PATUAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

COURSE CODE EEE-212

Electrical Technology Sessional

SUBMITTED TO:

Md. Naimur Rahman
Professor
Department of Electrical and Electronics Engineering
Faculty of Computer Science and Engineering

SUBMITTED BY:

MD Mobin Haque
ID: **2102064**,
Registration No: **10191**
Faculty of Computer Science and Engineering

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Project title: **Joystick/Button-Controlled Industrial Automation System for Multiple Servo Motor Control Using Arduino**

Project Proposal: Joystick/Button-Controlled Industrial Automation System for Multiple Servo Motor Control Using Arduino

1. Project Title

Joystick/Button-Controlled Industrial Automation System for Multiple Servo Motor Control Using Arduino

2. Introduction

Automation has become a key component in modern industries, aiming to increase precision, efficiency, and productivity. This project proposes an industrial automation system that uses a joystick and buttons to control multiple servo motors via an Arduino microcontroller. Servo motors are widely used in automation applications, such as in robotics, manufacturing lines, and machine tools, due to their ability to provide precise control of angular position, speed, and torque.

The system leverages a joystick for continuous motion control and buttons for discrete or on-demand motor control, offering a user-friendly interface for industrial applications that require manual input and adjustment of mechanical systems.

3. Objective

The primary goal of this project is to design and implement an automation system where multiple servo motors can be controlled using a joystick and buttons through an Arduino platform. The system should allow for precise angular control of each motor, offering both proportional (analog joystick) or direct (digital button) control mechanisms.

4. Scope

The project will focus on:

- Developing an interface to control multiple servo motors using a joystick or buttons.
- Integrating servo motor drivers with the Arduino microcontroller.

- Programming the Arduino to interpret joystick or button inputs to control the position of each servo motor.
- Creating a user-friendly interface for manual control in an industrial setting.
- Ensuring scalability to control more motors if needed.

5. Methodology

5.1 Hardware Requirements

- **Arduino Board (e.g., Arduino Uno)**: Serves as the main processing unit to interpret user inputs and drive the servo motors.
- **Servo Motors**: Multiple servos will be controlled to perform different tasks based on input.
- **Joystick Module**: Provides continuous, proportional control over the servo motors.
- **Buttons**: Used for discrete control of specific actions (e.g., start/stop, set positions).
- **Power Supply**: Depending on the number of servo motors, an adequate power supply will be chosen.
- **Breadboard and Wires**: For prototyping and connecting components.
- **Motor Drivers**: To ensure proper control signals are provided to the servo motors.

5.2 Software Requirements

- **Arduino IDE**: For programming the Arduino board.
- **Servo Library**: To simplify the control of multiple servo motors.
- **Custom Code for Joystick/Button Integration**: Custom code will be developed to process joystick and button inputs, and translate them into motor movements.

5.3 System Design

1. **Input Interface**:
    - Joystick will be used for analog control, where moving the joystick in different directions will cause corresponding movements in the servo motors (e.g., up/down or left/right).
    - Buttons will be programmed to trigger specific motor actions such as predefined positions or sequences.

2. **Microcontroller (Arduino)**:
    - The Arduino will read analog values from the joystick module and digital values from the buttons.
    - Based on these inputs, the Arduino will generate the appropriate PWM signals to control the servo motors.
3. **Servo Motors**:
    - Each servo motor will receive control signals from the Arduino, dictating the precise angular movement.
    - The system will support multiple servos, each capable of independent control.

5.4 Implementation Steps

1. **Component Integration**: Connect the joystick, buttons, servo motors, and Arduino.
2. **Programming**: Write and upload code to the Arduino that allows joystick and button inputs to control servo motor angles.
3. **Testing**: Validate the control system by testing various movements and configurations.
4. **Calibration**: Fine-tune the system for precise motor control in an industrial environment.
5. **Packaging**: Design a housing for the system, including the joystick, buttons, and feedback displays.

6. Applications

- **Robotics**: Manual control of robot arms or robotic mechanisms.
- **Conveyor Systems**: Adjustment of conveyor motor speeds or orientations.
- **CNC Machines**: Manual positioning of cutting tools.
- **Camera Gimbals**: Precision control of camera angles for industrial monitoring or cinematography.

7. Expected Outcomes

- A fully functional joystick/button-controlled servo motor system.
- The ability to manually control multiple servo motors in real-time.
- A scalable design for future expansion, allowing more motors to be controlled if needed.
- Enhanced efficiency and precision in industrial operations requiring manual motor control.

8. Timeline

Task	Duration
Component Selection and Purchase	1 Week
Hardware Integration	1 Week
Arduino Programming	2 Weeks
Testing and Calibration	1 Week
Final Integration and Packaging	1 Week

9. Budget Estimate

Component	Cost (BDT)
Arduino Uno	650৳
Servo Motors (2 units)	360৳
Joystick Module	100৳
Buttons (4 units)	15৳
Power Supply (9V Battery 2 Unit)	120৳
Miscellaneous (Wires, Breadboard)	250৳
Total	1495৳

10. Conclusion

The proposed joystick/button-controlled servo motor system using Arduino will provide a flexible, user-friendly interface for controlling multiple motors in industrial automation settings. This system will improve precision and ease of use in applications where manual input is required to adjust motor positions or perform certain tasks. The project is cost-effective, scalable, and adaptable to a wide range of industrial applications.