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Pusat Asasi

Automated Dish Sorter Using Arduino

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ABSTRACT

Commonly, the food court has a few stalls. Each stall uses a different set of colors for its plates. The customer usually places the plate in one place such as the basin provided. All the plates in the basin are unsorted. Sorting a pile of plates manually according to the stall's plate takes a long time for the worker. To overcome this problem, this study proposes an automated dish sorter using a microcontroller by applying the fuzzy logic method. An Arduino Uno microcontroller was used to control the process and a TCS3200 color sensor was used to detect the color of the plates. The fuzzy logic helps in the sorting process of the plate for each stall automatically. The result of this prototype is being able to sort the plates according to their color correctly into the respective bins.

Keywords: Arduino Uno; Fuzzy Logic; TCS3200 Color Sensor

INTRODUCTION

In today's fast-paced world, automation has become increasingly popular in various industries, including the food industry. Automated dish sorting systems are one such example that can significantly improve the efficiency and accuracy of commercial kitchens. By using sensors and controllers, these systems can automatically sort dishes and utensils, freeing up staff to focus on other tasks [1].

An automated dish sorting system using Arduino is an exciting development in this area. Arduino is a popular microcontroller platform that is widely used in various industries due to its affordability and flexibility [4]. With Arduino, an automated dish sorting system can be developed and implemented quickly and easily, providing businesses with an affordable solution to their dish sorting needs.

The system can sort dishes based on a main parameter which is the color sensor detects the various color of all the dishes according to the stallers preference [5]. By automating the dish sorting process, businesses can reduce labor costs, improve productivity, and minimize the risk of errors and cross-contamination. Additionally, the system can help to improve customer service by reducing wait times and enhancing order accuracy.

INNOVATION DEVELOPMENT

The automated dish sorter using Arduino is a fascinating innovation that has made the work of stall owners and restaurant staff easier. However, there is still room for development and improvement to make the process even more efficient. One potential area for future development is the integration of sensors that can detect the size of the plates and sort them accordingly. This would save time and improve accuracy, as the sorter would not have to rely

solely on color detection.

Another area for innovation is the use of artificial intelligence (AI) to improve the accuracy and speed of the sorting process. With AI, the sorter could learn from its previous sorting patterns and adjust accordingly to sort the dishes more efficiently. This would save time and reduce errors in the sorting process.

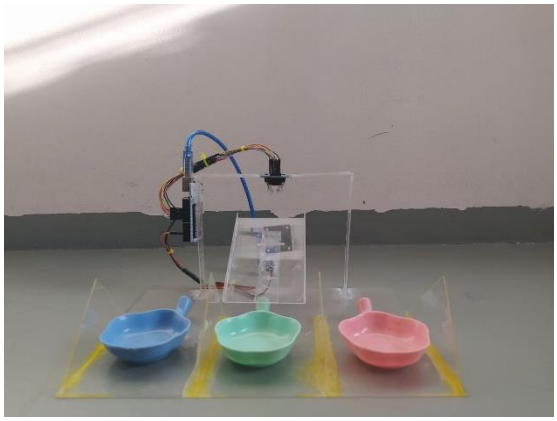

Figure 1: Front view

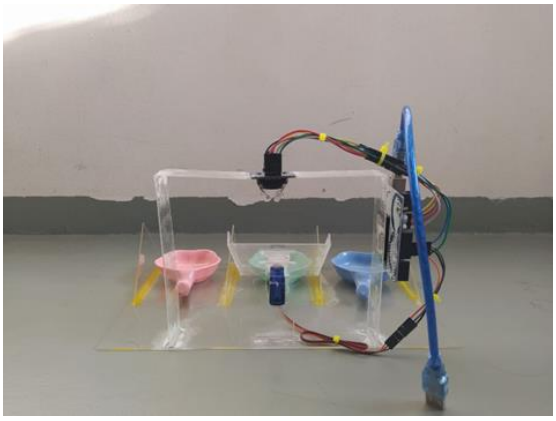

Figure 2: Back view

METHODOLOGY

The prototype was developed using Arduino Uno microcontroller and TCS3200 color sensor to detect the color of the plates. The color sensor was used to detect 3 different colors of the plates and fuzzy logic was implemented for the process of sorting the plates according to the color [7]. Servo motor was used to move the plates into 3 different bins according to their colors.

Block Diagram

Figure 3 shows the block diagram for the prototype dish sorter and several components contain in the automated dish sorter are light-emitting diode (LED), TCS3200 color sensor, Arduino Uno microcontroller and servo motor [3].

The power supply is part of the component used to supply electric current to the circuit. It helps to activate the circuit and electronic devices. LED is a semiconductor device that emits light. It is used in many applications. Sometimes it is used as an indicator to show whether the state is ON or OFF. In this prototype, LED was used to enhance the color of the plates more precisely.

TCS3200 color sensor has an array of photodiode. It is designed to detect light intensity. The color was sense and used as input to the Arduino Uno microcontroller.

The sorting process was controlled by the microcontroller which is Arduino Uno. It receives input from the color sensor then processes it by identifying the color and sort it based on the logic defined and provide the output.

The Servo motor helps to direct the plate based on the output received from the microcontroller to the respective bin according to the color.

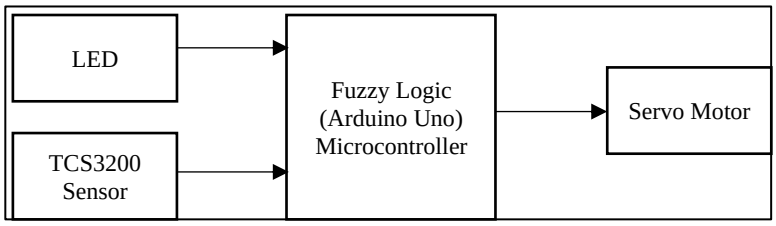

Figure 3: Schematic diagram of automated dish sorter

Flowchart

In Figure 4 shows the flowchart of the sorting process. The plate placed on the Perspex and the LED help to enhance the color of the plates. This will help the TCS3200 color sensor to detect the color correctly. TCS3200 color sensor detect the color on the plate as an input to the Arduino Uno microcontroller. Then, the microcontroller process the color and identify the Perspex turn to a certain degree of angle and place the plate according to the bins.

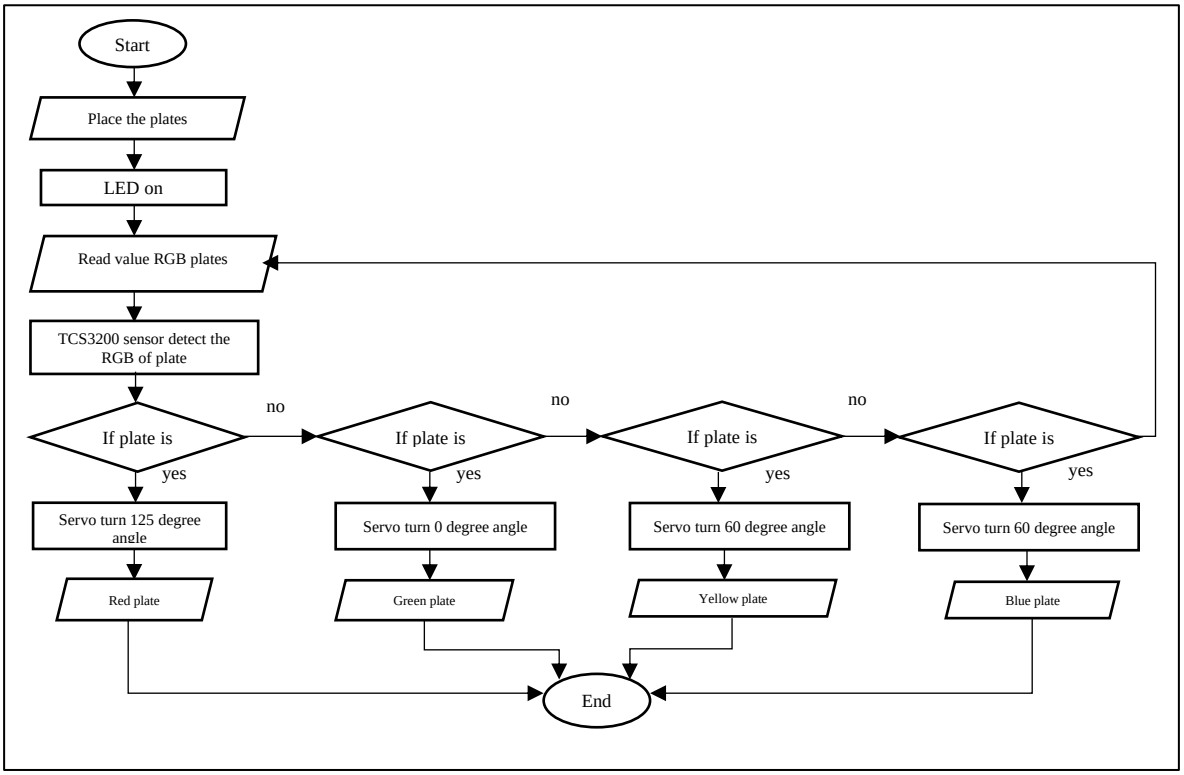

Figure 4: Flowchart sorting process

Implementation Fuzzy Logic for Sorting Process

The prototype is designed by adapting fuzzy logic for sorting process. The color of the plate is an input for the microcontroller and the output is the movement of the vane attached with servo motor. The fuzzy logic is used to determine the vane position and turn into a certain degree of angle and place the plate according to the correct bin based on the condition of the color plates.

COMMERCIAL POTENTIAL

Automated dish sorting systems have great commercial potential in the food industry, particularly in busy kitchens and food stalls where time and efficiency are crucial. An automated dish sorter using Arduino is an excellent example of how technology can be utilized to streamline kitchen operations and improve customer service [2].

The use of Arduino in automated dish sorting systems provides an affordable and user-friendly solution for businesses. The platform is widely available and has a large community of developers who can provide support and guidance. Additionally, the open-source nature of Arduino allows for customization and flexibility, making it easier for businesses to adapt to changing needs.

Automated dish sorting systems can greatly improve efficiency in the kitchen by reducing the need for manual labor. The system can quickly and accurately sort dishes based on various parameters such as size, shape, weight, or color. This frees up staff to focus on other tasks, such as food preparation and customer service. Furthermore, automated dish sorting can help to reduce errors and minimize the risk of cross-contamination.

The implementation of automated dish sorting can also lead to cost savings for businesses. By reducing the need for manual labor, businesses can reduce their labor costs and improve productivity [6]. The system can also help to minimize dish breakage, reducing the need for replacements and repairs.

In conclusion, the commercial potential of an automated dish sorting system using Arduino is significant. The technology can help businesses to improve efficiency, reduce costs, and enhance customer service [8]. With its affordability, user-friendliness, and flexibility, Arduino provides an excellent platform for developing and implementing automated dish sorting systems.

COST

ITEM	UNIT	PRICE(RM)
ARDUINO UNO BOARD	1	42.90
MICRO SERVO MOTOR	1	6.90
COLOR SENSOR	1	21.90
JUMPER WIRE (30cm)	25	0.25
BATTERY 9V	1	6.70
ACRYLIC SHEET(A4)	3	5.70
ACRYLIC GLUE (30ml)	1	10.00
ACRYLIC CUTTER	1	8.10
TOTAL COST(RM)		104.7

PROFIT MARGIN

PROFIT= PRICE - COST
= RM150 – RM104.7
= RM49.30

PROFIT MARGIN = PROFIT/PRICE*100
= RM49.30/RM150*100
= 32.87%

CONCLUSION

In conclusion, the automated dish sorter using Arduino is an innovative solution that addresses the challenges of dish sorting in food stalls and homes. The device offers convenience and efficiency, enabling stall owners to collect and sort their plates based on color preferences effortlessly.

Moving forward, there are several future developments that could enhance the device's functionality. For instance, incorporating machine learning algorithms could improve the device's ability to sort plates accurately, especially when the colors are similar. Additionally, incorporating a sensor to detect plate size could make the device versatile and applicable in different settings.

In terms of recommendation, we suggest that food stall owners and homeowners consider adopting the automated dish sorter to improve their efficiency and organization. The device's affordability and simplicity make it an attractive solution for those seeking to streamline their plate sorting process.

In summary, the automated dish sorter using Arduino is a practical and innovative solution to the challenges of plate sorting. With its ease of use and affordability, it has the potential to revolutionize the way we sort dishes in food stalls and homes. We look forward to seeing the device's continued development and adoption in the future.

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Finally, we would like to acknowledge the exceptional work done by our team members. With their active participation and efficient delegation, we were able to complete the project before the deadline. The group discussions and meetings were carried out without any hindrances, making it a smooth process.

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