

Sensor Based Color Identification Robot For Type Casting

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Abstract

We have developed a robotic system to separate the objects from a set according to their colour. This can be useful to categorize the objects which move on a conveyer belt. This investigates the development of an intelligent and low-cost monitoring system for color identification and segregation. Color is the most common feature to distinguish between objects, sorting, recognizing and tracking. We use DC motors for joint rotations involved in the robotic arm, these motors are interfaced with PIC microcontroller through motor driver circuits. In present work the 'color detecting' algorithm is written in MPLAB-IDE for performing the operation. The 'color detecting' algorithm is executed to identify the object and send the appropriate commands to the microcontroller to perform the sorting operation.

Keywords: Color identification and segregation, PIC controller, robotic arm and motor drivers.

INTRODUCTION

Traditionally, most of the industrial work is done by the operator manually. One of the major and the most commonly performed work in automation industries are picking and placing of objects from one place to another. Pick and place robots are used over a wide variety of material transfer applications.

This has provided the main motivation for the research and development of robotic arm. Though robotic arm system has already been implemented in sophisticated cases, still the technology is considered as a color sorting system with robot arm that will be operated using a computer/interfacing IC and 8 bit controller. We have used the

programming language to communicate with the PIC controller without use of host devices. The main objective of the present work is to sort the object according to their color using a color sensor and also to sort the object to the station accordingly. After determining the color of the object, the robot arm system will make its own decision to the objects to their respective locations. That has been programmed.

LITERATURE REVIEW

Vindhya D. et al.[1] has proposed “Design and Development of Object Recognition and Sorting Robot for Material Handling in Packaging and Logistic Industries”. In this proposal a MATLAB code is written for the algorithm for performing the operation. The algorithm is executed to identify the object and send the appropriate commands to the microcontroller using serial communication for the robot to perform the sorting operation.

Reeves[2] presented, with a demand for increased productivity from robotic manipulators, multiple robot arms are being used for applications which are more time consuming, difficult or impossible for a single arm. Because of increased computational complexity, a single processor is opening inadequate to meet real-time demands. We present a pick-and-place operation for two robot arms, controlled and synchronized by a multiprocessor real-time operating system.

Procedures:

The working model of the project is divided in to different sections like detection, control section and mechanical assembly.

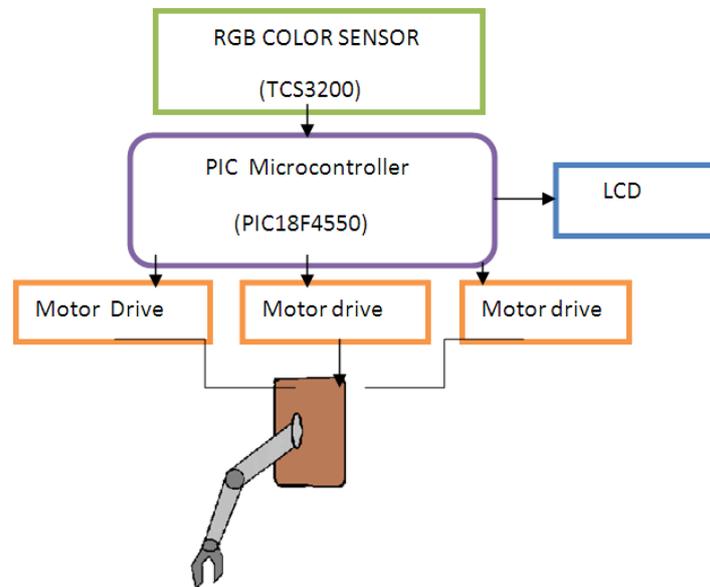


Fig.1: Block Diagram of the proposed system

Different mechanisms can be used for detection of the object. For the trial run of the project the colour based detection has been selected. Since the optical sensors are used without much processing of the input data the sensing is done at a faster rate. The colour sensor itself provide direct signal to the microcontroller after detecting the object. The main operation of the microcontroller is limited to servo motor control and the overall response is expected to be better. The L293D driver ICs are used to drive the DC servo motors. The drivers are fast enough to deliver the pulses at required speed to the motors

DESCRIPTION OF HARDWARE

1. RGB Sensor:

This section is used for detecting the colour of the object to be sorted. There are many colour sensing ICs available today. In different ICs the properties vary such as colour differentiating ability, output format, price, speed, resolution etc. In this project TCS3200 is selected.

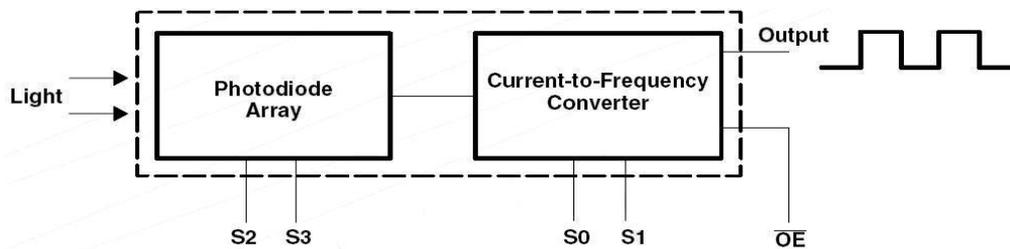


Fig.2: Functional block diagram of TCS3200

TCS3200 contains four types of filters: red filter, green filter, blue filter and clear with no filter. When the sensor is illuminated by a ray of light, the types of filters (blue, green, red, or clear) used by the device can be selected by two logic inputs, S2 and S3. Table-1 illustrates the relationship among S2, S3 and filter type TCS3200s outputs a square wave (50% duty cycle) with frequency corresponding to light intensity and color, and the frequency is directly proportional to light intensity.

Table-1 Relationship among S2, S3 and filter type

S2	S3	FILTER TYPE
L	L	RED
L	H	BLUE
H	L	CLEAR (NO FILTER)
H	H	GREEN

2-PIC Microcontroller:

In this work we have used PIC18F4550 microcontroller.

3-Motor and Robot arm:

Robotic Arm. A robotic arm is a programmable mechanical arm, analogous with functionality of a human arm. The links of a robotic arm are interconnected by joints allowing either translational or rotational motion. Robotic arm has three segments namely base, elbow and gripper. Each segment has one degree of freedom which means it will have six movements. Motor will be used to move the robot arm and will be located at every joint of the robot arm.

Motors. Permanent-magnet direct-current (PMDC) motor is used. DC Motor is inexpensive, small and powerful motors. These motors are flexible because both their direction and speed can be controlled; direction by polarity and speed by voltage. DC Motors are extensively used in robotics because of their lesser size and more energy output, they are excellent for driving the mechanical assemblies.

Motor Driver. A push-pull high current, high voltage four channel driver, L293D is used to control the robotic arm. It is designed to source bidirectional drive currents of up to 1Amperes (A) at voltages from 4.5 - 36 Volts (V). When the enable input is set, the associated drivers are activated, when the enable input is clear, those drivers are deactivated and their outputs are low and in the high impedance state.

4-LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segment and other multi segment LEDS. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animation and so on.

SOFTWARE IMPLEMENTATION

Microchip's MPLAB-The PIC assembly language development system provided by Microchip is named MPLAB. The package is furnished as an IDE (integrated development environment) and can be downloaded from the company's web site at www.microchip.com One limitation of the MPLAB package is that it is furnished only for the PC. If you are a Mac, UNIX, or Linux user you cannot use MPLAB. Development packages for other operating systems are available on the Web. The MPLAB IDE are intended for software development of *embedded systems*

APPLICATIONS

Automotive Agro Applications: - The Pick and Place robot is used in agriculture for collecting ripened fruits based on the color. The ripe fruits have a different color

compared to the unripe fruits. For example, ripened tomato is bright red in color and the unripen one is green. So the pick and place robot can pick the fruits according to their necessity by identifying the color.

Industrial Applications: - As the assembly of the machine parts involving color is a tedious task for execution, the robots are conveniently used to pick and place the parts. It can be used in packing fruits and vegetables of only specific quality in industries like the good quality apples which will be bright red in color.

Auto industry: - The auto industries are the largest user of robots, which industrialize the production of various components and assemble the body of the finished vehicle based on colours. Car production is one primary example of the employment of complex and large robots. Pick and place robots based on color identification are used in that process for the picking and placing the components for assembly of the body of the automobiles.

RESULT AND DISCUSSION

These are the working hardware model for “sensor based color identification robot for typecasting” which is consist of sensor, robot arm, PIC18F4550 microcontroller and servo motor.

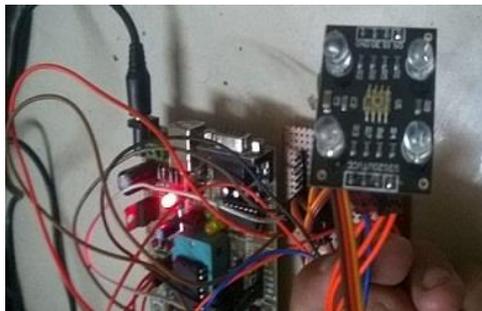


Fig. 3: tcs3200 sensor



Fig. 4: robot arm with pic board

ANALYSIS

1-Light interference from outside should be avoided, which may affect the result of color identification. It is recommended to place the light source and Color Sensor in a close, light reflection free box for testing.

2- White balance adjustment is required whenever Color Sensor module is reset or light source is changed.

CONCLUSION

Robotics is a technology with a future, and it is a technology for the future. In this project we are introducing a robot which can pick and place objects based on the color. Traditionally, most of the industrial work is done by the operator manually. But in our project we used color sensor to sort the object based on color and eventually the

robot picks and places that object accordingly. By doing so the speed and the accuracy of the color sorting process is increased. The cost for the color sorting process is considerably reduced. And most importantly there is overall optimization in the productivity if an industry. This robot arm can perform an action which is much similar to human. Although there is significant progress in robotics, still its usage is limited due to less availability of resources and high cost of production. If we able to overcome these restrictions, more benefits can be achieved from robotics

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