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Colour and Size of Fruit Sorting Machine: Case Study

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Abstract: *The IoT-Based colour and size sorting system is an innovative solution designed to automate the classification of objects based on color and size, catering to industrial and logistical needs for efficient sorting processes. Manual sorting methods are often labor-intensive, time-consuming, and prone to errors, making them inefficient for large-scale operations. This project aims to address these challenges by implementing a smart, Arduino-based robotic system capable of detecting and sorting objects autonomously with high precision.*

The system integrates IoT capabilities for real-time monitoring and control using the Blynk app on a smartphone. At its core, the project utilizes an Arduino Uno microcontroller paired with sensors such as a TCS3200 color sensor for detecting object colours and an ultrasonic sensor for determining object size. The sorting mechanism is driven by servo motors and a conveyor belt powered by a DC gear motor, ensuring smooth and accurate movement of objects. Sorted items are directed into appropriate bins based on predefined categories.

Energy efficiency and sustainability are prioritized by incorporating a 12V adaptor, enabling operation in remote or off-grid environments. The IoT integration allows users to monitor system performance, view real-time data, and make adjustments to sorting parameters through the Blynk app, promoting user convenience and adaptability.

This system enhances sorting accuracy, reduces human intervention, and boosts productivity while minimizing operational costs. Its scalable design and user-friendly interface make it suitable for various applications, including recycling plants, manufacturing units, and agricultural produce sorting. The combination of Arduino's robust capabilities and IoT-based control offers a smart, efficient, and sustainable solution for modern sorting requirements.

With its precision, adaptability, and IoT-enabled features, the IoT-Based colour and size of fruit sorting system represents a significant advancement in automated sorting technology, contributing to streamlined workflows and improved resource management across diverse industries..

Keywords: IoT-Based colour and size sorting

I. INTRODUCTION

Efficient sorting of colour and size based on predefined parameters is a critical aspectofvarious industries, including manufacturing, recycling, and packaging. Traditional methods of sorting often rely heavily on manual labor, which can be time-consuming, error-prone, and inefficient, particularly when handling large volumes of items. As industries strive to optimize their processes and reduce costs, there is an increasing demand for innovative solutions that enhance speed, accuracy, and automation in sorting systems.

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Advancements in automation and robotics, coupled with the versatility of microcontroller platforms like Arduino, have paved the way for smart object-sorting systems. These systems employ sensors and actuators to identify and classify objects based on characteristics such as color and size, enabling precise and automated sorting. By eliminating the need for manual intervention, these systems improve efficiency, reduce human error, and lower operational costs.

The **Arduino-based colour and sizesorting system** focuses on automating the process of object classification by utilizing a TCS3200 color sensor and a servo motor-driven sorting mechanism. This system is designed to sort objects accurately based on their color, with the flexibility to adapt to various industrial requirements. The system's modular and cost-effective design makes it suitable for applications ranging from recycling facilities to small-scale production lines.

The system employs an **Arduino Uno** as the central processing unit, controlling the sensor and actuators. fruit are detected and classified as they pass through thesystem, with the sorting mechanism directing them to appropriate bins. The servo motor ensures smooth and precise operation, while the system's compact design makes it scalable and easy to implement in diverse environments.

By integrating automation into traditional sorting tasks, the Arduino-based colour and size sorting system exemplifies the potential of modern technology to address industrial challenges. This project highlights how robotics and sensor technology can contribute to more efficient workflows, reduce resource wastage, and improve productivity across various sectors.

II. METHODOLOGY

Steps in methodology

- Market review
- Design the model
- Cost estimation
- Purchasing the materials
- Manufacturing and assembly of components
- Testing of machine.

III. MATERIAL USED

- Arduino uno
- Colour sensor (Adafruit TCS34725)
- Servo motor
- DC motor
- L298N motor driver
- Ultrasonic sensor (HC-SR04)
- 16x2 I2C LCD Display
- Wires and jumper cables
- Power supply (Adapter)
- Conveyor belt

IV. WORKING PRINCIPLE

- **Feeding system Conveyor belt:** Fruits are fed onto a conveyor belt that transports them to the sorting area.
- **Optical sorting Cameras and sensors:** Advanced machines may include optical sorting systems that use cameras and sensors to analyze the size and shape of each item. This data can help sort based on not only size but also quality.

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- **Collection system Separate channels:** After sizing, the sorted items are directed into separate channels or bins for collection.
- **Control System Automation and controls:** Many machines are equipped with automated control systems that allow operators to adjust settings for different types of produce. This can include adjusting the speed of the conveyor, the size of openings, or the sensitivity of sensors.
- **Output Sorted produce:** The final output consists of different bins or areas for each size category, making it easy for workers to package or process the produce further.

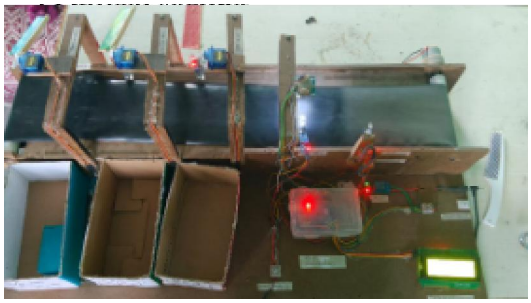

Fig no:-01-Fruit sorting machine

V. CONCLUSION

The **colour and size of fruit sorting system** using **Arduino** effectively demonstrates the potential of automation in streamlining sorting processes based on **colour** and **size**. Through the integration of **colour sensors**, **ultrasonic sensors**, and **servo motors**, this system offers accurate, efficient, and reliable sorting of objects in various industrial applications. The system's automated nature reduces human intervention, minimizes sorting errors, and improves overall productivity, making it a valuable solution for sectors such as manufacturing, recycling, and packaging.

The performance analysis highlights the system's efficiency in detecting object properties and its adaptability to different fruit types, ensuring optimal sorting operations. Furthermore, the system's low power consumption makes it suitable for continuous use in real-world environments.

With further enhancements, such as the addition of more advanced sensors, multiple sorting bins, or IoT integration for real-time monitoring, this object sorting system has the potential to revolutionize sorting tasks, contributing to the advancement of **smart automation** and more efficient industry operations.

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