Design of a Product Sorting System Based on Color Using S7-1200 PLC

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***Abstract*—This undergraduate thesis presents the design and implementation of a product sorting system based on color using a S7-1200 PLC. The author describes the system's components and the programming involved, focusing on the color detection and sorting process. The work highlights the setup and implementation of the system, but does not report any specific performance metrics or evaluations. The system uses an Arduino IDE for color detection and a PLC S7-1200 for system control. The code for the Arduino IDE and the PLC are provided, detailing the setup, color detection, and sorting process. The author acknowledges the limitations of the project due to time and resource constraints, and mentions the need for further improvements in the system's accuracy and the integration of the system with existing manual processes.**

***Index Terms*—PLC, S7-1200, Arduino, Color Sensor, Relay, Product Sorting**

I. Introduction

The thesis introduces the design of a product sorting system that utilizes color as a sorting criterion. It covers the general trends in product sorting systems, the application of color sorting in industries, and the overall structure of the product sorting system. The author also discusses the PLC S7-1200, which is used as the core control unit, and other components such as color sensors and relays. The system is designed to sort products based on their color, which is detected using a color sensor. The author explains the importance of this system in improving efficiency and reducing errors in the manufacturing process. However, the system is still in the design and simulation phase and has not been deployed in a real-world setting [1]. Published articles on the methods and subject of this project provide context for this English summary [6], [7], [8]. Published books on the methods and subject of this project provide context for this English summary [9], [10].

II. Methods

The methods section describes the components and programming involved in the system. The author uses an Arduino IDE for color detection and a PLC S7-1200 for system control. The code for the Arduino IDE and the PLC are provided, detailing the setup, color detection, and sorting process. The author explains the setup of the system, including the connection of the color sensor, relays, and other components. The color detection process involves measuring the red and green values of the product and comparing them to predefined thresholds. The sorting process is controlled by the PLC, which activates the appropriate relays based on the color detection results. The author does not provide any specific performance metrics or evaluations of the system [1].

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III. Results

The results section does not report any specific numerical evaluations or performance metrics. The author describes the setup and implementation of the system, but no test cases or evaluations are mentioned. The code for the Arduino IDE and the PLC are provided, detailing the setup, color detection, and sorting process. The author mentions that the system is still in the design and simulation phase and has not been deployed in a real-world setting. The author does not provide any worked examples or test results to demonstrate the system's functionality [1].

IV. Discussion

The discussion highlights the challenges faced during the implementation, such as the need for further improvements in the system's accuracy and the integration of the system with existing manual processes. The author also acknowledges the limitations of the project due to time and resource constraints. The author mentions that the system is still in the design and simulation phase and has not been deployed in a real-world setting. The author suggests that further improvements are needed to enhance the system's accuracy and reliability. The author also notes that the integration of the system with existing manual processes may require additional work to ensure seamless operation [1].

V. Conclusion

The conclusion summarizes the author's achievements, including a better understanding of the system components and the ability to integrate the system with TIA Portal software. The author also mentions the need for further improvements and the limitations of the project. The author acknowledges the limitations of the project due to time and resource constraints and suggests that further work is needed to improve the system's accuracy and reliability. The author also notes that the integration of the system with existing manual processes may require additional work to ensure seamless operation [1].

References

[1] Tạ Văn Dần, ”Design of a Product Sorting System Based on Color Using S7-1200 PLC,” internal undergraduate thesis (original in Vietnamese), Thai Nguyen University of Information and Communication Technology, 2021.

[2] S7-1200 Programmable controller - System Manual – SIEMENS

[3] Trần Văn Hiếu, Thiết kế hệ thống HMI/SCADA với TIA Portal, NXB Khoa học và kỹ thuật, 2019

[4] Trần Văn Hiếu, Tự động hóa PLC S7-1200 với TIA Portal, NXB Khoa học và kỹ thuật, 2015

[5] Phạm Quang Huy – Nguyễn Duy Ngọc, Điều khiển lập trình với S7 - TIA Portal, NXB Khoa học và kỹ thuật 2014. 70

[6] D. Ajay abilash, P. Kayalvizhi, C. Ramachandra Durai, ”Automatic Multi-Operation Machine Using Low Cost Color Sensor and Plc,” International Journal of Hybrid Information Technology, vol. 9, no. 2, pp. 407-416, 2016. DOI: 10.14257/ijhit.2016.9.2.36.

[7] Poltak Sihombing, Faddly Tommy, Sajadin Sembiring, Nogar Silitonga, ”The Citrus Fruit Sorting Device Automatically Based On Color Method By Using Tcs320 Color Sensor And Arduino Uno Microcontroller,” Journal of Physics: Conference Series, vol. 1235, pp. 012064, 2019. DOI: 10.1088/1742-6596/1235/1/012064.

[8] Ankit Yadav, Amit Zanzane, Siyaram Soni, Suresh Teli, Pradnya Kamble, ”Color Based Product Sorting Machine Using PLC,” SSRN Electronic Journal, 2019. DOI: 10.2139/ssrn.3372980.

[9] T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, 2nd ed. MIT Press, 2001. ISBN 9780262032933.

[10] I. Sommerville, Software Engineering, 7th ed. Addison-Wesley, 2004. ISBN 9780321210265.