Colour recognition using TCS230 Colour sensor and Arduino

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ABSTRACT:

Blindness is the condition of poor visual perception, estimation from World Health Organization state that 285 million people are visually impaired worldwide, 39 million are blind and 246 million have low vision. A Blind person with proper training can function like any person with perfect vision, but there are the small things that can improve the quality of a blind person life, like color detection which is the focus of this project. Being able to detect color can help in many ways, like identifying colors of clothes or even identifying uniquely colored objects (e.g. paper money) and appreciating art. The project will help overcome challenges that visually impaired people face in daily basis, by creating a way to detect colors and providing unique biofeedback for each color. The proposed embedded system imbibes Arduino microcontroller which reads the RGB data from the color sensor TCS230 which when processed further classify the color based on the lookup table programmed within the controller. The color so identified is displayed along with the RGB combination and also audio feedback of the color identified is given using DF player interfaced with Arduino. During the testing the embedded system the success rate of identification of colors was found to be 93%.

Index Terms: Arduino, Color detection, TCS230, DF player.

I.INTRODUCTION

Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The count of visually impaired people rises every year. The 2011 statistics by the World Health Organization (WHO) estimates that there are 285 billion people in world with visual impairment, 39 billion of which are blind and 246 with low vision [1]. In [2], The system presents a concept to provide a smart electronic aid for blind people, both in public and private space. The system is intended to provide overall measures artificial vision and object detection, real time assistance via global positioning system (GPS). The microcontroller used is PIC microcontroller. The microcontroller circuit is on the outside of the stick but is protected with a code so its security cannot be breached. The only feedback given to the user is through the vibration motor. In [3], three sensors are used viz. In [4], the stick has a ping sonar sensor to sense the distant objects. It also has a wet detector to detect the water. The microcontroller used is PIC microcontroller. Along with the developing

technology, the use of devices such as Arduino is rapidly spreading. The simplicity of Arduino programming makes it more costeffective to use it with a lot of additional parts. Arduino can be used not only for those with high level programming skills, but also for people of all age groups and those with any level programming knowledge. According to 2012 data, 1.559.222 people in Turkey have various obstacles due to various reasons. Approximately 213,077 people in our country have blindness. This corresponds to 14% of persons with general disabilities [5]. This rate is 284 million worldwide. 80% of the hindrances are treatable or preventable [6]. The paper Sensor assisted stick for the blind people describes about a wearable equipment which consists of a light weight blind stick and the obstacle detection circuit is based on a sensor.

In the paper[8] Obstacle Detection and location finding For Blind People the author describes a device which is used for guiding the person who is blind or partially sighted. The biggest problem of visually impaired people today is finding the roads and directions in the streets. Measures are taken with the yellow embossed roads that the municipalities apply to the paving stones. However, this method is often insufficient. In the paper [9] multitasking stick for indicating safe path to visually disable people it describes a micro-controller based automated hardware that allows a blind to detect obstacles in front of her or him. The paper [10] ultrasonic blind walking stick describes an innovative stick which is designed for the visually disabled people for their easy navigation.

This study aims to make it easier to follow the yellow path on the ground with the color detection sensor in order to find the roads of visually impaired people more comfortable.

II.RELATED WORK

This paper Review on Color object Sorting Systems Using Arduino UNO by Mr. Pratik, Bapusao Patil,Mr. M.L.Harugade[2] helps us to understand how we can make a Color Detection application using Arduino UNO and TCS3200 Color Sensor. Also Object Sorting using color Sensor and Arduino by Tushar G. Gaikar, Soham N. Zadokar,Rajendr and S.Bhandari [4], during this paper we found out how to sense multiple color by color sensor and sorted more objects using extra hardware assembly . We can use a Robotic arm to pick and place the object. From this paper , Working Principle of Arduino and using it as a tool by Leo Louis[7] we got to know about Programming of Arduino, its types and various applications.

III.PROPOSED SYSTEM

Arduino NANO: Microcontroller: atmega328, architecture: AVR, Operating voltage: 5v, Flash memory: 32 kb of which 2 kb used by bootloader, SRAM: 2 kb, Clock speed: 16 MHZ, Analog in pins: 8, EEPROM: 1 kb, DC current per I/o pins: 40 ma(I/o pins), Input voltage: 7-12 v, Digital I/o pins: 22(6 of which are PWM),PWM output: 6, Power consumption:19ma, PCB size: 18x45mm, Weight:7g, Product code: a000005.

Fig 1: Arduino NANO

Colour Sensor : TCS3200 color sensor gy-31 TCS230 module for Arduino, arm and other MCU high-resolution conversion of light intensity to frequency programmable color and full-scale output frequency power down feature communicates directly to microcontroller s0~s1: Output frequency scaling selection inputs s2~s3: Photodiode type selection inputs out pin: Output Table frequency1 supply voltages up to 5v. : Input voltage: (2.7V to 5.5V) Working temperature: -40 deg C to 85 deg C Size: 28.4 x 28.4 mm (1.12x1.12") Programmable color and full-scale output frequency .

Fig 2: Color Sensor

Servo Motors: Aptech deals with SG90 micro servo motor 9g rc robot helicopter airplane boat controls (1pc) – get this micro servo motor 9g rc robot helicopter airplane boat controls. Operating speed: 0.12second/ 60degree (4.8v no load). Stall torque (4.8v): 17.5oz /in (1kg/cm) .

Fig 3: Servo Motor

Jump Wires: Length: 200mm, Weight: 25 gm. 1p-1p pinheader, Male to Female, A row of 40 root Compatible with 2.54 mm spacing pin headers, 40pcs chromatic male to female color jump wire.

Fig 4: Jump Wires

Switch : Rating: AC 250V/16A 125V/20A, Contact Type: DPDT,On/Off/On; Pins:6, size : 31 x 25 x 29 (L X B X H) mm,Material: Plastic, Metal; Package Content: 2pcs x 3 way Rocker Switch.

Fig -5: Switch

3.1 BLOCK DIAGRAM

Fig -6: Block Diagram Of System

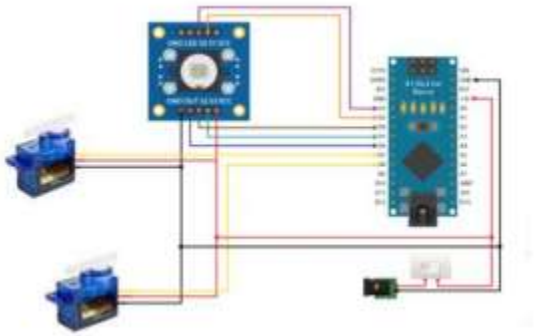

Fig -7: Circuit Diagram

In this circuit diagram we can see two servo motors, color sensor, Arduino & switch interfaced with each other. The black color lines in the diagram indicate that they are connected to the ground . The light-yellow lines from both servo motors are connected to D7 & D8 digital pins of Arduino respectively. The S0, S1, S2, S3 pins of the color sensor are connected to D2, D3, D4, D5 digital pins of Arduino respectively. The o/p of the color sensor is connected to the D6 digital pin of Arduino. The red lines show the voltage supply in the whole circuit. At the end it is connected to the power on/off switch to keep the circuit in working mode or in sleep mode.

Fig 8: 3D Printed Parts

We have used the FDM process for 3D printing our Slider ,Rotary Platform , Guiding Rail and Slider Support.The material that we have used here is 9085 RESIN.It features a high strength-to-weight ratio, excellent heat resistance and high impact strength. It also possesses favorable flame, smoke and toxicity (FST) characteristics. Certified for high performance. ULTEM 9085 resin CG meets stringent test criteria .

From testing with following colors , range for different colors are as :

Brown[R(45-65) , G(60-74)];

Green[R(43-56) , B(51-61)];

Orange[R(30-43) , B(45-59)];

Yellow[R(30-43) , G(42-54)].

And also The angle movement for Top servo is 105°-42° - 12°-105° and for Bottom servo are 40°,75°,110° ,145°. The output

frequency scaling we used is 20% that is S0=H and S1=L .

IV.RESULTS

Fig 9: Final System

This system is able to recognize four different types of colored skittles using RGB values of the skittles in order to sort them based on the respective color. It takes 1.5 seconds time to sort one skittle which is less than the manual sorting. With this automatic sorting machine we can save time and labor cost very effectively. Though this system has some limitations, by having done some modification this concept can be implemented in a wide range of applications such as in Fruit Industries.

V.CONCLUSION AND FUTURE WORK

The fully automatic system outlined above provides cost effective, low time consuming and technically simple approach for sorting of objects. This system uses C programming which makes the model easy to use and more efficient. Generally, sensing the color of the object is a big challenge as there is a chance of high uncertainty due to the external lighting conditions. Similarly while collecting the objects from conveyor by using a linear actuator system. This project of automatic color sorting is excellent one because of its working principle and wide implementation.

It will be useful in a wide variety of industries in the packaging sector. This prototype can be customized by making changes in sensor and program. Some changes that can be made are like, by adding some sensors it will be useful in quality controlling and handling. We can add a display unit to get an accurate count of sorted objects. We can change the sensor according to the type of product. Adding load cells can give accurate weight of the product.

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