

IoT Color-Based Product Sorting Machine

Nalinkumar S¹, Arun M², Barathwaj S³, Biju J⁴

¹Nalinkumar S *EEE & Bannari amman institute of technology*

²Arun M *EEE & Bannari amman institute of technology*

³Barathwaj S *EEE & Bannari amman institute of technology*

⁴Biju J | *AP ISE & Bannari amman institute of technology*

Abstract - The IoT Color-Based Product Sorting Machine is a cutting-edge automated system designed to revolutionize the manufacturing and packaging industries. This innovative solution employs Internet of Things (IoT) technology to enable efficient and precise sorting of products based on their color attributes. The system integrates advanced image recognition algorithms, sensor networks, and cloud computing to streamline the sorting process. Color Based Object Sorting has a wide usage in fruit sorting as well as candy sorting industries. This system puts forward a mechanism to detect color and sort items through image processing. Once identified a mechanism is used to sort the candies into particular bins baskets. We here demonstrate this mechanism using a camera with electronic circuitry along with sorting mechanism using 3 bins. The system uses raspberry pi connected to a controller circuit to achieve this task. The controller circuit consists of a camera attached to it that detects color of a small object in front of it. A motor is used to feed an object to the camera chamber.

As soon as the color is detected a signal is sent to the sorter mechanism which uses a motor to position the sorting tube towards respective section. A feeder is then used to push the object towards the tubs so that it gets sorted and next object is pulled in by the feeder. The action details are sent to the IOT server using iotgecko platform to keep track of the number of objects sorted in each section. Thus we achieve a completely automated IOT based sorting system. Color based product sorting has a wide usage in fruits sorting as well as candy sorting industries. Now a day's industrial area requires demand for automation. Due to automation human

efforts are going on decreasing day-by-day. Since last decade. This system puts forward mechanism to detect color and sort item through image processing. This mechanism is used to sort the candies into particular bins or baskets

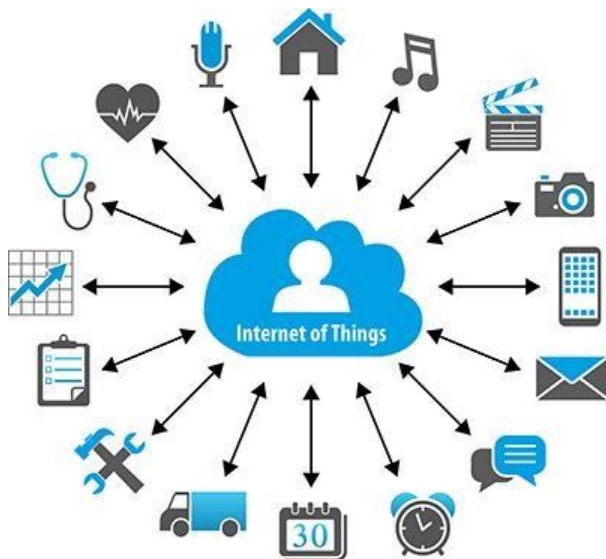
Key Words: IoT, colour sensor, servo motor, node MCU,,

1.INTRODUCTION

An Internet of Things (IoT) Color-Based Product Sorting Machine is a cutting-edge automation system that leverages IoT technology to enhance the efficiency and precision of product sorting in various industries. This innovative solution integrates hardware and software components to identify, classify, and sort objects based on their colors, providing an efficient and reliable way to streamline manufacturing and logistics processes. With the ever-increasing demand for faster production and error-free sorting, this IoT-based system offers a comprehensive solution that utilizes sensors, cameras, and connectivity to automate the sorting process. It can be applied in industries such as manufacturing, e-commerce, agriculture, and more to ensure that products are categorized accurately and quickly, reducing labor costs and errors.

Key components of this system typically include a network of color sensors and cameras, a central processing unit or microcontroller, and a cloud-based software platform. These components work in unison to capture images of products, analyze their colors, and relay data to a central hub. Machine learning algorithms can then be employed to recognize and classify products, making real-time sorting decisions. Users can monitor and manage the system remotely via a web or mobile interface, adding a layer of convenience and flexibility to the operation.

The IoT enables physical things to look, listen, assume and perform businesses by having them "talk" together, to share information and to orchestrate choices. The IoT changes these articles from being conventional to shrewd by its basic advancements, for example, worldwide computing, embedded gadgets, correspondence advances. Shrewd questions alongside their appointed undertakings constitute space particular applications while universal registering and scientific administrations frame application area autonomous administrations Fig-2 shows the general idea of the IoT in which each area particular application is cooperating with autonomous administrations.



The IoT idea, consequently, goes for making the Internet considerably more immersive and inescapable. Besides, by empowering simple access and collaboration with a wide assortment of gadgets, for example, for example, home apparatuses, observation cameras, checking sensors, actuators, showcases, vehicles, et cetera, the IoT will cultivate the advancement of various applications that make utilization of the possibly huge sum and assortment of information produced by such questions give new administrations to subjects, organizations, and open organizations

2. LITERATURE REVIEW

For the operation of object sorting machines based on colour, size, weight, etc., this is not a unique concept. The concept has been around for a long, ever since technology has advanced.

Design and development of a robot for color sorting Irda Hassan [4] and Lim Jie Shen (*) -This taught us how a robot is utilized for sorting, eliminating the need for physical labor or assistance [7].

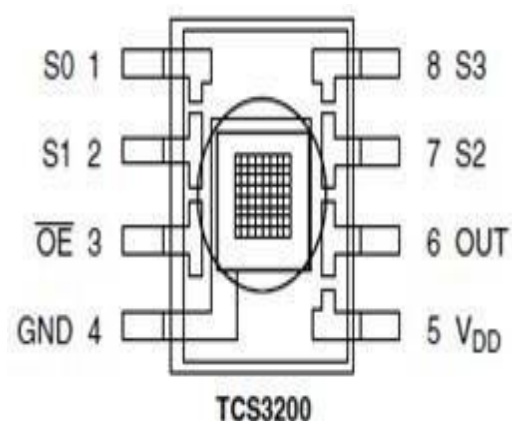
Using a Raspberry Pi, Automated Object Sorting N. Aarthi, P. Sahithi, P.V. Sitaramaih, M. Indu Vardhani, N. Ranjith Kumar, and D. Suneel Varma - This published work offered various perspectives on how this sorting mechanism may be taken into account [8].

Sorting of object based on colour weight and type on a Conveyor Line Using PLC, S. V. Rautu, A. P. Shinde, N. R. Darda, A. V. Vaghule, C. B. Meshram, S. S. Sarawade –their gave us the knowledge of how different sensors are responsible and helpful for the sorting based on weight, colour and metal [9].

3. TECHNOLOGY FOR OBJECT SORTING

1) Colour sensor

A colour sensor depends on a photodiode which measure the power reflected by the protest for a red, green and blue light source. Because of the same it will help in detecting the specified color. There are total 8 pins in a color sensor. pin no 7 and 8 are selection pins, pin no 1 and pin 2 are frequency scaling pin. Pin 6 is output.



Working of color sensor

Each photodiodes have an 8*8 matrix which results into 16 of green filter, 16 of red filter, 16 of blue filter and the rest 16 of clear filter when no colour will be detected.

Table 1: Pin description

Pin Name	I/O	DESCRIPTION
GND(4)		Power supply ground. All voltages are referenced to GND
OE(3)	I	Enable for fo (active low).
OUT	O	Output frequency (fo).
S0,S1 (1,2)	I	Output frequency scaling selection inputs.
S2,S3 (7,8)	I	Photodiode type selection inputs
VDD (5)		Supply voltage

2) Colour sensor:

Image processing In image processing pictures are caught, transmitted, and prepared in advanced frame. Computerized picture handling is one of division in electronic territory where picture is altered to pixels, put away in an advanced stockpiling and prepared by the PC. In result, it diminishes cost computational speed, and adaptability. The center assignment of advanced picture preparing is safeguarding pictures and improves them to the new data structures, to give a superior premise to acquiring and examination of related exercises. Also, the image processing prompts improvement of picture highlights intrigue and helpful data about the scene from upgraded picture could be figured. Propelled picture getting ready, remove information of a photo for taking care of and examination. After taking the photo from the camera, the framework exchanges to a PC for preparing and capacity by utilizing distinctive procedures, for example, picture catching, picture digitization, commotion sifting and highlight recognizable proof [10].

Image processing is done with the following steps.

- Taking the photograph with optical scanner or by electronic mode.
- Analyzing and changing the picture which integrates evidence load and portrait headway and spotting plans that are not to mortal senses like digital TV photos.

- The yield picture can be adjusted representation that relies on picture analysis [14].

2) Robotic technology:

In this era where technology is increasing at a high speed, need of manufacturing and handling is also increasing. Robotics has found its place in this area where work can be done without man-handling, resulting into speed and accuracy in work. Robotic technology helps in making task more easily and efficiently [9]. There are various tasks of a robot which are now widely used. Some of them are:

- Household chores
- Workplace chores
- Hospital works
- Help for the disabled people
- Wars and disasters (calamities that occur)

Here, it is specifically detailed how the robotic arm is used for the color sorting machine. In order to coordinate the construction of an automated arm that picks up items as they go along a transport line, a microcontroller is used. Different technologies and fabrication techniques, such as microcontroller, Arduino, raspberry pi, etc., can be used to create this type of arm. This effort focuses on grouping the shaded items that are being transported in advance by choosing and placing each item in its unique, pre-designed habitat [13].



COMPONENT DESCRIPTION

Apart from colour sensor we have used arduino uno and two servo motors (sg90).

1) Arduino Uno

An open-source electronics platform called the Arduino is built on simple hardware and software. A motor can be started, an LED can be turned on, and something may be published online by using an Arduino board to receive inputs like light on a sensor, a finger on a button, or a tweet. Sending a set of instructions to the board's microcontroller will instruct your board what to do. You achieve this by using the Arduino Software (IDE), which is based on Processing, and the Wiring-based Arduino Programming Language.

Over the years, countless of projects, ranging from simple household items to intricate scientific instruments, have used Arduino as their brain. Students, enthusiasts, artists, programmers, and professionals from all around the world have united around this open-source platform.

At the Ivrea Interaction Design Institute, Arduino was created as a simple tool for quick prototyping geared toward students with no prior experience in electronics or programming. The Arduino board started evolving as soon as it gained a larger audience, diversifying its offering from basic 8-bit boards to items for Internet of Things (IoT) applications, wearable technology, 3D printing, and embedded environments. All Arduino boards are fully open-source, enabling users to construct them on their own and eventually customize them to suit their own needs. The program is open-source as well, and it is expanding thanks to donations from users all over the world [11].



2) Servo Motor:

It is tiny and lightweight with high output power. This servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos. It comes with a 3 horns (arms) and hardware [12].

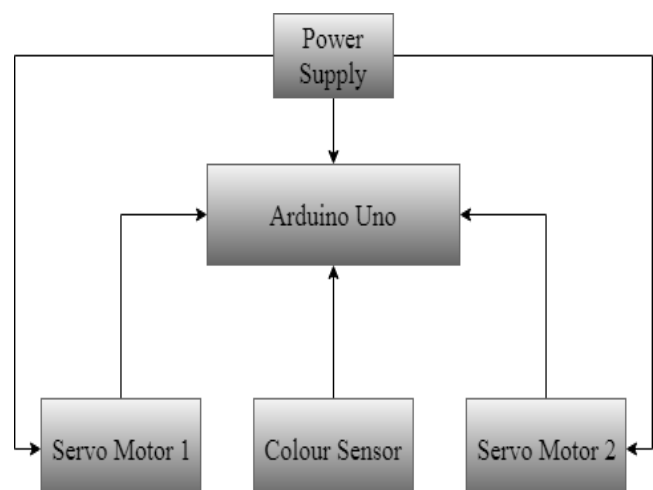


The Specifications of servo motor are mentioned below

- Operating voltage: 4.8 V (~5V)
- Operating speed: 0.1 s/60 degree
- Stall torque: 1.8 kgf·cm
- Dead band width: 10 μ s
- Temperature range: 0 $^{\circ}$ C – 55 $^{\circ}$ C [16].

PROPOSED WORK

Objects which are to be separated are fed in tube. A color sensor senses the items coming in its sight and code for the same is coded in arduino in such a way that only the desired object colors are sensed and collected in the bins at the end using servo motors.



ADVANTAGES AND APPLICATIONS:

Advantages:

- Accurate
- Good repeatability
- Reduce labor cost
- Less human interference
 - Fast
 - Accurate
 - Good repeatability
 - Reduce labor cost
 - Less human interference
 - Fully automatic operation

Applications:

- In food industry to identify rotted fruits and vegetables, in minor scale and big scale productions, to categorize the products established on the several factors.
- In production units to scan and identify the defects in raw materials.
- In fruits and vegetable farming areas (rural areas) where installation of expensive sorters is very difficult.
- In malls (to segregate and separate different clothes, toys, bags etc.) and in small shop

4. CONCLUSIONS

The suggested framework will be a demo version that offers the most cost-effective, expedient, and technically simple method for object differentiation. This framework makes use of the Arduino Uno, which makes it easy to use and even more efficient. If object detection based on color is not done, the main failure will result.

Therefore, having appropriate and tested sensors is crucial. Additionally, it can be applied to both large- and small-scale industries, bringing about the desired improvements.

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