

# OBJECTO-SORTOMETER

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**Abstract** - *The objecto-sortometer using arduino is a novel and facile method to sort the colored objects. There is an accelerated development on sorting by the effort of combining those streams of electronics, machine building and programming. The objecto-sortometer is mainly used to sort the object on the basis of RGB colors. This machine separates the colored objects and classifies them into respective containers/cups. In this paper we present the details on how the machine will operated and design of objecto-sortometer. In this machine the large disk will move the skittles along to the designated hole, pre-determined program will direct the skittles to designated bins. It was found that a microprocessor would be used to read the skittles. The conjunction of photo-resistor/RGB sensor with arduino and the calibration of skittles color and intensity would be more quick and efficient than using a microprocessor. The objecto-sortometer was found to be a very good implementation of a sorting machine, with many areas that could be improved with further research. This novel device can serve as a building block towards the development of sorting of objects*

**Key Words:** Color sorting ,RGB sensor, mechatronics, arduino

## 1.INTRODUCTION

Color sensing and color sorting is tedious task in many packaging industries. In early days, manual sorting is the method used for this purpose. But it is time consuming, tedious, slow and variant process. Therefore we had taken the efforts to design and implement a new sorting machine, which is known as objecto-sortometer. It sort the object based on the color. This machine worked based on mechatronics. It was really an interesting and colorful machine worked with the help of arduino UNO. sensing is done by the color sensor TCS3200. And color sorting is done

by servo motors. This two steps are integrated by arduino UNO

Existing sorting machines are for sorting bottle, Led, wafer, rice, beans etc. But due to its slow speed and equipment errors, it was an inefficient machine. But our objecto-sortometer reduces human work, labor cost and errors. It was really a challenge to an existing sorting machines. The present paper relates to an apparatus which sort small sized object based on its property known as color. It works well and sort the object. Mainly, it has two steps, color sensing and color sorting. The color sensing is done by the color sensor TCS3200. And color sorting is done by servo motors. This two steps are integrated by arduino UNO.

### 1.1 Loading pieces

Here, in this machine we use two servos for loading and sorting objects. First, we load the pieces into predefined slots in the feed wheel. The slot is made such that, has deep enough to hold a single object. The system will detect if any of the object stuck between the loading tube and the slot. It automatically reverse its rotation of the feed wheel to leave the object. Totally, there is 4 slots.

### 1.2 Analysing color

After the object has been put into the slots, the servo motor rotates the slot and RGB sensor placed below senses the color of object. It captures three color profiles at different angles. The sensor placed next to the feed wheel will glow to give indication of the detected color. The color sensor used here is TCS3200 Sensor. It is a light to frequency converter which consists of silicon photodiodes and current to frequency converter.

### 1.3 Sorting

After the color has been detected, the object is dropped into the desired cup from the feed wheel. The object is released from the feed wheel before the feeding tube is within range of the cup. At that time, the servo has had in meantime to get

into position. This makes to improve the system performances.

## 2. Physical parts of objecto-sortometer

There are mainly three sections such as funnel section, color sorting section, chute section.

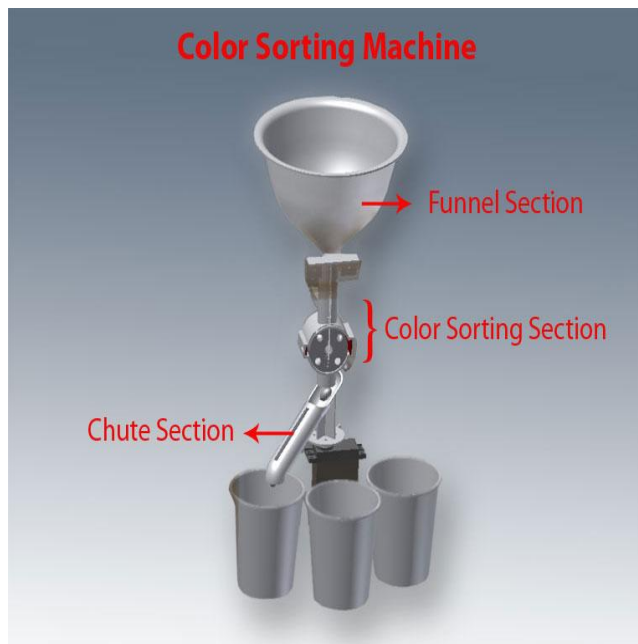


Fig-1: Schematics of objecto-sortometer

### 2.1 Funnel section

We can fill the colored pieces into the funnel that is provided in the sorting machine. Funnel is in the shape of a cup with a hole and situated on the feeding wheel.

### 2.2 Color sorting section

It consists of two parts, object picking part and object carrying part. The object picking part is jointed with funnel section so as to pick up the colored object from the funnel. The RGB color is fixed inside the object picking part for the accurate sensing. The object carrying part is placed over the object picking part which has two holes. The object carrying part is tormented, while the object picking part is revolving.

The RGB Sensor is an important part in color sorting section. Color intensity/wavelength are the most considerable factors for the accurate calibration of RGB sensor. While considering the factors such as varying light intensity, light-to-skittle distance and ambient light intrusion, the data for the different colors showed that each color could have a distinct

range of response voltages. The graph shows the wavelength approximation using ocean optics spectra suite software.

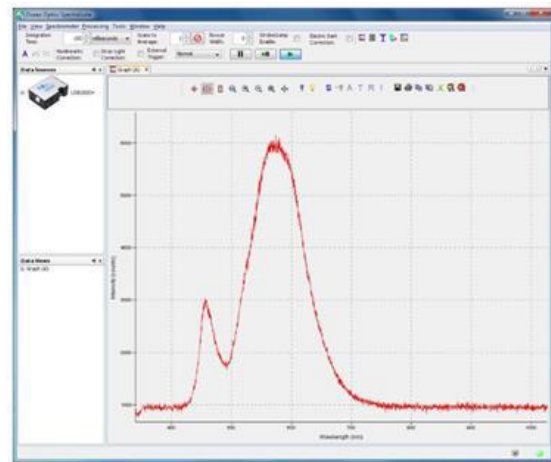


Chart -1: Wavelength approximation using spectra suite

Table-1 Wavelength by color

Skittle(R) Wavelength by Color (nm)					
	Red	Orange	Yellow	Green	Violet
Center	645	605	565	550	no read
Range	625-660	585-630	540-610	530-570	

## MOTOR CONTROL

Using pulse width modulation technique, we were adjusted the speed between analog value 0 and 255. The time taken for one revolution must be measured for calculating the amount of skittles that could be sorted in one second. The servos are direct current motors with built-in gearing and feedback control loop circuitry. It allows for precise control of angular position. It consists of a motor coupled to a sensor for position feedback. This motor has some control circuits and a potentiometer that is connected to the output shaft. The control circuitry will monitor the current angle of the servo motor. A normal servo is used to provide an angular motion of between 0 and 180. The measured value from the color sensor and the value generated by the potentiometer are compared in the error amplifier. It will produce an error signal which causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the position reaches the error signal reduces to zero and the motor stops.

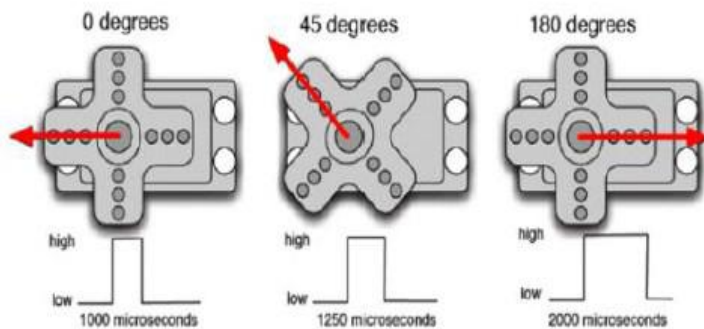


Fig-2: Rotation of motor

### Delays

Servo should be worked correctly in order to guarantee delay. This was calculated to incorporating the speed of the disk, opening and closing of each door contribute to the total time the door operated. It was found to be 160 milliseconds, 80 milliseconds.

### 2.3 Chute section

The sorted colored objects drop into corresponding cups through chute section. Chute means a slopping channel that carrying the sorted object into cup.

## 3. APPLICATION

waste management

It is used separate biodegradable, nondegradable, metal pieces and plastics based on color. It can also be used to separate dry and wet waste.

Agriculture

It is used in agriculture for comparing ripened and unripened fruits based on the color. For example, ripened mango is yellow in color and the unripened one is green so it can pick the fruit according to our needs by detecting the color.

Industries

Based on the color sortometer can pick and place the parts of the machine. It can also be used for packing fruits and vegetables of only specific quality in industries.

Automobiles

In automobiles pick and place robots are sort based on color for assembling the body of automobiles

Biomedical field

By analysing color and shape of cancerous and noncancerous cells in living beings.

## 4. RESULT AND DISCUSSION

This paper presents the design and implementation of color sorting machine. Which can sort the object based on color. This system was designed using arduino, which has ability to reprogram and can handle large complex system. In the final run of project red, green, blue and their combination objects were sorted successfully.

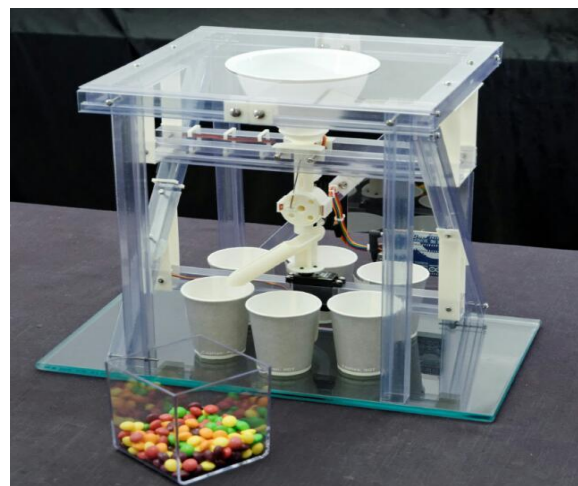


Fig-3: Displaying color sorting of object

## 5. FUTURE SCOPE

We can improve the system by implementing mobile application. With the small changes in the software and prototype this system can be used to determine shape of different objects

## 6. CONCLUSION

This paper demonstrates implementation of color sorting system using arduino and color sensor. Using this simple concept a cost effective mechatronics system can be designed. It reduces human effort and perform a continuous and reliable tasks without any error. In the final run of the project red, green, blue and combination of these were sorted successfully. This sortometer can perform handling station task successfully with the help of sensor and arduino. The proposed system worked accurately with cost effective manner.

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