution Conversion of Light Intensity to Frequency.
- 3) Programmable Color and Full-Scale Output Frequency.
- 4) Power Down Feature.
- 5) Communicates Directly to Microcontroller.
- 6) S0~S1: Output frequency scaling selection inputs.
- 7) S2~S3: Photodiode type selection inputs.
- 8) OUT Pin: Output frequency.
- 9) OE Pin: Output frequency enable pin (active low), can be impending when using.

V. ARDUINO NANO

The Arduino Nano could be a small, complete, and breadboard-friendly board supported the ATmega328P released in 2008. It offers the identical connectivity and specs of the Arduino Uno board in an exceedingly smaller form factor. The Arduino Nano is supplied with 30 male I/O headers, during a DIP-30-like configuration, which may be programmed using the Arduino Software integrated development environment (IDE), which is common to any or all Arduino boards and running both online and offline. The board is powered through a type-B mini-USB cable or from a 9 V battery. In 2019, Arduino released the Arduino Nano Every, a pin-equivalent evolution of the Nano. It features a more powerful ATmega4809 processor and twice the RAM. Arduino Nano is one sort of microcontroller board, and it's designed by Arduino.cc. It are often built with a microcontroller like Atmega328. This microcontroller is additionally utilized in Arduino UNO. It's a little size board and also flexible with a good kind of applications. Other Arduino boards mainly include Arduino Mega, Arduino Pro Mini, Arduino UNO, Arduino YUN, Arduino Lilypad, Arduino Leonardo, and Arduino Due. And other development boards are AVR Development Board, PIC Development Board, Raspberry Pi, Intel Edison, MSP430 Launchpad, and ESP32 board.

This board has many functions and features like an Arduino Duemilanove board. However, this Nano board is different in packaging. It doesn't have any DC jack so the facility supply may be given employing a small USB port otherwise straightly connected to the pins like VCC & GND. This board are often furnished 6 to 20volts employing a mini USB port on the board.



VI. CONVEYOR BELT

A conveyor belt is that the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one amongst many sorts of conveyor systems. A belt conveyor system consists of two or more pulleys (sometimes cited as drums), with a control system of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and also the material on the belt forward. The powered pulley is termed the drive pulley while the unpowered pulley is termed the block. There are two main industrial classes of belt conveyors; Those normally material handling like those moving boxes along inside a factory and bulk material handling like those wont to transport large volumes of resources and agricultural materials, like grain, salt, coal, ore, sand, overburden and more. Conveyors are durable and reliable components utilized in automated distribution and warehousing, similarly as manufacturing and production facilities. together with computer-controlled pallet handling equipment this enables for more efficient retail, wholesale, and manufacturing distribution. it's considered a labor-saving system that permits large volumes to maneuver rapidly through a process, allowing companies to ship or receive higher volumes with smaller space for storing and with labor expense. Belt conveyors are the foremost commonly used powered conveyors because they're the foremost versatile and therefore the least expensive. Products are conveyed directly on the belt so both regular and irregular shaped objects, large or small, light and heavy, may be transported successfully. Belt conveyors are manufactured with curved sections that use tapered rollers and curved belting to convey products around a corner. These conveyor systems are commonly employed in postal sorting offices and airport baggage handling systems.



VII. SERVO MOTOR

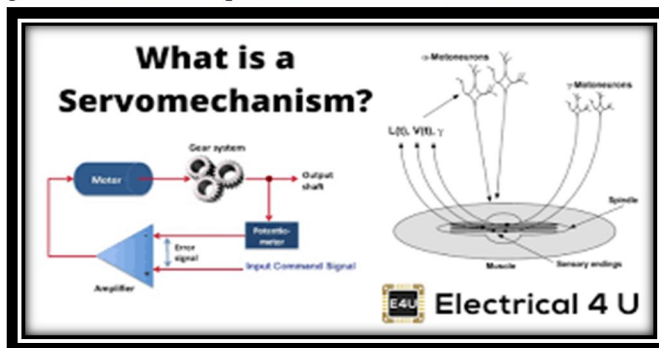
A servomotor (or servo motor) could be a positioner or linear actuator that permits for precise control of angular or linear position, velocity, and acceleration. It consists of an appropriate motor coupled to a sensor for position feedback. Servomotors are employed in applications like robotics, CNC machinery, or automated manufacturing. It also requires a comparatively sophisticated controller, often a zealous module designed specifically to be used with servomotors. Servomotors don't seem to be a particular class of motor, although the term servomotor is usually accustomed discuss with a motor suitable to be used in a very closed-loop system. Servo motors are a part of a closed-loop system and include several parts namely a sway circuit, a servo motor, a shaft, a potentiometer, a drive gear, an amplifier, and either an encoder or a resolver. A servomotor could be a self-contained device that rotates parts of a machine with high efficiency and great precision.

The output shaft of this motor is moved to a particular angle, position, and velocity that a standard motor doesn't have. The servo motor uses a daily motor and couples it with a sensor for position feedback. The controller is that the most significant a part of the servo motor specially designed and used for this purpose. The servo motor could be a closed-loop mechanism that includes position feedback to manage rotational or linear speed and position. The motor is controlled with an electrical signal, either analog or digital, that determines the number of movement that represents the ultimate commanded position for the shaft. a sort of encoder is a sensor that has speed and position feedback. This circuit is constructed directly into the motor housing, which is typically equipped with a gear system.



VIII. MECHANISM OF SERVO MOTOR

A servomotor may be a closed-loop servomechanism that uses position feedback to manage its motion and final position. The input to its control could be a signal (either analog or digital) representing the position commanded for the output shaft. The motor is paired with some variety of position encoder to supply position and speed feedback. within the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, a blunder signal is generated which then causes the motor to rotate in either direction, PRN to bring the output shaft to the suitable position. because the positions approach, the error signal reduces to zero, and also the motor stops. The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). this sort of servomotor isn't widely utilized in industrial motion control, but it forms the premise of the straightforward and cheap servos used for radio-controlled models.



A gripper may be a device which enables the holding of an object to be manipulated. the better thanks to describe a gripper is to consider the human hand. a bit like a hand, a gripper enables holding, tightening, handling and releasing of an object. A gripper is simply one component of an automatic system. A gripper is attached to a robot or it may be a part of a hard and fast automation system. Many styles and sizes of grippers exist so the proper model is selected for the applying.

A. What is the basic Operating Principal of a Gripper?

Compressed air is supplied to the cylinder of the gripper body forcing the piston up and down, which through a mechanical linkage, forces the gripper jaws open and closed. There are 3 primary motions of the gripper jaws; parallel, angular and toggle. These operating principals check with the motion of the gripper jaws in regard to the gripper body.

IX. APPLICATIONS OF COLOR DETECTING AND SORTING ROBOT

- 1) Colour sorting machines are most ordinarily utilized in the sorting of agricultural grain and rice, additionally as within the processing of food products, like coffee, nuts and oil crops. The optical sorter separates any stones, mouse droppings and discoloured, toxic or otherwise unacceptable items. Where a nut or seed, for instance, has already been dehusked, the color sorter will detect any remaining husk and separate the offending item from the remainder for disposal or alternative use.

- 2) Grading of colored produces products determines coded marks, detects the info codes on a package.
- 3) Color Detection and color identification.
- 4) Used in image processing and Digital signal processing and object identification.
- 5) Used in true color recognition.
- 6) Distinguishes different reminder colors.
- 7) Textile industry automotive industries, the food industries, printing industries, pharmaceutical industry etc. in internal control in visual inspection tools.
- 8) Process controlling, Production and Quality Assurance.
- 9) Controls, Stores and evaluates the visible colors.
- 10) Spectral sensing for color measurement.
- 11) Detection of the Environment.

X. ADVANTAGES OF COLOR SENSOR

- 1) It helps in sorting of objects supported three color approach.
- 2) Automated system may be built using color sensors which help in completion of labor in less time. Moreover human intervention isn't needed.
- 3) Powerful and huge memory color sensor IC's are available at low cost. This has driven its use in many applications.
- 4) It is easy to vary or modify manufacturing setups without even reprogramming the sensor device. this can be beneficial in low volume manufacturing applications having frequent color variations.
- 5) With the advancement of technology and memory loaded with color intensity data, color sensor controller can store and might make color matching decisions or unlimited number of colours virtually.

XI. FUTURE SCOPE

- 1) This project may use in robotic arm.
- 2) Create a program that may use to spot different (red, and green)color.
- 3) Run the programming system.
- 4) Sorting the merchandise consistent with their color.
- 5) Ensuring internal control in production.
- 6) By some modification it is accustomed detect any colored object.
- 7) By some modification it is wont to measure the dimension of a product.
- 8) By increasing its sensing capacity it will be employed in airport.
- 9) It is additionally very useful in laboratories and workshops.

XII. CONCLUSION

The System has been successfully designed and it has the capability to rotate 3600 and handle the required task. It can take specific colored object, hold it and put it to a particular atation even to some height using RGB color sensor. Color sensing section performed two main tasks; object's detection and color recognition. System if fully remote controlled and can pick objects. The cost effective system was designed to perform the continuous and reliable tasks without human errors using the simplest concepts. The robotic sorting systems are useful in industries and different household activities activities. Since this system is mainly controlled by the PIC Microcontroller, the results obtained are more reliable and faster.

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