Automated Wood Sorting System Depending on Shapes

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Abstract- By automating the sorting of wooden products according to their geometric shapes, the automatic wood shapes sorting mechanism that uses a Programmable Logic Controller (PLC) is intended to improve efficiency and accuracy in the wood processing sectors. This system uses sensors to recognize various wooden component shapes on a conveyor belt, including rectangular, cylindrical, and irregular shapes. The PLC receives shape data from the sensors, processes it, and sets actuators to move the wood to the proper sections or bins for additional processing. PLC integration guarantees the sorting process's flexibility, dependability, and real-time control, enabling high-speed sorting with less need for human interaction. This technique increases overall production throughput while lowering labor expenses and sorting error rates.

Indexed Terms- Programmable Logic Controller, Proximity Sensor, Switched-Mode Power Supply, Miniature Circuit Board, Push Button, Terminal Block.

I. INTRODUCTION

A wood sorting system based on shape is an automated or semi-automated setup that categorizes wood pieces by their geometrical characteristics, such as length, width, thickness, curvature, and overall profile. This kind of system is crucial in industries like lumber production, furniture manufacturing, and carpentry, where efficient sorting helps improve productivity and reduce waste. Wood sorting by shape often involves using sensors, cameras, or scanners that capture the dimensions and contours of each piece.

With the help of algorithms and image processing, the system can classify wood pieces based on predefined shape categories. For example, it might separate logs from planks, identify irregular shapes, or distinguish different cut sizes.

This process ensures that each type of wood is routed to the correct stage in production, which helps streamline operations, improve quality control, and optimize material usage. These systems can be customized to handle a wide range of wood shapes and sizes, making them adaptable to various industrial needs.

II. METHODOLOGY

Describe the issue: Sorting of different types of shapes of wood like triangle, rectangle, square, circle. Design the system: Select the appropriate components to construct a PLC-based automatic wood sorting system that meets the specified sorting requirements.

Configure the system: Assemble the components according to the system design, ensuring that all connections are secure and configured appropriately.

Program the PLC: create a PLC program that helps to sort the shapes of the wood accurately and enhances the speed of the sorting.

Examine the system: To ensure that it is functioning properly and meeting the shape sorting criterion, run a number of tests.

Monitoring: To optimize the sorting efficiency, continuously assess the system's performance and make any required adjustments.

Keep track of the system: Make sure that all of the system's design, installation, programming, testing, and any instructions for maintenance or troubleshooting are well documented.

III. BLOCK DIAGRAM
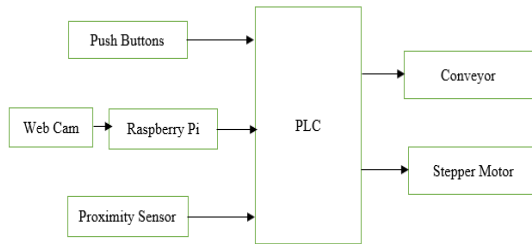
IV. PRIOR APPROACH

While sorting the wood shapes in the manufacturing industry it leads to take much time and also leads to the inaccuracy in the sorting. To minimize that we are going to introduce the solution on that problem using our project. It also helps to minimize the waste of wood material during sorting and accurately helps to sort.

V. OUR APPROACH

A PLC (Programmable Logic Controller) will be used in this project. Our approach is to sort the wood materials depending on their shapes and making the system automatic which leads to more accuracy and reliable in the wood industry minimizing labor error and time. The wood shapes will be detected by using Web camera and processed by the Raspberry Pi and sends signal to the PLC and it operates the servo motor to sort in properly.

ACKNOWLEDGEMENT

Result

By creating criteria and employing sensors and/or computer vision to detect and classify wood pieces, a wood sorting system that groups wood according to forms can be created. A high-level strategy for developing such a system is as follows:

1. Describe the Shape Categories

For uniform boards or planks, use square or rectangular pieces.

Round or cylindrical pieces: For poles or logs.

Random/Irregular Shapes: For raw, untreated wood.

Other Shapes: Personalized forms like hexagons or triangles.

2. Detection Based on Sensors and Vision

Computer Vision (Camera System): Take pictures of wood on a conveyor belt using cameras.

Alphabets for Shape Analysis:

Edge Detection: Outline each item using edge-detection techniques (such as Canny Edge Detection).

Detecting contours and comparing them to known shapes is the process of contour detection.

Aspect Ratio & Symmetry: Determine the wood pieces' aspect ratio in order to differentiate between square and rectangular shapes.

Laser or LIDAR sensors are useful for measuring thickness or diameter and for obtaining depth information in 3D shapes.

3. Mechanism of Sorting

Wood pieces are directed to designated bins by the conveyor system depending on their detected shape.

Wood pieces are picked up or pushed into specified bins by a robotic arm or ejector.

Bins for automatic sorting: open or close according to a detected shape.

4. Algorithms and Software

Image Processing Software: For shape recognition, use programs such as OpenCV.

Match identified shapes with predetermined shape criteria (such as round or rectangular) using the Shape Matching Algorithm.

Machine Learning (Optional): Over time, increase the accuracy of shape detection, particularly for irregular shapes, by using machine learning.

5. System Output

Sorted Bins: Each bin is designated for a specific wood shape. Data Logging: Keep track of quantities sorted by shape for inventory and process optimization.

CONCLUSION

An automated sorting system has been developed to sort products in real time, detecting products in any orientation and identifying their edges. The system's processing times vary based on image size and volume, with low resolution camera drawbacks. The system can sort products with various shapes, including complex ones, but has a drawback of having identical edges.

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