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OBJECT SORTING MACHINE USING ARDUINO-UNO

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Abstract – *This paper focuses on the concept of object sorting machine using Arduino-Uno and its working. This machine can mainly be used in warehouses and industries where certain parts such as glass bottles have to be reused and are large in quantity. Using this machine will save the time and cost to be paid to a worker in case of sorting the objects manually. The average sorting time for an object is 6 seconds.*
This machine can be implemented in industries where Mechatronics systems are used.

***Key Words*: OBJECT SORTING, ARDUINO UNO, ULTRASONIC SENSOR, CONVEYOR, L293D MOTOR DRIVER, 12V DC MOTOR.**

1. INTRODUCTION

The object sorting machine can mainly be used in warehouses and industries and help in reducing errors while sorting and reduce human effort. The main features of this machine are high repeatability, robust in design, and requires less maintenance.

2. LITERATURE REVIEW

1. Title: "Model design and simulation of automatic sorting machine using proximity sensor" by I,A Daniyan, Esoso Aghor.

This paper deals with separating species of non- ferrous objects and at the same time moving objects automatically to the basket as defined by the regulation of the Programmable Logic Controllers (PLC) with a capacitive proximity sensor to detect a value range of objects. Each object has been sorted correctly into the designated compartment with an average sorting time of 9.9, 14.1 and 18.5 seconds for plastic, wood and steel objects respectively. The authors conclude that PLC is the 'brain' of the sorting system to executes the programmed functions.

2. Title: "PLC Based Object Sorting Automation" by Aditya Deshpande, Rucha Kulkarni, Rucha Moghe.

This paper focuses on the need to develop Low Cost Automation (LCA) for sorting products in an accurate manner. The authors have developed a LCA system for sorting the light weight objects on the basis of height variation using DC geared motors which is controlled by Programmable Logic Controller (PLC). Finally, the authors conclude that the LCA system reduces cycle time, improves

3. PROBLEM STATEMENT

To build a prototype of an object sorting machine based on height of object as a parameter which will sort 10 objects/minute.

4. COMPONENTS USED

S.NO	NAME OF COMPONENT	DESCRIPTION
1	Arduino Uno	• Microcontroller: ATmega328 • Operating Voltage: 5V • Input Voltage (recommended): 7-12V • Input Voltage (limits): 6-20V • Digital I/O Pins: 14 (of which 6 provide PWM output) • Analog Input Pins: 6 • DC Current per I/O Pin: 40 mA • DC Current for 3.3V Pin: 50 mA • Flash Memory: 32 KB of which 0.5 KB used by bootloader • SRAM: 2 KB (ATmega328) • EEPROM: 1 KB (ATmega328) Clock Speed: 16 MHz
2	12 V DC motor	30 rpm dc motor

<table>
<tr><td>3</td><td>Ultrasonic sensor</td><td>
<table>
<tr><th>Pin No.</th><th>Pin Name</th><th>Description</th></tr>
<tr><td>1</td><td>Vcc</td><td>Powers the sensor, +5V.</td></tr>
<tr><td>2</td><td>Trigger</td><td>Input pin.</td></tr>
<tr><td>3</td><td>Echo</td><td>Output pin.</td></tr>
<tr><td>4</td><td>Gnd</td><td>Connected to the Ground.</td></tr>
</table>
</td></tr>
<tr><td>4</td><td>Conveyor Belt</td><td>Rubber conveyor belt</td></tr>
<tr><td>5</td><td>Shaft</td><td>Stainless Steel shaft</td></tr>
<tr><td>6</td><td>L293D</td><td>• Supply Voltage Range 4.5V to 36V.
• 600-mA Output current capability per driver.
• Separate Input-logic supply.
• It can drive small DC-geared motors, bipolar stepper motor.
• Pulsed Current 1.2-A Per Driver.
• Thermal Shutdown.</td></tr>
<tr><td>8</td><td>Pulley</td><td>Plastic Pulley for conveyor belt</td></tr>
<tr><td>9</td><td>12V battery</td><td>12 V, 2.5 A battery for power supply</td></tr>
<tr><td>10</td><td>Frame</td><td>Mild Steel Frame as a base</td></tr>
</table>

5. CONSTRUCTION

The shafts on which the pulleys are mounted , are inserted on opposite sides of frame. The shaft of DC motor is inserted in one of the pulleys. The conveyor belt is placed on the pulleys and the Ultrasonic sensor is mounted at the center of the belt at certain distance away from the belt. Arduino is placed along with L293D at the bottom of the belt. Refer diagram.

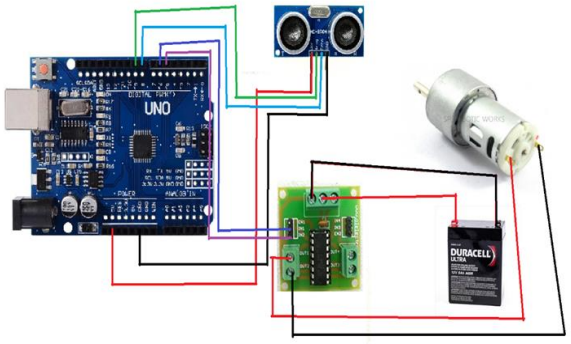

Fig-1: Circuit Diagram.

Fig-2: Construction (Angle 1).

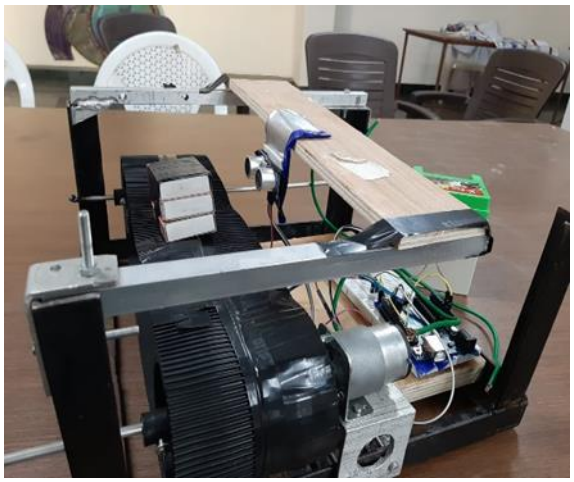

Fig-3: Construction (Angle 2).

6. WORKING

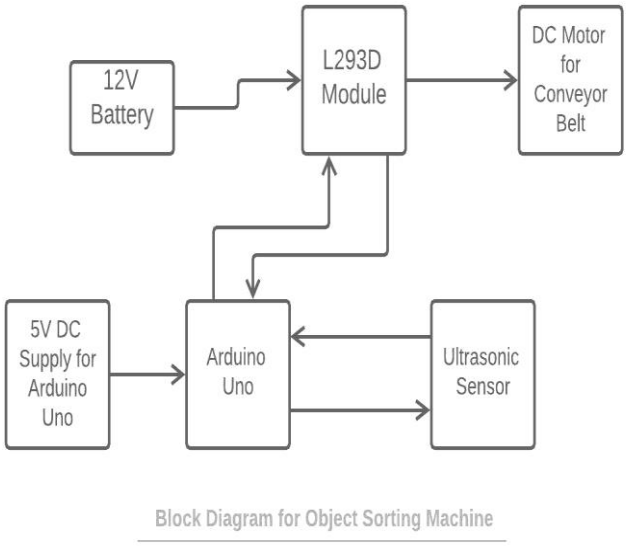

Fig-4: Block Diagram

The object is placed at the center of the conveyor in the range of the Ultrasonic sensor. The sensor senses the object based on its height which is inserted into the program of Arduino and if the object has a height more than the decided height, the conveyor belt moves towards one side and if the object has a height less than the decided height, the conveyor belt moves towards the other side. As the speed of the motor is 30rpm, we decide the delay in the program for the conveyor belt to stop so that the next object can be placed and in this way, 10 objects can be sorted in a minute. As the range of Ultrasonic sensor is 2-25 centimeters, the object is placed on the conveyor at a distance of more than 2 centimeters. Since we have made a prototype, the object is placed manually, but in industries the object can be placed using pick and place robot or using any other means by which the object will automatically get placed at a distance of more than 2 centimeters in case ultrasonic sensor is used.

7. CONCLUSION

In this paper concept of object sorting machine is explained with the help of a prototype which sorts objects according to their height. Although the prototype shown in this paper is a smal scale model, it can be designed and manufactured for large scale industrial applications. While testing the prototype, we also observed that the machine has high repeatability. Instead of Ultrasonic sensor, Capacitive type proximity sensor can also be used which when mounted at a certain height on the frame, can detect the presence of object and the conveyor will move towards one side and if the object is below the decided height, it will not get detected and thus the conveyor will move towards the other side. A significant amount of cost can be reduced if this machine is implemented in industries.

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