Microcontroller Setup Instructions

1. **Install Arduino IDE**:
    - Download and install the Arduino IDE from arduino.cc.
2. **Install Required Libraries**:
    - Open Arduino IDE.
    - Go to **Sketch > Include Library > Manage Libraries**.
    - Search for and install:
        - **Servo**
3. **Connect Components**:
    - **Proximity Sensor**: Connect the signal pin to a GPIO pin (e.g., D8 on ESP8266).
    - **Servo Motor**: Connect the control pin to a GPIO pin (e.g., D2 on ESP8266).
    - **DRV8825 Driver**:
        - Connect STEP to GPIO (e.g., D6), DIR to GPIO (e.g., D7), and ENABLE to GND or a control pin.
        - Provide appropriate power (5V).
    - **Power Supply**: Ensure the microcontroller and motors have stable power. Use common GND.
4. **Configure Arduino IDE for ESP8266**:
    - Install the ESP8266 board package:
        - Go to **File > Preferences**.
        - Add this URL to **Additional Board Manager URLs**: http://arduino.esp8266.com/stable/package_esp8266com_index.json
        - Go to **Tools > Board > Board Manager**, search for ESP8266, and install it.
5. **Upload Code**:
    - Connect the microcontroller via USB to your computer.
    - Select the correct **board** and **port** in **Tools**.

- Click **Upload** to flash the code to the microcontroller.

6. **Test and Debug**:
    - Open the Serial Monitor in the Arduino IDE to view debugging messages.
    - Verify that the proximity sensor, servo motor, and stepper motor respond correctly to inputs.

Summary of Statement 4

Additional Features

1. *Steerable Wheel Module: to change the direction of detected object*
2. IoT Integration: Real-time monitoring and analytics via cloud.
3. Adaptive Speed Control: Adjust conveyor speed dynamically.
4. Multiple Sorting Criteria: Add bins for more categories.

Challenges and Solutions

1. Sensor Sensitivity: Use adjustable or optical sensors for better detection.
2. Classification Accuracy: Integrate advanced sensors or camera modules.
3. Motor Precision: Use micro stepping and high-torque motors.
4. Power Stability: Implement power management with voltage regulators.

Component Selection

1. Inductive Proximity Sensor: For Reliable object detection.
2. Servo Motor: Precise angular control for sorting.
3. DRV8825 Driver: Micro stepping for precise stepper control.
4. Microcontroller (e.g., ESP8266): Handles logic.
5. Power Supply (5V): Stable and suitable for components.