

Product Based Shape Sorting Machine Using Arduino

Pallavi Surkar¹, Surbhi Bhongade², Sneha Gadkari³, Vaibhav Malode⁴, Premankit Patil⁵,
Uday Mahure⁶, Dr. Amit Thakare⁷, Professor S. V Raut⁸

^{1,2,3,4,5,6,7,8}Department of Computer Engineering Bapurao Deshmukh College of Engineering
Sewagram, Maharashtra, India

Abstract: *Sorting systems are used to sort items based on various criteria so that they can be packaged accordingly. Manual sorting is a time and effort intensive process. Automatic sorting systems allow for fast and efficient of products. To demonstrate the sorting system we develop Arduino based sorting system project. The system consists of a proximity sensor to sense the type of product using shape. The system is powered by Arduino to control the sorting system. Sorting is a process in which two or more objects of similar, yet different characteristics are arranged in a systematic order. This is generally carry through manually or by using sensors in automation. Here a highly automated system is proposed which uses Arduino UNO for detecting the presence of objects and sort on the basis of shape.*

1. INTRODUCTION

The project aims in designing a system to sort the products. To demonstrate the sorting system, we develop a Arduino based sorting system project that uses valves with height of the product, system powered by controller to achieve this functionality. Sorting systems are used to bridge between production and packaging machinery. Sorting systems are used to sort items based on various criteria so that they can be packaged accordingly. Manual sorting is a time and effort intensive process. Automatic sorting systems allow for fast and efficient sorting of products. The controlling device of the whole system is ARDUINO controller.

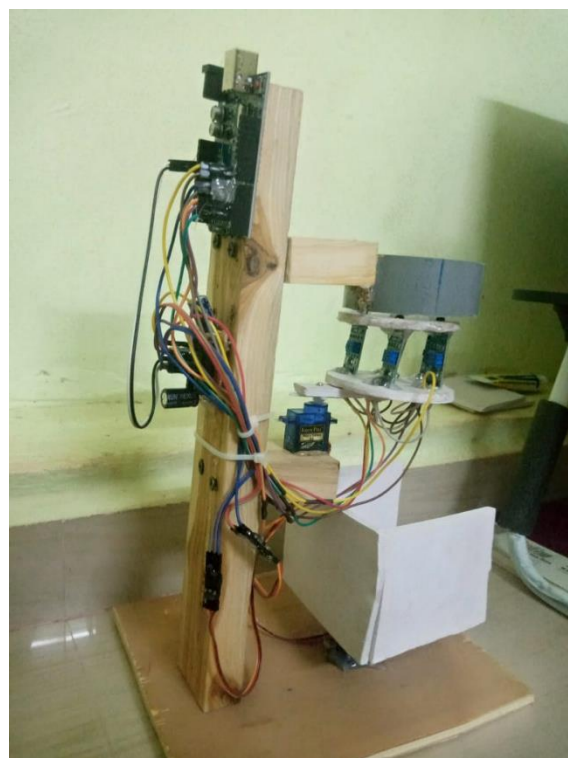
The system is powered by an Arduino to control the sorting system. The Arduino with IR sensors and Servo motor demonstrate the fully automated product sorting system on the bases of shape. The system consists of IR sensors to sense the type of products according to the shape of the product .the development of a product-based shape sorting machine using Arduino is a project motivated by the need for automation and efficiency in various industries and applications. In modern manufacturing and assembly processes, the ability to sort products based on their shape is crucial for quality control, packaging, and logistics. Increased Efficiency: Manual sorting of products based on their shape can be time-consuming and prone to human error. Automation can significantly increase the efficiency of this process, allowing for faster and more accurate sorting.

Labor Savings: By automating the sorting process, businesses can reduce their reliance on manual labor for repetitive and monotonous tasks. This not only saves on labor costs but also allows employees to focus on more skilled and valuable tasks.

Cost-Effective Solution: Traditional industrial sorting machines can be expensive and may not be justifiable for small or medium-sized businesses. Arduino-based solutions are cost-effective and can be customized to meet specific requirements without a hefty price tag.

Flexibility: Arduino's programmability and expandability make it an ideal choice for creating

a shape sorting machine that can be easily adapted for various product types and shapes. This flexibility is essential as product shapes may change over time or between different production runs.



2. LITERATURE SURVEY

In the paper “colored object sorting system using Arduino UNO the Mr.Pratik Bapuso Patil.The system work on the Arduino UNO and color detection application using Arduino UNO and TCS3200 color sensor.The Arduino UNO compares the code with the stored data and gives specified output related to the input.Finally the controller will give command to mechanical assembly to place the object at specified location.

OBJECTIVE

The main idea of this project is to Design and Development a product-based shape sorting machine using Arduino,. The objectives of the project are as follows:

To develop an object sorting system based on shape.

To replace manual sorting with an automated system.

To protect operators and prevent accidents.

3. METHODOLOGY

Define the Sorting Criteria: Decide on the criteria for sorting. For a shape sorting machine, it could be the shape of the object. Consider the types of shapes you want to sort (e.g., circles, squares, triangles).

Hardware Setup: a. Connect the sensors and servos to the Arduino. Ultrasonic or IR sensors can be used for detecting objects, and servo motors can be used to sort the objects. b. Mount sensors above the conveyor belt to detect incoming objects. c. Set up chutes or containers for each category of shape where sorted objects will be directed

Proposed Approach

Define the Project Scope and Requirements: Clearly define the goals and requirements of your shape sorting machine. Consider factors such as the types of products to be sorted, the desired sorting speed, accuracy, and the number of sorting categories (e.g., different shapes).

Select Hardware Components: Identify the necessary hardware components based on your requirements. This may include cosensors, actuators, bins or chutes, and an Arduino board.

Design the Mechanical Structure: Design and build the mechanical structure of the machine, including the conveyor system, sensor placement, and sorting mechanism. Ensure that the products can move smoothly through the machine.

Choose and Configure Sensors: Select sensors suitable for shape detection. Options include infrared sensors, ultrasonic sensors, or image processing cameras. Configure and position these sensors to detect the shape and position of the products accurately.



Fig.1.1 Flowchart of the System

FLOWCHART

IMPLEMENTATION

Step 1: Hardware Setup:

1. **Sensor Installation:** Set up your shape sensor to detect the shapes of objects placed on the conveyor belt. The sensor's output should be connected to an analog or digital pin on the Arduino.
2. **Conveyor Belt:** Design and build a conveyor belt or sorting mechanism. Attach a motor (stepper or DC motor) to move objects along the belt. Connect the motor to the Arduino.
3. **Actuators:** Install actuators (e.g., servos) to divert objects into different bins based on their shapes. You'll need one actuator per bin.
4. **Power Supply:** Provide separate power supplies for the motor and actuators. Ensure that the power supply meets the voltage and current requirements of the components.

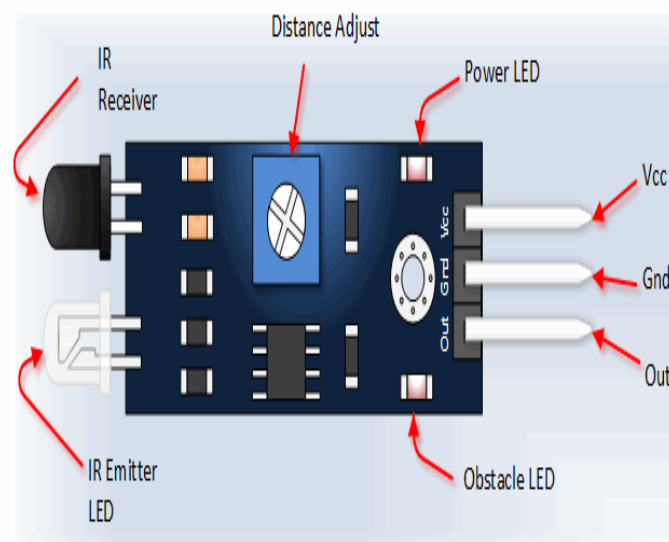
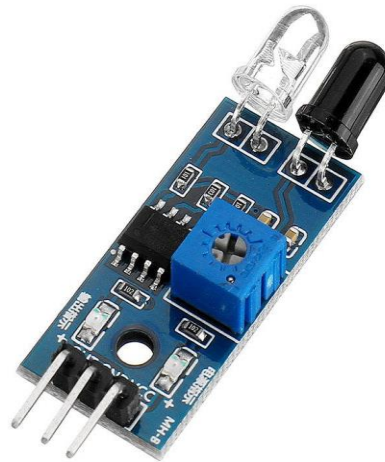
ARDUINO UNO

- Arduino Uno is a popular microcontroller development board based on 8-bit ATmega328P microcontroller.
- Along with ATmega328P MCU IC, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller IR Sensors



Infrared technology is found not just in industry, but also in every-day life. Televisions, for example, use an infrared detector to interpret the signals sent from a remote control. Passive Infrared sensors are used for motion detection systems, and LDR sensors are used for outdoor lighting systems.

IR Sensors



Step 2: Arduino Programming:

```
#include <Servo.h>

// Define sensor pins
const int sensorPin = A0; // Analog input for shape sensor
const int motorPin = 9; // Digital output to control the conveyor motor
Servo servo1; // Servo for bin 1
Servo servo2; // Servo for bin 2

void setup() {
  pinMode(sensorPin, INPUT);
  pinMode(motorPin, OUTPUT);

  servo1.attach(10); // Attach servo1 to digital pin 10
  servo2.attach(11); // Attach servo2 to digital pin 11

  // Initialize serial communication for debugging
  Serial.begin(9600);
}

void loop() {
  int sensorValue = analogRead(sensorPin);
```

```
  // Determine the shape based on sensor value (adjust the thresholds as needed)
  if (sensorValue > 500) {
    // Circle detected, divert to bin 1
    servo1.write(90); // Move servo1 to divert the object
  } else {
    // Square detected, divert to bin 2
    servo2.write(90); // Move servo2 to divert the object
  }

  // Start the conveyor motor
  digitalWrite(motorPin, HIGH);

  // Add some delay to allow the object to move along the conveyor
  delay(1000); // Adjust the delay as needed

  // Stop the conveyor motor
  digitalWrite(motorPin, LOW);

  // Reset servos to their default positions
  servo1.write(0);
  servo2.write(0);
}
```

4. CONCLUSION

The product-based shape sorting machine using Arduino has successfully addressed the need for automation and efficiency in sorting products based on their shape. It offers a cost-effective, flexible, and customizable solution, making it a valuable addition to various industries. As technology continues to advance, there is an opportunity for further innovation and optimization of this machine, ensuring its relevance in the ever-changing landscape of automation and control systems. The proposed product-based shape sorting machine, driven by Arduino technology and comprising components like IR sensors, Arduino UNO, and a servo motor, offers an innovative solution for automated object sorting based on their shapes. This technology finds wide-ranging applicability in industries such as food, grain, candy, and mining, significantly enhancing automation while reducing the need for manual labor. The incorporation of a servo motor facilitates precise rotation, further optimizing the sorting process.

5. REFERENCES

- [1] A. P. Yadav, Anusuiya parihar, Ishika Bagdiya, Deepika Bhukele "DESIGN AND IMPLEMENT COLOR SORTING MACHINE USING ARDUINO"Volume: 06 Issue: 06 | June - 2022
- [2] Herode Baswa Raj, Dr. K. Sudhakar Reddy "ARDUINO BASED PRODUCT SORTING MACHINE"Vol 11, Issue1,JAN/2020.
- [3] Attila Géczy Applied "COLOR SENSOR BASED SOLUTION FOR SORTING IN FOOD INDUSTRY PROCESSING"2019
- [4] Umesh A. Chatte, UtkarshKadam, Vikram Khupase, Sanket Mane, Pooja Kharat,"ARDUINO BASED OBJECT SORTING".March 2018
- [5] Sagar S. Patil, Tushar G. Gaikar, Soham N. Zadokar, Rajendra S. Bhandari "OBJECT SORTING USING SENSOR AND ARDUIN.
- [6] Dhanoj M1, Reshma K V2, Sheeba V3, Marymol P4,"COLOUR SENSOR BASED OBJECT SORTING ROBOT USING EMBEDDED SYSTEM".Vol. 4, Issue 4, April
- [7] Vishnu R. Kale, V. A. Kulkarni, "AUTOMATION OF OBJECT SORTING SYSTEM USING PICK AND PLACE ROBOTIC ARM AND IMAGE PROCESSING".5, January 2014.