A

PROJECT REPORT

ON

USING A CONVEYOR ASSEMBLY IN INDUSTRIES

Submitted By:

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Introduction:

Conveyor systems are integral to various industries, facilitating material handling, assembly lines, and packaging processes. This project aims to design and implement a simple conveyor assembly system using Arduino, providing insights into the fundamental principles of conveyor systems, motor control, and sensor integration.

Purpose:

In our increasingly digital world, the demand for intuitive and effortless control over devices continues to grow. Traditional methods, such as remote controls or touchscreens, often require physical interaction, which can be inconvenient or even impossible in certain situations. This project introduces a novel approach to device control: clap-based activation.

Objectives:

- To design a basic conveyor assembly system using Arduino.
- To control the movement of the conveyor belt using a DC motor.
- To integrate sensors for detecting the presence of objects on the conveyor.
- To understand the principles of automation and control systems.

Components:

The project involves several key components, each serving a specific function in the overall system:

1. **Arduino Board**
    - **Description**: An open-source electronics platform based on easy-to-use hardware and software, typically using the ATmega328 microcontroller.
    - **Function**: Acts as the central control unit, processing inputs from the ultrasonic sensor and controlling the motor driver to manage the conveyor belt's operation.
2. **Ultrasonic Sensor (HC-SR04)**
    - **Description**: A popular ultrasonic distance sensor that uses sonar to measure distances.
    - **Function**: Detects the presence of objects on the conveyor belt by measuring the distance to the nearest object, providing real-time feedback to the Arduino.
3. **DC Motor**
    - **Description**: An electric motor that runs on direct current (DC) electricity, converting electrical energy into mechanical energy.
    - **Function**: Drives the movement of the conveyor belt, enabling it to transport objects from one point to another.
4. **Motor Driver (e.g., L298N)**
    - **Description**: An electronic circuit that allows a microcontroller to control the speed and direction of a motor.
    - **Function**: Receives control signals from the Arduino and regulates the power supplied to the DC motor for precise control.

5. **Conveyor Belt Mechanism**
    - **Description**: A belt (often made of rubber or plastic) looped around rollers or pulleys.
    - **Function**: Physically moves objects along its surface, driven by the DC motor.
6. **Power Supply**
    - **Description**: Provides the necessary electrical energy to the entire system.
    - **Function**: Ensures all components receive the appropriate voltage and current to operate effectively.
7. **Connecting Wires and Breadboard**
    - **Description**: Used for establishing electrical connections and prototyping circuits.
    - **Function**: Facilitates the assembly of the circuit, allowing for easy connections and modifications.
8. **Optional Components (e.g., LEDs, Buttons)**
    - **Description**: Additional components for user interaction and feedback.
    - **Function**: Enhance the user experience by providing visual feedback and control options.

Connections:

Wiring the Components:

1. **Arduino to Ultrasonic Sensor (HC-SR04)**
    - VCC to 5V on Arduino
    - GND to GND on Arduino
    - TRIG to Digital Pin 9 on Arduino
    - ECHO to Digital Pin 10 on Arduino
2. **Arduino to Motor Driver (L298N)**
    - GND of L298N to GND on Arduino
    - VCC of L298N to an appropriate power supply (e.g., 12V)
    - IN1 to Digital Pin 3 on Arduino
    - IN2 to Digital Pin 4 on Arduino
    - EN (Enable Pin) to PWM Pin 5 on Arduino
3. **DC Motor to Motor Driver (L298N)**
    - One terminal of the DC motor to OUT1 of L298N
    - Other terminal of the DC motor to OUT2 of L298N
4. **Power Supply**
    - Connect the power supply (e.g., 12V) to the VCC of the motor driver.
    - Ensure the GND of the power supply is connected to the GND of the Arduino and the motor driver.

Program:

```
const int trigPin = 9;
const int echoPin = 10;
const int motorPin1 = 3;
const int motorPin2 = 4;
const int enablePin = 5;


const int distanceThreshold = 10;

void setup() {

  Serial.begin(9600);


  pinMode(motorPin1, OUTPUT);
  pinMode(motorPin2, OUTPUT);
  pinMode(enablePin, OUTPUT);


  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
}

void loop() {
  long duration, distance;


  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);


  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
```

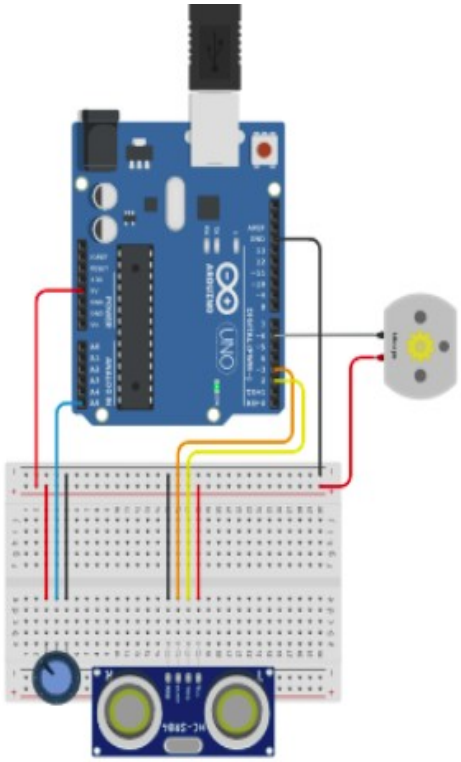
```
  duration = pulseIn(echoPin, HIGH);


  distance = duration * 0.034 / 2;


  Serial.print("Distance: ");
  Serial.print(distance);
  Serial.println(" cm");


  if (distance < distanceThreshold) {
    // Object detected, run the motor
    digitalWrite(motorPin1, HIGH);
    digitalWrite(motorPin2, LOW);
    analogWrite(enablePin, 255);
  } else {
    // No object detected, stop the motor
    digitalWrite(motorPin1, LOW);
    digitalWrite(motorPin2, LOW);
    analogWrite(enablePin, 0);
  }
  delay(100);
}
```

Circuit diagram:



Working Principle

- **Distance Measurement**: The ultrasonic sensor emits sound waves and measures the time taken for the echo to return, calculating the distance to the nearest object.
- **Object Detection**: If an object is detected within the defined threshold, the system activates the motor.
- **Motor Control**: The motor driver receives signals from the Arduino to control the motor's speed and direction based on object detection.
- **Stopping the Motor**: If no object is detected, the motor stops, conserving energy and preventing unnecessary movement.

Applications

1. **Automated Material Handling**
    - Sorting Systems: Used in warehouses and distribution centers to sort packages based on size, weight, or destination.
    - Assembly Lines: Facilitates the movement of components between different stages of assembly in manufacturing processes.
2. **Manufacturing and Production**

- Product Conveying: Moves products from one workstation to another, improving efficiency in production lines.
- Quality Control: Integrates with sensors to detect defects in products and remove them from the production line.

3. **Food Processing**
    - Ingredient Dispensing: Moves ingredients to different processing stations in food manufacturing.
    - Packaging: Automates the packaging process by moving products to packing stations.
4. **Logistics and Warehousing**
    - Inventory Management: Helps in tracking and managing inventory by moving items to designated storage areas.
    - Order Fulfillment: Assists in picking and packing orders by transporting items to packing stations.
5. **Robotics and Automation**
    - Mobile Robots: Can be integrated into robotic systems for transporting materials or products within a facility.
    - Automated Guided Vehicles (AGVs): Used in conjunction with AGVs for efficient material transport.
6. **Educational Projects**
    - STEM Education: Used in educational settings to teach students about automation, robotics, and programming.
    - Prototyping: Allows students and hobbyists to create prototypes for various engineering projects.
7. **Recycling and Waste Management**
    - Sorting Recyclables: Automates the sorting of recyclable materials based on size or type.
    - Waste Processing: Moves waste materials to processing areas for recycling or disposal.
8. **Healthcare**
    - Medication Dispensing: Moves medications to different areas in a pharmacy or hospital.
    - Sample Transport: Automates the transport of medical samples between labs and testing areas.
9. **Research and Development**
    - Experimental Setups: Used in laboratories for experiments that require the movement of materials or samples.
    - Data Collection: Can be integrated with sensors to collect data on material flow and processing times.

Conclusion

In conclusion, the Arduino-based conveyor belt project exemplifies the potential of simple technology to create effective automation solutions. It not only enhances operational efficiency but also provides valuable learning opportunities for individuals interested in electronics and programming. As industries continue to seek innovative ways to improve productivity, projects like this will play a crucial role in shaping the future of automation and robotics.