# NORTH WESTERN UNIVERSITY, KHULNA

Course Code: **CSE-3104**
Course Title: **Software Engineering Laboratory**

Final Report
Report Name: **Robotic Arm**

## Submitted By:


Hasibul Hossen (20221066010)
Shananjoyee Chakrobortty (20221068010)
Md. Rakib Hasan (20221052010)


## Submitted To:


M. Raihan
Assistant Professor
Department of Computer Science and Engineering
North Western University, Khulna


th May, 2024

## Introduction to Robotic Arm:

In the realm of robotics, the development of wireless robotic arms represents a significant leap forward in terms of flexibility, mobility, and ease of deployment. These robotic arms leverage advanced wireless communication technologies to liberate them from the constraints of physical cables, opening up a myriad of possibilities in various fields such as manufacturing, healthcare, research, and more.

## Problem Statement for Robotic Arm Development:

In contemporary industries and research environments, the integration of robotic arms has significantly improved efficiency and precision. However, the reliance on traditional wired connections limits the flexibility and adaptability of these robotic systems. Therefore, the objective is to address the following challenges through the development of a wireless robotic arm:

1. Mobility and Flexibility Constraints:

Current robotic arms are tethered by physical cables, restricting their movement and adaptability on the factory floor or in research settings. This limitation hampers their ability to perform tasks in dynamic and changing environments.

2. Cable-Related Interference:

Wired connections introduce the risk of interference, particularly in environments with other electronic equipment. This interference can lead to communication disruptions, compromising the reliability and safety of robotic arm operations.

3. Setup and Configuration Complexity:

The installation and setup of traditional robotic arms with cables are often complex and time-consuming. The goal is to simplify the deployment process by eliminating the need for intricate cable management and routing.

4. Safety Concerns:

Cables pose safety risks in industrial settings as they can be tripped over or damaged. Additionally, in applications like healthcare and surgery, cables may hinder the precise movements required, leading to potential safety hazards for both operators and patients.

5. Limited Workspace Accessibility:

Wired robotic arms are constrained by the length of their cables, limiting their reach and accessibility in large workspaces. This becomes a critical issue in applications where the robotic arm needs to traverse varying distances.

Force and Torque Sensing:

Incorporate force and torque sensors to provide feedback to the control system. This feature enhances the robotic arm's ability to interact with its environment more sensitively, making it suitable for delicate tasks.

Safety Mechanisms:

Implement safety features such as emergency stop buttons, collision detection, and fail-safe mechanisms to ensure the safety of both the robotic arm and its surroundings.

Extended Reach and Articulation:

Design the robotic arm with an extended reach and multiple degrees of freedom to enhance its versatility and enable it to access a wide range of positions.

Wireless Charging:

Explore wireless charging capabilities to eliminate the need for physical charging cables, allowing for continuous operation without interruptions.

Modularity and Customization:

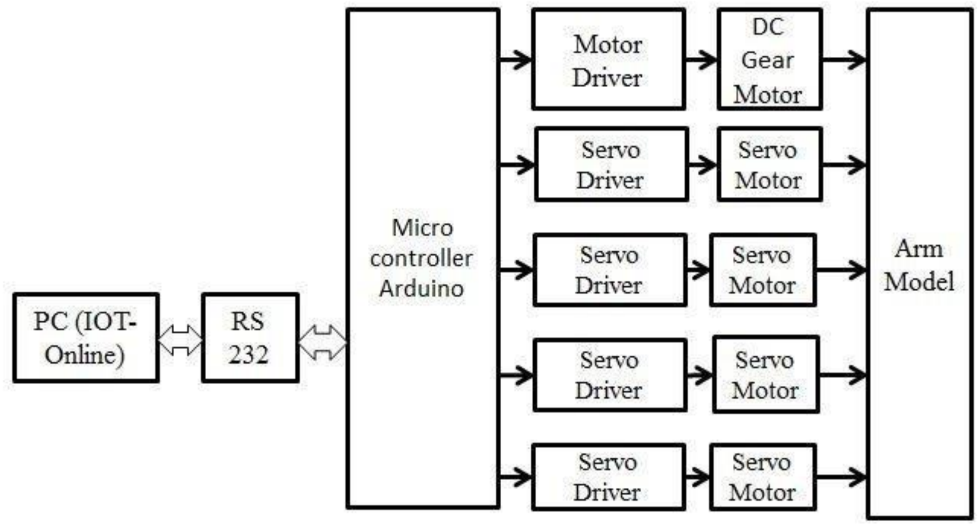
Design the robotic arm with a modular structure, allowing users to customize and expand its capabilities by adding or replacing modules as needed.

Integration with IoT (Internet of Things):

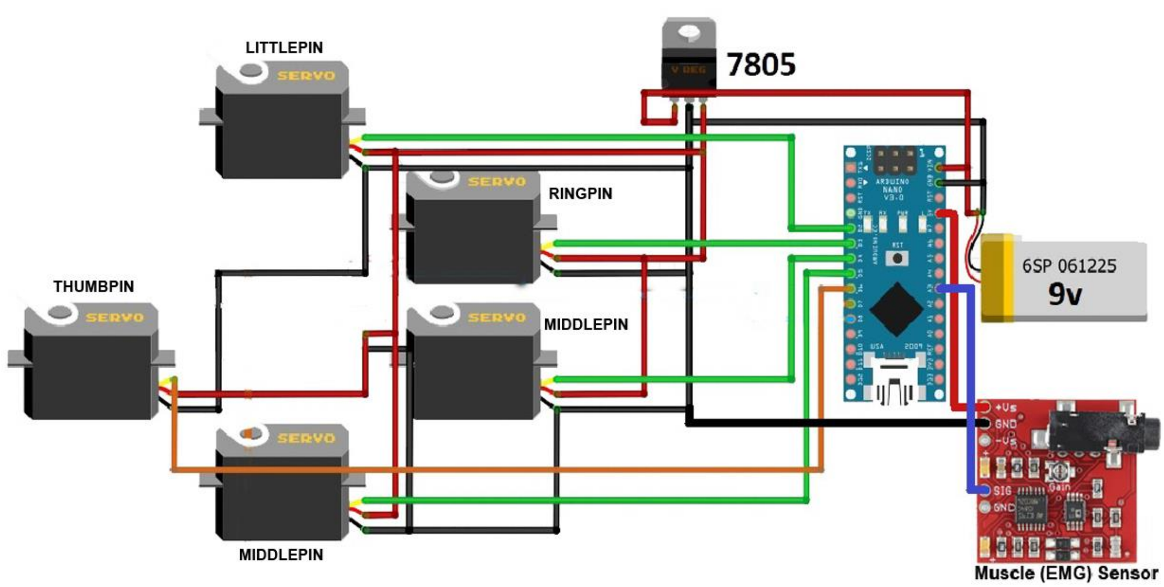
Enable connectivity with IoT platforms to facilitate remote monitoring, data logging, and integration with other smart devices in the environment.

## Project Architecture:

1. Model View Controller:




2. Circuit Diagram:




## Social Benefits:

Robotic arms offer a range of social benefits across various fields and industries. Some of these include:

Medical Applications:

Surgery: Robotic arms in surgery can enhance precision and allow for minimally invasive procedures, reducing patient recovery time, pain, and scarring.

Rehabilitation: Robotic arms are used in rehabilitation therapy to assist individuals with disabilities, helping them regain mobility and independence.

Manufacturing and Industry:

Automation: Robotic arms in manufacturing streamline production processes, increasing efficiency, and reducing costs. This can lead to the creation of more jobs in research, development, and maintenance of robotic systems.

Safety: Dangerous and repetitive tasks can be delegated to robotic arms, protecting human workers from potential hazards.

Assistance for People with Disabilities:

Assistive Devices: Robotic arms can be adapted into assistive devices for individuals with physical disabilities, providing them with increased autonomy and improving their quality of life.

Search and Rescue Operations:

Disaster Response: Robotic arms can be used in disaster-stricken areas to assist in search and rescue operations, where human access might be limited or dangerous.

Education and Skill Development:

Training: Robotic arms can be used as educational tools to train individuals in various fields, including engineering, programming, and advanced manufacturing skills.

Agriculture:

Precision Farming: Robotic arms can aid in precision agriculture, optimizing resource use and crop management, leading to increased agricultural productivity.

Space Exploration:

Exploration and Colonization: Robotic arms are crucial in space missions for tasks such as collecting samples, repairing equipment, and building structures. This technology contributes to advancements in space exploration and potential future colonization efforts.

## Target population:

The target population for robotic arms varies across different applications and industries. Here are some key sectors and corresponding target populations for the use of robotic arms:

Manufacturing and Industrial Settings:

Target Population: Factory workers, engineers, and technicians involved in assembly lines and manufacturing processes. Industries such as automotive, electronics, and aerospace often deploy robotic arms to assist in tasks like welding, painting, and assembly.

Medical Field:

Target Population: Surgeons, healthcare professionals, and patients. Robotic arms are used in surgical procedures, rehabilitation, and telemedicine, benefiting both medical practitioners and individuals requiring medical interventions.

Assistive Devices for Disabilities:

Target Population: Individuals with physical disabilities. Robotic arms can be adapted into assistive devices to aid those with limited mobility, enhancing their independence and quality of life.

Research and Development:

Target Population: Scientists, researchers, and engineers. Robotic arms are used in laboratories and research institutions for various applications, including material handling, experimentation, and prototyping.

## Project Timeline:

1. Project Initiation (Weeks 1-2)

2. Research and Requirements Gathering (Weeks 3-4)

3. Design and Planning (Weeks 5-6)

4. Procurement (Weeks 7)

5. Development (Weeks 8 )

6. Testing and Quality Assurance (Weeks 9)

7. Optimization and Fine-Tuning (Weeks 9)

## Project Picture:

## Conclusion:

In conclusion, the integration of robotic arms offers a multitude of social and economic benefits, contributing to advancements across various industries. From enhancing precision in medical procedures to improving productivity in manufacturing, the positive impact of robotic arms is evident.

## Reference:


1. https://www.researchgate.net/figure/Experiment-results-of-Robot-Arm_tbl2_268289482
2. https://www.scribd.com/document/38686184/Robotic-Arm-Lab