

# Design Project 3

FINAL PROJECT TOPIC: Robotic Arm

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A grayscale image of a robotic arm, likely a LEGO Mindstorms Technic arm, is positioned diagonally across the slide. The arm's joints and segments are visible, extending from the top left towards the bottom right. The background is a solid dark gray, decorated with several semi-transparent colored circles in shades of purple, pink, and blue, scattered primarily on the left and right sides.

# TOPIC : ROBOTIC ARM

## Objectives of the presentation:

- Introduction
  - what is a Robotic Arm?
- Problem Statement
- What are the Uses of a Robotic Arm?
- Software and Hardware Overview
- Mechanical Design
- Software program
- Pick and Place demonstration
- Future Scope
- Conclusion
- References

# Introduction

- A robotic arm, sometimes referred to as an industrial robot, is often described as a 'mechanical' arm.
- It is a device that operates in a similar way to a human arm, with a number of joints that either move along an axis or can rotate in certain directions.
- In fact, some robotic arms are anthropomorphic and **try and imitate the exact movements of human arms**. They are, in most cases programmable and used to perform specific tasks, most commonly for **manufacturing, fabrication, and industrial applications**.

- They can be small devices that perform intricate, detailed tasks, small enough to be held in one hand; or so big that their reach is large enough to construct entire buildings.  
Robotic arms were originally designed to assist in **mass production factories**, most famously in the **manufacturing of cars**.
- They were also implemented to mitigate the risk of injury for workers, and to undertake **monotonous tasks**, so as to free workers to concentrate on the more complex elements of production

# What is a Robotic Arm?

- Machines that are programmed to execute a specific task.
- Generally motor-driven, they're most often used for the rapid, consistent performance of heavy and/or highly repetitive procedure.
- A typical industrial robot arm includes a series of joints, articulations and manipulators.
- robotic arms lies in the way their joints are designed to articulate - and subsequently the range of movement and functions they're able to perform - as well as the type of framework they're supported by and the footprint they require for installation and operation.

# Types of Robotic Arm

- Cartesian (gantry) robotic arms
- Cylindrical robotic arms
- Polar/Spherical robotic arms
- SCARA robotic arms

# Cartesian (gantry) robotic arms



- Mechatronic Cartesian or gantry robots tend to consist of three articulating joints that are programmed using these X,Y and Z.
- They can be mounted horizontally, vertically or overhead, and are widely used in a range of applications such as machining parts or picking and placement alongside conveyor belts.

# Cylindrical robotic arms



- Programmed movements take place within a cylinder-shaped space (up, down and around).
- This type of arm is more commonly used for assembly operations, spot-welding and machine tool handling, where the rotary and prismatic joints give it both rotational and linear motion.



# Problem Statement

- Consideration of atmospheric conditions and potential hazards (including dust, dirt and moisture levels) in the immediate working environment will be important when choosing an appropriate type of robotic arm for a specific location.
- Physical footprint, orientation and range of movement will also influence how suitable a particular model or arm type is for use in a particular environment, with other equipment and workers taken into account.
- All types of robotic arms have a given load capacity, and this manufacturer-specified number always needs to exceed the total weight of the payload involved in any job you expect the arm to perform (including tools and attachments).
- Different sorts of robot arms are supported by differently designed frameworks, which can increase or decrease overall load capacity - this must be balanced with consideration of physical placement and footprint.

# What are the Uses of a Robotic Arm?

- Robotic arms can be used for all manner of industrial production, processing and manufacturing roles - any task in which extremely precise, fast and repeatable movements are required.

# Car manufacturing



# Food production





# Robotic-assisted surgery



# • Pick and place products

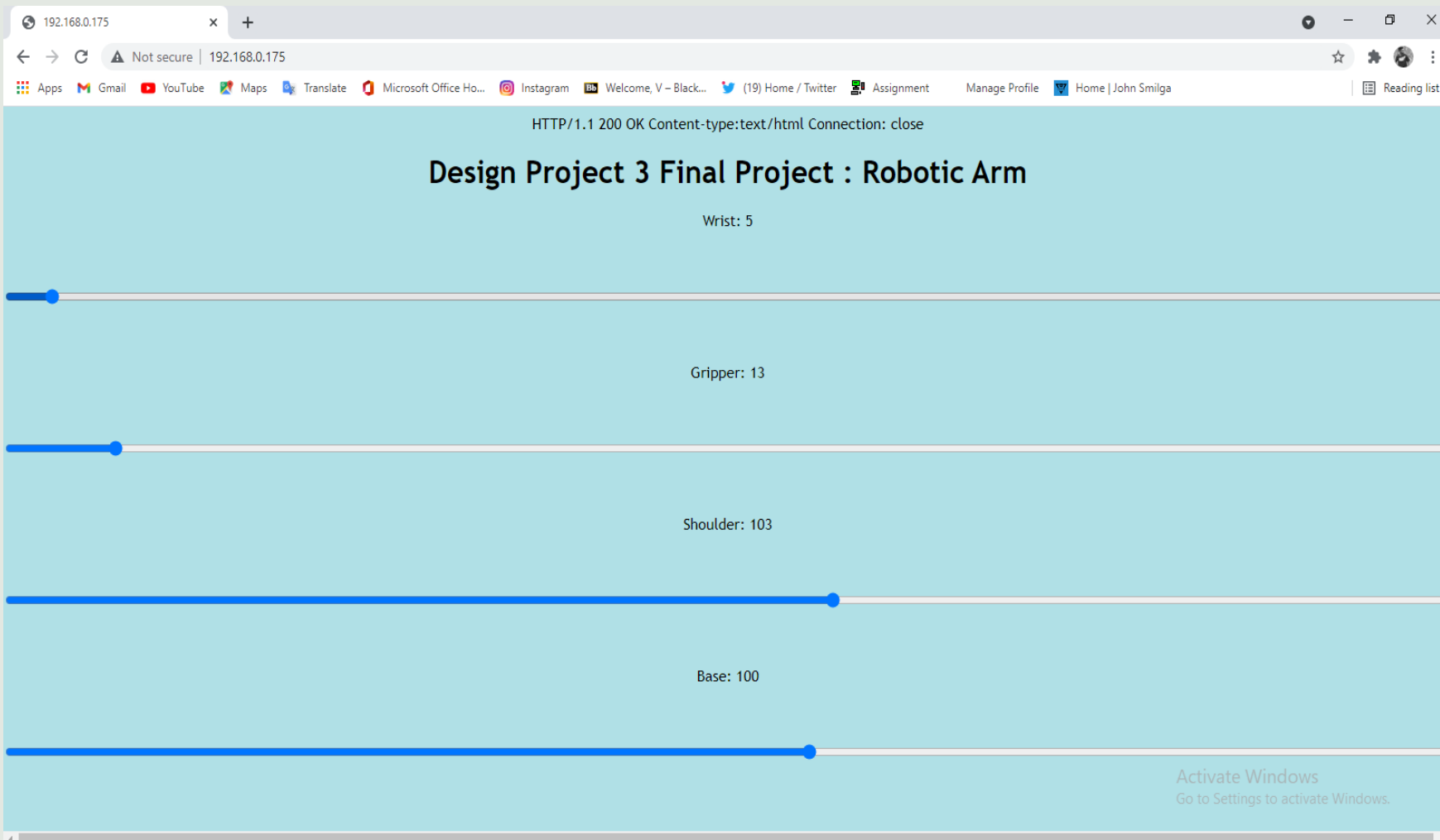


# Software Overview

Arduino integrated development environment (**IDE**)



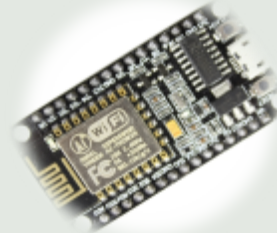
# Web application



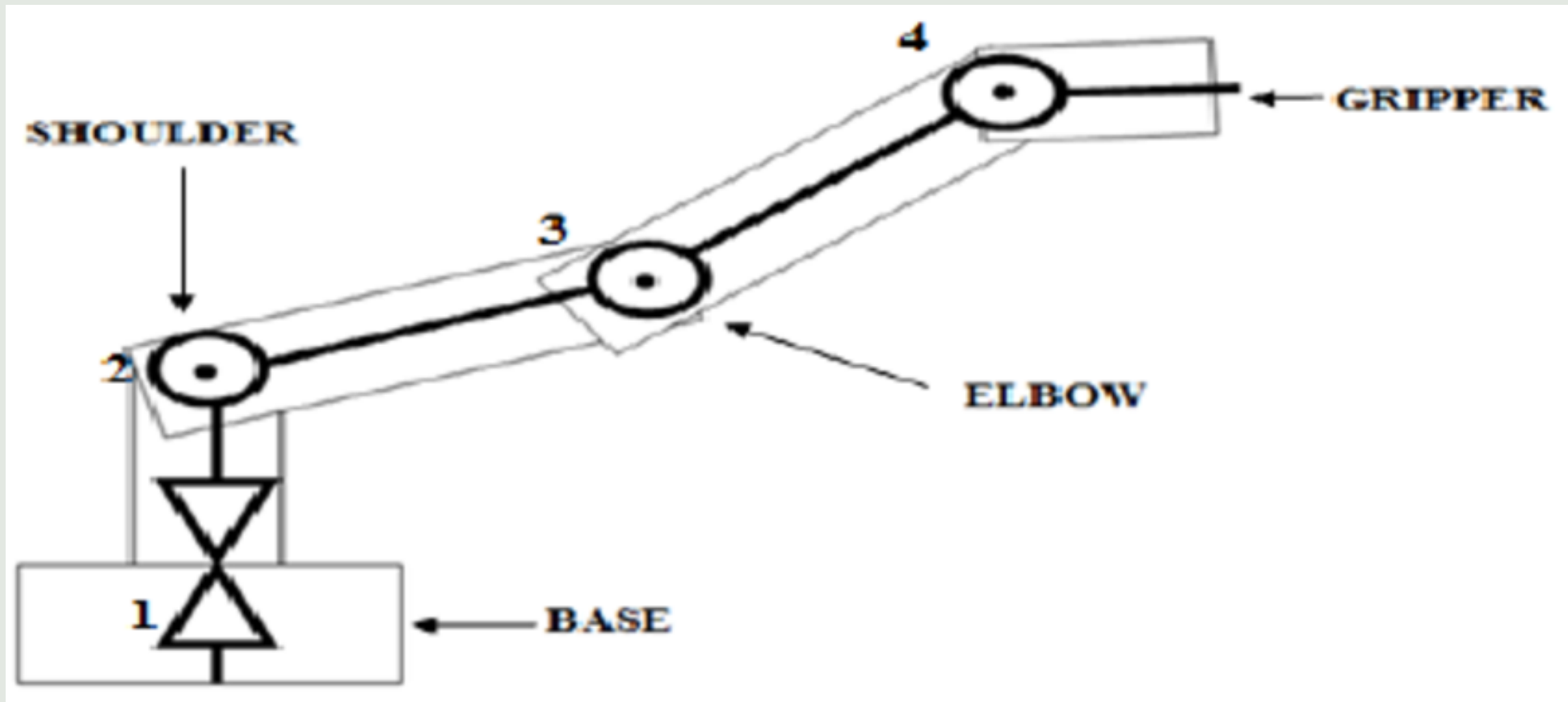


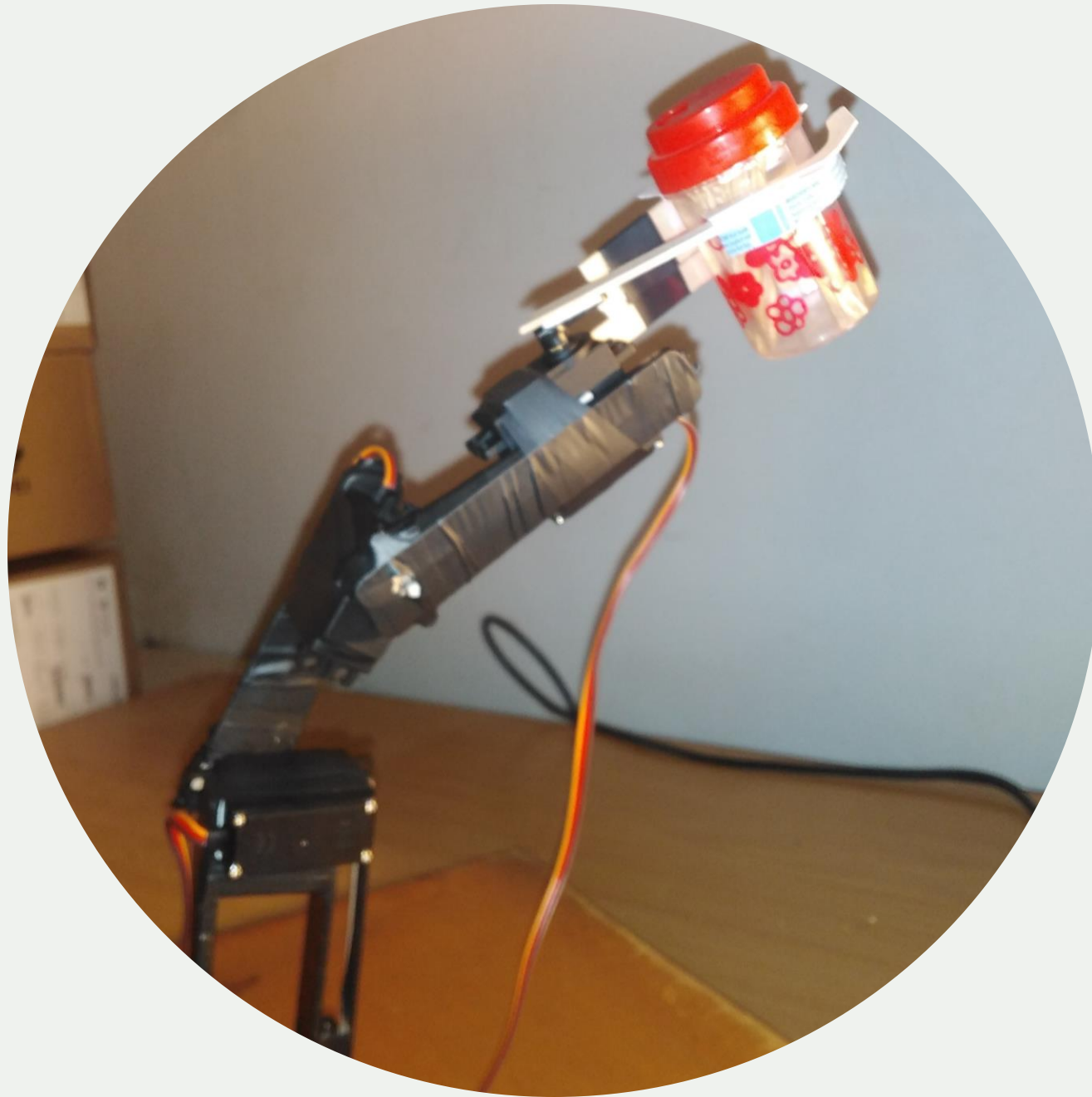
# Hardware Overview

- Servo Motors
- Esp8266 Nodecmu Wi-Fi
- Wooden Sticks



# Mechanism Structure





# Future Scope

- Robotic Arms has a wide scope of development. In the near future the arms will be able to perform every task as humans and in much better way. Imagination is the limit for its future applications.
- It can be a real boon for handicapped people, who are paralyzed or lost their hands in some accident. The arm can be trained to listen to the command from a human and perform that task. A Precise gesture controlled system is also possible. Wearable devices can be used to send the command and control the movements of the arm

# Conclusion

- Even after many years of research, the applications of robotic arm are restricted to the industries and primarily used in manufacturing units for increasing productivity.
- These arms are very sophisticated and can manage to make extremely precise movements. The robotic arms have wide variety of general purpose and domestic applications too, which are not much explored.

# References

- 1. Dynamics of Robotic Arm Abhishek Chavan Dept. of Computer Engg., SITS, Pune
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- 3. [https://create.arduino.cc/projecthub/Mako\\_/robotic-arm-9a9227?ref=part&ref\\_id=10308&offset=17](https://create.arduino.cc/projecthub/Mako_/robotic-arm-9a9227?ref=part&ref_id=10308&offset=17)
- 4. <https://www.instructables.com/Arduino-Robot-Arm/>