Automatic Clothes Segregator

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***Abstract*— Washing machines are an integral part of day-to-day life. In the washing machine, if coloured and white clothes are washed together, there is the possibility to mix colours. Colour segregation is needed for washing machines to resolve this issue. The proposed system introduces an Automatic Clothes Segregator that employs the TCS3200 colour sensor and Arduino Uno microcontroller as fundamental components. The Automatic clothes segregator operates on the TCS3200 sensor and detects the colour of incoming garments, converting light intensity into digital signals processed by the Arduino Uno controller. Upon analysis, the controller initiates segregation, directing garments to designated compartments based on colour. Rigorous testing validates the system's reliability and accuracy, showcasing high precision in colour detection and segregation while accommodating a broad spectrum of colours. The proposed system holds significant promise for industries reliant on efficient sorting processes, including laundry services, garment manufacturing, and retail. Integrating advanced sensor technology and microcontroller systems is a transformative step towards automation, promising heightened productivity and resource optimization across diverse operational contexts.**

Keywords*— *Arduino nano, Automation, Color Detection, Segregation, TCS3200

I. INTRODUCTION

This project provides a solution called the Automatic Clothes Segregator, which is aimed at optimizing the sorting process of garments based on their colours. Utilizing the TCS3200 colour sensor alongside the flexibility of the Arduino Uno microcontroller, the proposed system automates the identification and separation of clothes based on their distinct colours. The proposed work can be used to transform industries that are reliant on efficient sorting methods, including laundry services, garment manufacturing, and retail, offering enhanced productivity and resource utilization through integrating advanced sensor technology and microcontroller platforms.

II. LITERATURE SURVEY

The Automatic Clothes Segregator employs a TCS3200 colour sensor and Arduino Uno microcontroller to segregate clothes based on their colour [1]. Several studies have shown that Arduino and the TCS3200 can be used for colour sorting in diverse applications, such as industrial parts, tomatoes, and educational aids [1-16]. This work's potential applications span several industries, including laundry services, garment manufacturing, and retail [1, 14, 16]. Automatic sorting can significantly enhance efficiency, reduce human error, and potentially mitigate damages caused by colour bleeding during washing [1, 18]. This versatility suggests that this system could help improve the quality of services. The project utilizes established components and presents an application focusing on clothes segregation [13, 14, 17]. Existing studies often address sorting in broader contexts, such as object recognition or industrial automation. This targeted approach towards clothes segregation adds a distinctive dimension to the project's contribution to the field of automated sorting systems. With the sensitivity to ambient light and the necessity for regular sensor calibration mentioned in [17-20], future studies could explore integrating advanced sensor technologies and machine learning algorithms. These enhancements could significantly improve colour detection and classification accuracy, thereby boosting the system's overall effectiveness [1, 13, 17]. Current research on automated sorting systems has primarily focused on general applications, with limited attention given to fabric sorting based on colour. Existing technologies often do not address the specific challenges associated with textiles, such as distinguishing between similar shades and handling various fabric types. Thus, there is a need to develop an optimized system based on fabric colour sorting in industries like garment manufacturing and laundry services.

III. METHODOLOGY

The proposed system is shown in Figure1, explains the working of the model and the work of all components to carry out the mechanism of clothes segregation. This automated system commences by identifying incoming clothes and employing a TCS3200 colour sensor interfaced with an Arduino Uno microcontroller to analyze their colour. The servo motor 1 places the clothes below the colour sensor. The clothes are then directed to a designated bin for white or coloured clothes using the servo motor 2. The segregation process is coordinated by Arduino Uno, which operates two servo motors. A battery regulated to 5V via a voltage

regulator powers this system. This battery supplies energy to Arduino Uno, the colour sensor and the servo motors. This setup ensures efficient clothes segregation based on colour, enhancing workflow automation across diverse applications.

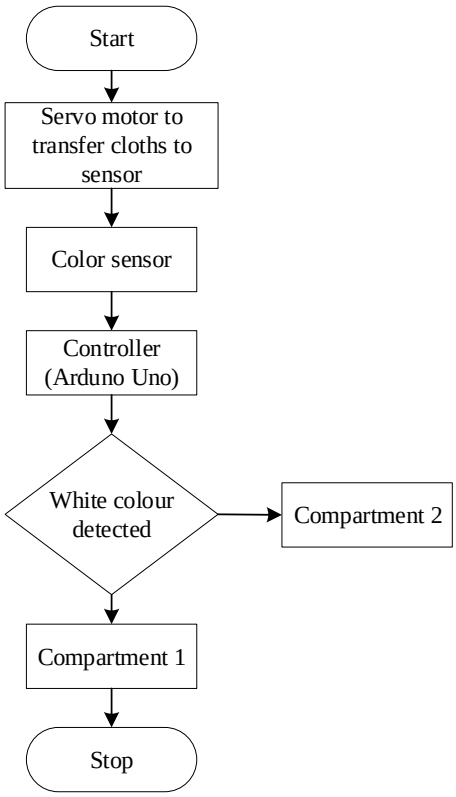

Fig. 1. Process flow of Automated Clothes Segregator

By integrating precise colour detection with servo-controlled segregation, the system offers a reliable and adaptable solution for industries reliant on efficient sorting processes, such as laundry services and retail. Moreover, its reliance on battery power provides flexibility in deployment, making it suitable for various operational environments where reliable and efficient clothes segregation is essential.

Figure 2 depicts the Automated Clothes Segregator, which includes Servo motors and Arduino Uno with Colour sensor TCS3200.

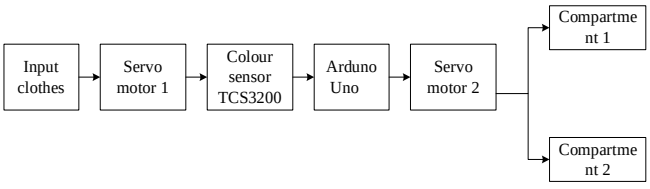

Fig 2. Block diagram of Automated Clothes Segregator

This system includes two servo motors, a TCS3200 Colour sensor, and Arduino Uno, two compartments for white and coloured cloths, as shown in Figure 2.

IV. IMPLEMENTATION

Figure 3 shows the interfacing of stepper motors and TCS3200 colour sensor with Arduino Nano.

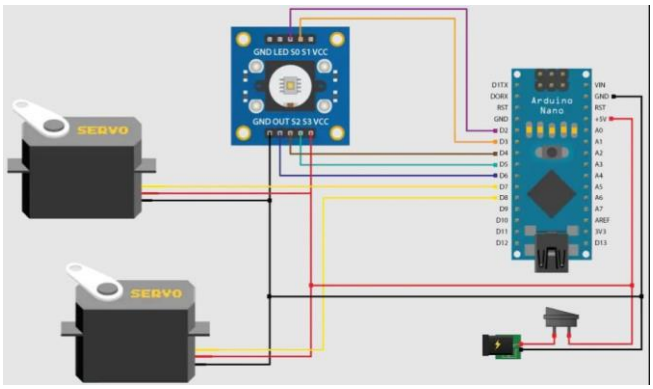

Fig. 3. Circuit Diagram of Automated Clothes Segregator

Figure 4 shows the working prototype model of the Automatic Clothes Segregator.

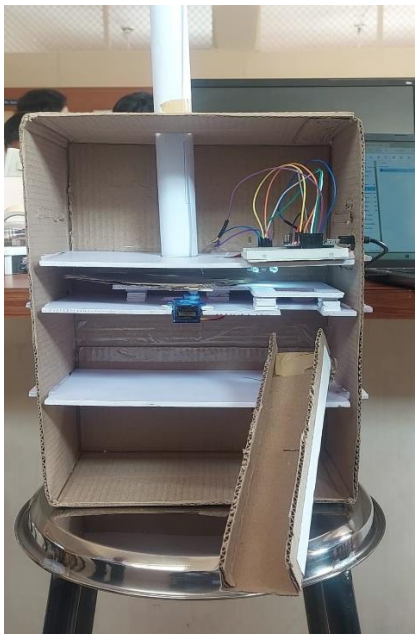

Fig.4. Working prototype model of Automated Clothes Segregator

The servo motor is seamlessly integrated into the system to ensure optimal functionality, with specific connections to the Arduino Nano. Its VCC pin is linked to the 5V pin on the Arduino Nano, providing a consistent power supply. Meanwhile, the GND pin is connected to the ground pin for proper grounding. The servo motor's control signal is intricately tied to a PWM (Pulse Width Modulation) pin, typically designated as pin 9 on the Arduino Nano. This allows precise control over the motor's movements. During operation, the Arduino Nano receives input signals from sensors, often indicating the type of clothing detected. Based

on this input, the Arduino Nano sends a corresponding signal to the servo motor through the control pin. As a result, the servo motor rotates to a predefined position, activating a mechanism configured for sorting clothing items. This streamlined and automated setup enhances efficiency and accuracy in various sorting applications. The system demonstrates effective colour-based clothing classification. Accurately identifying colours mitigates issues like colour bleeding and fading in textiles. There is a need to explore advanced sensor technologies with machine learning algorithms in order to improve the accuracy of colour detection and classification, and overcome current limitations..

V. RESULTS

The system is tested for 100 clothes and shows the results in Table 1.

Table 1 Accuracy and reliability of the model

Parameter	Description	Typical value
Sensing Accuracy	Ability to distinguish colours	95%
Measurement Range	Range of detectable colours	100%
Calibration	Need for calibration	Periodically
Reliability	In various conditions	95%

Based on Table 1, the TCS3200 colour sensor demonstrates high accuracy and reliability, effectively covering the entire visible spectrum. It is suitable for efficient fabric segregation based on colour.

VI. CONCLUSION

The proposed work provides a comprehensive solution for automating clothing sorting based on predefined criteria. By integrating servo motors controlled by an Arduino Nano microcontroller, precise sorting operations are achieved in response to input signals. The meticulous connections between the servo motor and the Arduino Nano ensure reliable functionality, with optimized power supply and signal transmission for seamless operation. The system's uniqueness is its streamlined sorting processes across various industries, including logistics, retail, and manufacturing. With the Arduino Nano as the central controller, the system demonstrates adaptability and scalability, making it suitable for diverse operational settings. By harnessing servo motor technology and microcontroller capabilities, our project underscores the power of automation in enhancing workflow efficiency and precision. The Automatic Clothes Segregator is sensitive to ambient light, which can impact the accuracy of the TCS3200 colour sensor, leading to regular calibration to ensure reliable performance. Additionally, it may struggle with distinguishing similar colours, leading to misclassification. Future improvements could involve integrating advanced sensors and machine learning algorithms to enhance colour detection and sorting accuracy and expand its capabilities to accommodate different fabric types and operational environments.

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