



IoT Based Coloured Products Sorting Machine

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ABSTRACT

IOT based coloured products sorting machine widely used in candy industry, food industry (grain, fruit) and mining industry. In candy industry using this can differentiate the candies according to their colour. In grain industry using this can differentiate the grains based on their colour. In Diamond and mining industry, segregates the precious stones according to their color. This machine arranges the items in particular order as required, so physical work is not needed. Improves automation and decreases the man work. This machine puts forward the mechanism to sort and display the colour of the product. We are implementing this machine in an effective way, using colour sensor (TCS 3200), Arduino nano, servo motors and LCD display.

Key words: Colour sensor (TCS 3200), Arduino nano, servo motors, LCD display.

1. INTRODUCTION

Color sorting machine, works under IOT. Here IOT (Internet of Things) implies a combination of interrelated computing devices, Mechanical and digital machines. IOT encourages the communication between the devices which is famously know as machine to machine communication. In the world automation is increases with the help of IOT. IOT have both advantages and disadvantages. Although it contains few disadvantages, it is widely used. Time saving is the main advantage, so consumers are mainly attracted to it.

IOT based colored products sorting machine is an effective machine which works under the mechanism of sorting. It is demonstrated using color sensor, Arduino nano, servo motors and LCD display. We are using color sensor to detect the color, Servo motor used to rotate arm, Arduino nano is used to direct the work as per the code uploaded in it. This machine detects the color of an object displays the color and sort the object accordingly. Objects are sorted into their respective bins and tells how many objects are that in that particular bin.

2. LITERATURE REVIEW

[1] According to Publication named, "IOT Color Based Product Sorting Machine", Components used to sort colors are Arduino Nano, Color Sensor, WIFI Module, Servo Motor. In this, they used color sensor to segregate three colors into three different bins. WIFI Module is used to connect with the cloud in order to save the data, so that saved data can be accessed from anywhere. Once the object is detected using color sensor it will coordinate with the Arduino nano, follow the instructions given and servo motor rotates accordingly to put the colored objects in their respective bin. By using this methodology, we can save money, time and it also includes less manpower.

[2] According to Publication named, "IOT color Based Object Sorting Machine", There are many ways to identify which color it is like by using image processing etc., but now a day's technology is increasing and we are used to choose the best easiest quickly done alternative. So, publisher used the simple components to build the color sorting model. Components used are Arduino Uno, color sensor and 2 servo motors. By using these components model is built and accuracy rate has also increased.

[3] According to Publication named, "Arduino Based Color sorting machine using TCS3200 color sensor", It is totally implemented based on shading by using TCS3200 Shading sensor with two servo motors associated with Arduino Uno. To build up this model Conveyor belt has also been used in order to increase the speed.

[4] According to Publication named "Automatic color sorting machine using TCS3200 color sensor and PIC Microcontroller "manual sorting of products involves many risks, in order to reduce those risks sorting process has become automatic process. In this to increase the speed and to control the process microcontroller is used along with color sensor and conveyer belt. PIC microcontroller controls the entire process and gives instructions accordingly. In this, three colors are sorted and put into different bins by using conveyer belt.

[5] According to Publication named “Object Sorting using Color sensor and Arduino” this sorting can be used for tablet separation, brick sorting etc., Components used are color sensor which works by identifying frequency range, Arduino Uno which is used for Processing and controlling the flow, servo motor used for rotation process, Audio recorder which is used to sound the color which is detected, LCD display which displays the sorted color.

3. PROBLEM STATEMENT

Usually, particular set of objects are differentiated based on color. This will be done in different industries for food Processing as their requirement. Previously, it is done manually but as the technology is developing day-by-day, this sorting based on color is done by color sorting machine, which does not require any manual support. By using this color sorting machine, sorting will be based on its color and put into different bins. Here again previously count and which color is sorted is done manually, but to avoid manual involvement, this model will sort, displays which color is being sorted and gives total count for each color.

4. TECHNOLOGY FOR COLOURED OBJECT SORTING:

4.1. Arduino Nano

Arduino Nano is breadboard friendly based on the processor. Processor is ATmega328P. There is one limitation in this Arduino nano, lack of DC power jack. As it is the limitation it works with a mini-B USB cable. Input voltage is around 5V or 7 TO 12 V. Speed of CPU is 16MHz. Analog Input -Output pins are 8. Digital Input-Output pins are 14. Flash memory 16KB or 32KB. It comes with a crystal oscillator of frequency 16MHZ. These are some specifications of Arduino Nano.

Arduino Nano and Arduino UNO are similar. Both works under the same principal. The size of them are different. Arduino uno is twice the Arduino nano. Programming in UNO done using a USB cable when comes to Nano uses the mini USB cable. Using mini USB cable can upload code into Arduino board. There is an IDE used to write this code, available in online (Arduino IDE)

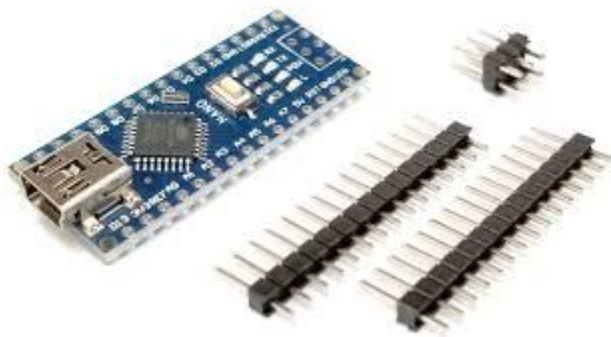


Figure 1: Arduino Nano

4.2. Servo motor

Servo motor is an electrical device. It is used to rotate or push the object with precision. This is used in radio-controlled airplanes to position control surfaces. Elevators, rubbers, operating grippers are control surfaces. It comprises of three wire system power, ground, control. Servo motor have many advantages, good speed control characteristics, smooth control, high efficiency, low heat. Position of servo motor is set by length of a pulse. It typically operates between 4.5 to 6 V. It weighs around 9 g.



Figure 2: Servo motor

4.3. Color sensor

Color sensor is used to detect the color of the object or material. With this we can completely detect colors. It consists of TAOS TCS3200 RGB sensor chip. It also consists four white LEDs. As it contains TAOS TCS3200 RGB sensor chip it is named as TCS3200. It detects limitless range of visible colors. It detects the color in the RGB scale. This works like combination one or two colors gives us another color. For example, combining red and green we will get yellow. So, with the help of this we can sense remaining colors. This sensor has two control pins S0 and S1. These pins are used for scaling the output frequency. Specification are power 2.7 V to 5.5V. It is compact design, power down feature, single supply operation.



Figure 3: Color sensor

4.4. LCD display

LCD implies Liquid Crystal Display. It is a display which uses liquid crystal. When a power is passed through it a source of information is displayed on the screen. We are using it in our daily basis like screens of laptops, personal computer, smartphones. Here we are using 16*2 LCD display, which is commonly used in DIYS and circuits. This one converts 16 characters per line in 2 lines, displayed in 5*7-pixel matrix. Operating voltage is 4.7V to 5.3V. It works on both 8 bit and 4-bit mode.



Figure 4: LCD display

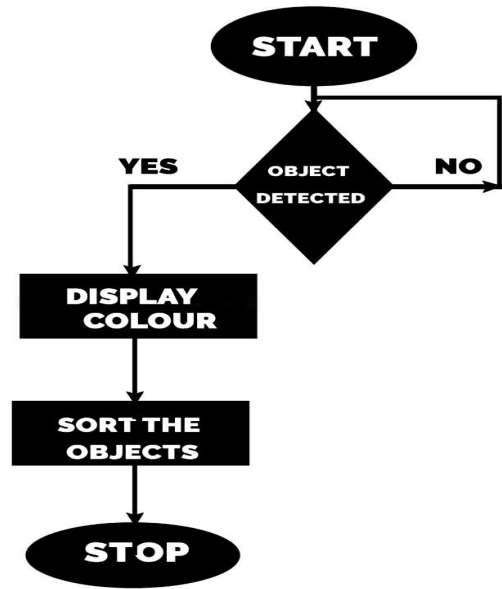


Figure 5: Flowchart

5.2 Block Diagram

5. METHODOLOGY

This machine uses a mechanism which uses a colour sensor to sort coloured product into 4 bins. We are connecting Arduino nano to a controller circuit. To this circuit a colour sensor is attached. This colour sensor is to detect the colour. After the colour is detected, a signal is sent to the Arduino nano to sort and display colour. To that we use a motor to position the sorting tube towards respective section. LCD is used to display colour which is been sorted. Where LCD is connected to controller circuit.

5.1 Flowchart

From the above Fig 1.1, if the object is detected then it displays in LCD. The color which displays in LCD is the color which is been detected then it sorts the object. Current object which is detected is placed in its respective bins. If the object is not detected then it will wait for next object to get detected.

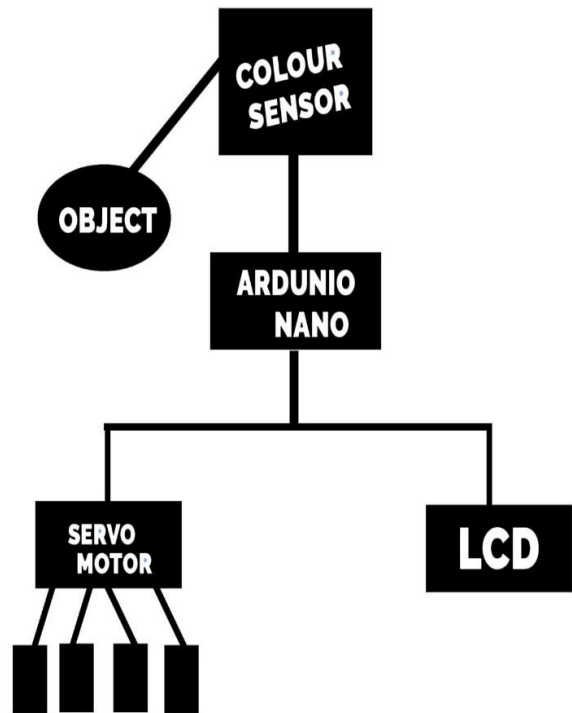


Figure 6: Block Diagram

From the above block diagram, it is mentioned as, first object is sensed using color sensor, frequency rate of particular

object used to display the color of the object and sort them. Here in Arduino Nano code is uploaded. Code according to the code it will work servo motor is used to rotate. To place the particular object in the particular bins using servo motor. To display the color of the object using LCD.

5.3 Execution steps

- Object is sensed using colour sensor frequency rate is sent to Arduino Nano.
- Code in Arduino Nano directs the LCD displays and servo motor.
- Respective colour is displayed in LCD.
- Servo motor will segregate the object.

6. RESULTS

The color of the object is displayed in 16*2 LCD screen and the object is sorted with respect to the colour and is dropped into the bins. To detect the colour RGB sensor is used. Firstly, colour is placed in front of colour sensor it detects the colour and gives the frequencies and the frequencies last from 0 to 400, frequencies may vary for every RGB sensor.



Figure 7: Showing the colour sensing and display

When a colour is kept for detection Infront of the sensor it gives the frequencies in the serial-monitor. We kept a paper of Red colour it gave the frequencies R=75, B=300, G=390, Same way all the colors have different frequency values. Then the Aurdino Nano performs two operations first it sends the output to LCD display, LCD displays the colour then the colour is counted, Then the Aurdino Nano sends to servo motor, Servo motor then perform the rotating operation based on the input given by the Aurdino Nano.

6.1 Comparison Table

Table 1: Readings of this device

RED	R=60 to 75	G=380 to 400	B=275 to 300
GREEN	R= 245 to 255	G= 255 to 265	B= 315 to 326
BLUE	R= 285 to 300	G= 255 to 265	B= 315 to 326
WHITE	R= 34 to 37	G = 43 to 46	B= 32 to 39

Table 2: Comparing readings of another device

RED	R=50 to 95	G= 9 to 19	B= 8 to 16
GREEN	R=10 to 20	G= 20 to 25	B=20 to 38
BLUE	R= 65 to 125	G=65 to 115	B= 32 to 65
WHITE	R=60 to 75	G=9 to 19	B= 8 to 16

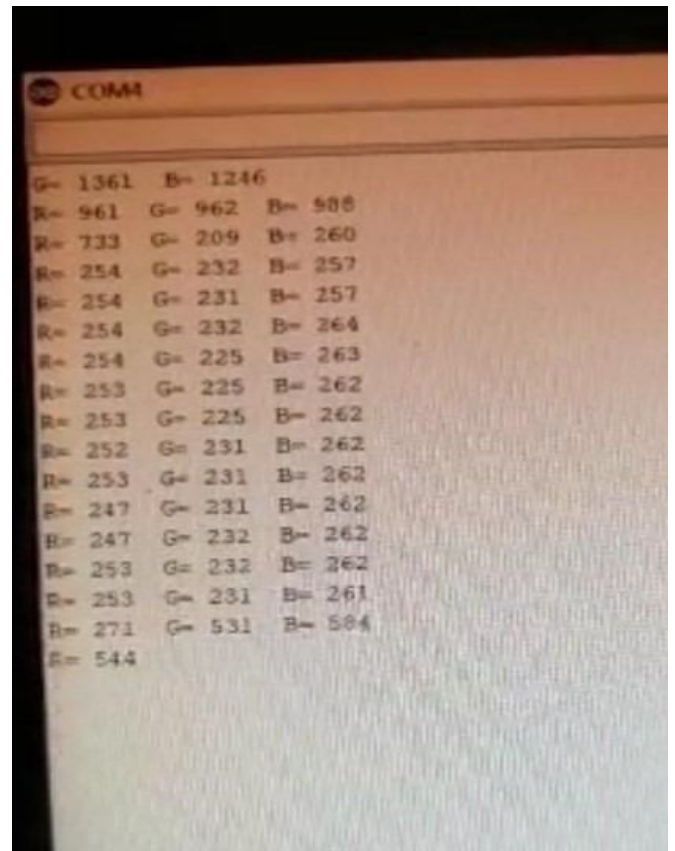


Figure 8: Serial monitor reading samples

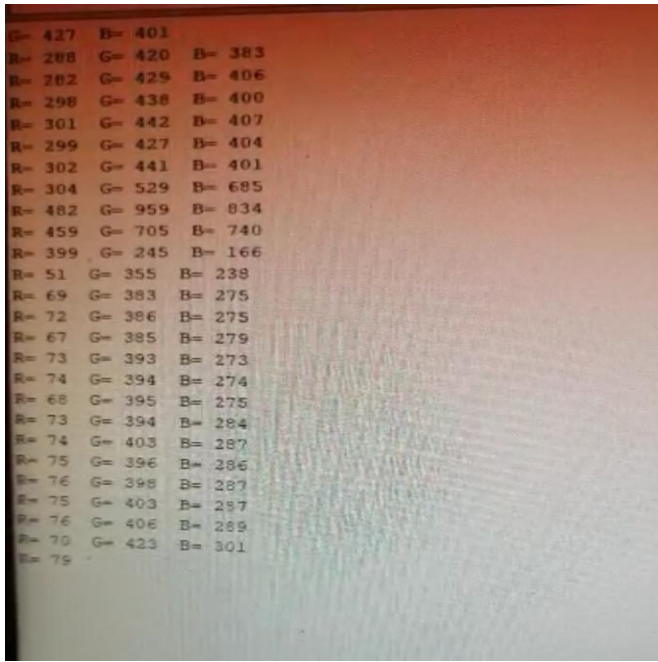
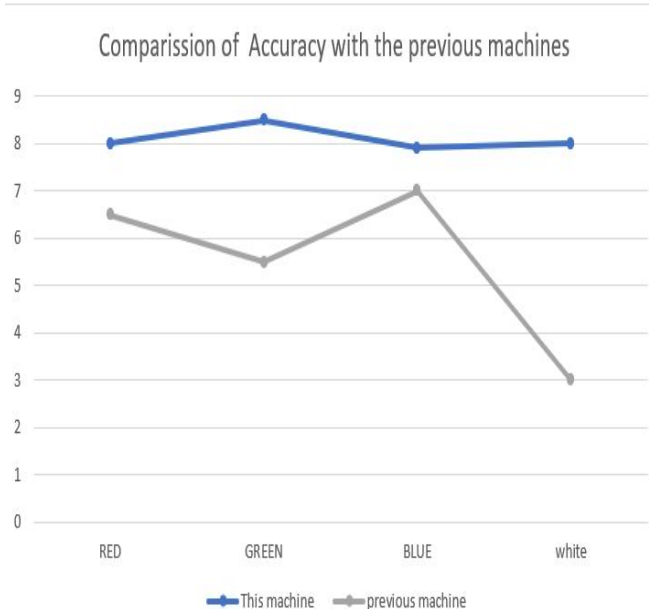


Figure 9: Serial monitor reading samples

Comparing with old machines new implementation is LCD display to show the colour and the count and board is Aurdino Nano.



Based on the frequencies generated by the colour sensor, that frequencies increases the machine accuracy, comparing with previous devices our system gave accuracy of colors like red is 8 out of 9 where previous machines accuracy is 6 out of 9, Green is 8.5 out of 9 where previous machines accuracy is 5.5 out of 9, blue is 8 out of 9 where previous machines accuracy is 7 out of 9, white is 8 out of 9 where previous machines accuracy is 3 out of 9.

- Some of the advantages are Accurate, Fast repeatability, Reduce labor cost, Less human interface.

7. CONCLUSION

An IOT based colored products sorting machine is an effective one used to sort the objects according to their color. It is applicable in many industries such as food industry, grain industry, candy industry and mining industry. It increases automation and decreases man work. Components used in this machine are color sensor, Arduino nano, servo motor. Servo motor used to rotate. Color sensor detects the color

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