EXPERIENTIAL LEARNING : Elements of Industry 4.0 –22EM217

ROBOTIC ARM

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Objective

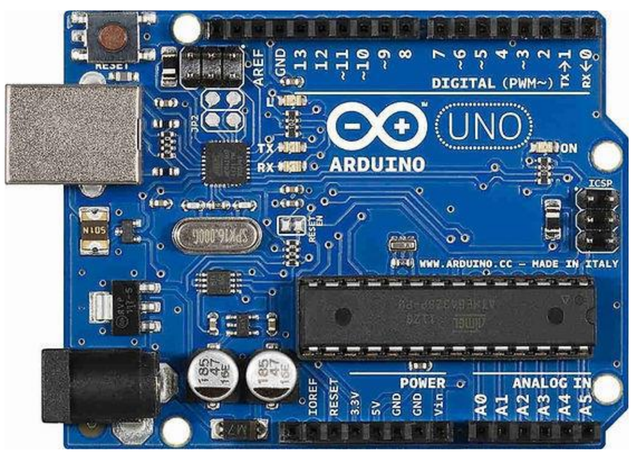
The objectives for creating a 4-DOF (Degree of Freedom) Robotic Arm are to develop a versatile and efficient automation tool capable of precise and controlled movements. Such a robotic arm aims to enhance productivity by automating repetitive tasks, improving precision in manufacturing processes, and reducing human exposure to hazardous environment .

Project Methodology

Developing a 4-DOF (Degree of Freedom) Robotic Arm follows a systematic methodology. It begins with defining project objectives and requirements, including precision, payload, and workspace. Next, kinematic analysis determines the arm's range of motion and equations for positioning.

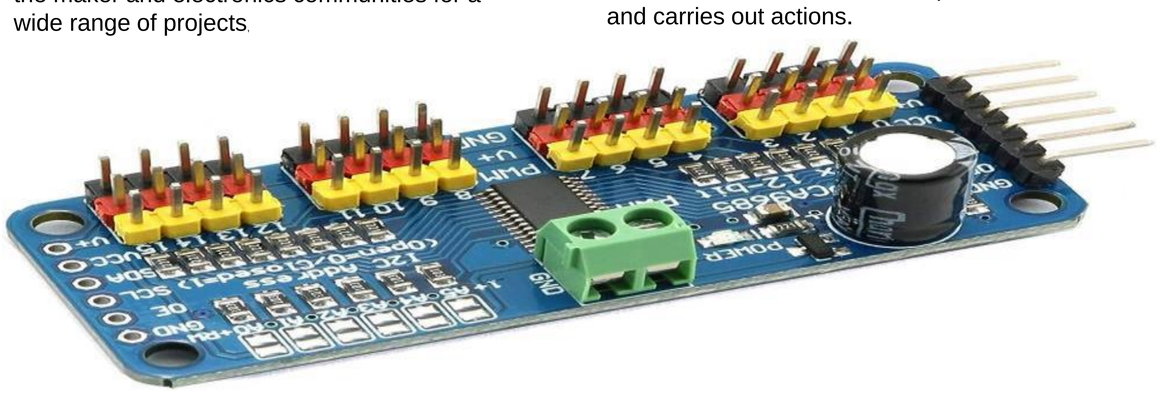
Component selection involves choosing actuators and sensors.

Components Used



Arduino Uno: Arduino Uno is a versatile and beginner-friendly microcontroller board that's widely used in the maker and electronics communities for a wide range of projects.

End Effector : An end effector is a device attached to the end of a robotic arm or manipulator. It is the part of the robot that interacts with the environment, performs tasks, and carries out actions.



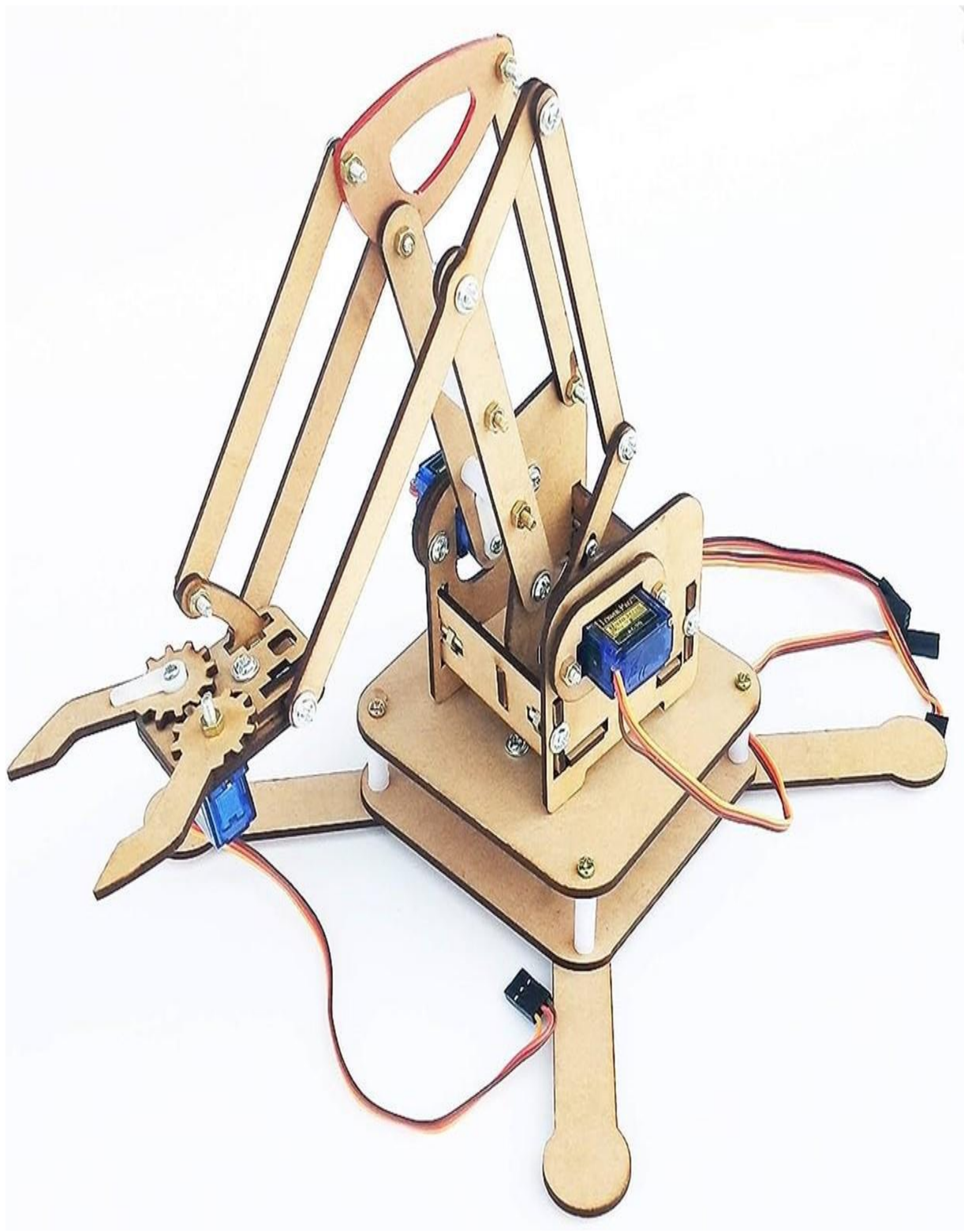
Motor Drivers: Motor drivers are essential components in systems where precise motor control is required ,it provides the necessary power, voltage regulation, and control signals to drive electric motors.

Servo Motors: Servo motors are a vital component in many systems that require accurate and dynamic control of mechanical movements. Their ability to provide precise position, velocity, and torque control makes them invaluable in a wide variety of applications.

Power Supply: Power supplies are essential components that provide the necessary electrical energy to power and operate the various devices in the arm.

Wires and Connectors: Wires and connectors are the fundamental components of electrical and electronic systems, facilitating the transmission of electrical signals, power, and data between various devices and components.

Results



Industrial Applications :

A 4-DOF (Degrees of Freedom) robotic arm has various industrial applications due to its versatility, precision, and ability to perform a range of tasks. Here are some common industrial applications: **Material Handling and Assembly, Pick and Place Operations, Machine Tending, Welding, Painting and Coating , Laboratory Automation , Electronics Assembly & 3D Printing**.

Conclusions: This project was aimed at reducing production cost for the 4 DOF Robotic Arm ,by using lesser material to produce the same model without affecting the model's quality and performance.

- **Precision and Accuracy,** This arm can perform tasks with incredible precision, ensuring consistent quality and minimizing errors, which is crucial in industries like manufacturing, healthcare, and quality control
- **Enhanced Safety,** By handling dangerous or hazardous materials and performing tasks in risky environments , this robotic arm protect human workers from potential harm.
- **Flexibility, Our** Robotic arm can be reprogrammed or adapted to perform various tasks, making them a versatile asset for businesses that require different processes.
- **Environmental Impact,** By optimizing processes and reducing waste, this robotic arm contributed to sustainability efforts and can lead to decreased conventional resource consumption.

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Key References:

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