IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 5, April 2024

Design and Development of a Prototype of Industrial Robotic Arm Controlled by Touch Interface

Prof. A. S. Kotakar[1], Aachal Deshmukh[2], Prathamesh Chavan[3], Shrinivas Kale[4], Chetan Khedekar[5]
Assistant Professor, Department of Robotics and Automation [1]
Scholars, Department of Robotics and Automation [2,3,4]
Zeal College of Engineering & Research, Pune, Maharashtra, India

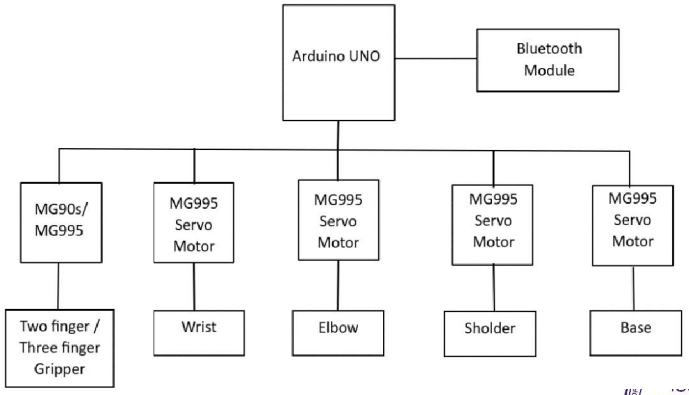
Abstract: *This project proposes a prototype of a industrial robotic arm to pick & place major & minor products with the help of two finger and three finger gripper which is controlled by touch interface. This project explores building a basic, controllable robotic arm for industrial purposes. Instead of using a joystick or buttons, this arm will be controlled by a touch interface. Imagine a tablet or screen where you can simply touch where you want the arm to move. This prototype will focus on the design, construction, and testing of this touch-controlled system. Developing this prototype involves two main parts: the robotic arm itself and the touch interface. The robotic arm will be constructed with lightweight materials and controlled by servo motors, allowing for precise movement. These motors will be connected to a microcontroller board, which is the brain of the system..*

Keywords: Cartesian Robot, Pick and Place, Grasp Major And Minor Products, Two and Three Finger Gripper, Servo Motors.

I. INTRODUCTION

This project outlines the design and development of a prototype robotic arm controlled through a touch interface. Robotic arms have become increasingly prevalent in various industries, automating tasks and improving efficiency. This project delves into the design and development of a prototype robotic arm controlled by a user-friendly touch interface. This approach aims to make interacting with the arm more intuitive and accessible, particularly for non-technical users. The core concept involves translating user input from the touch interface into control signals for the robotic arm's motors. This interface could be a tablet screen, a dedicated touch pad, or even a smartphone app. By implementing intuitive touch gestures or on-screen buttons, users can instruct the arm to perform specific movements. For instance, tapping a designated area on the interface could correspond to the arm moving in a particular direction, while swiping across the screen might control the gripper's opening and closing.

II. BLOCK DIAGRAM



IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 5, April 2024

III. METHODOLOGY

- Objective Definition: Clearly outline project goals, including precision, flexibility, and ease of control, catering to industrial automation needs.
- User Feedback Analysis: Gather insights from potential users and industry experts regarding preferences, usability, and functionality expectations for industrial robotic arms.
- Market Survey: Investigate existing industrial robotic arm solutions, competition, and technological advancements in touch interface integration.
- Compliance Assessment: Ensure the robotic arm prototype complies with industry standards and safety regulations, considering factors such as payload capacity and operational environment.
- Arm Structure Design: Select or develop a robust arm structure that supports precise movements while accommodating touch interface components.
- Sensor Integration: Integrate touch sensors and feedback mechanisms to facilitate intuitive control and enhance user experience.
- Power Management System: Select appropriate power sources and implement efficient management systems to sustain prolonged operation periods.
- Interface Development: Design an intuitive touch interface for controlling the robotic arm's movements, grip strength, and other functionalities.
- Emergency Shutdown Mechanism: Implement safety features such as emergency stop buttons and collision detection systems to prevent accidents.
- Performance Testing: Conduct rigorous testing to evaluate the prototype's accuracy, speed, and reliability under various operating conditions.
- Documentation and Training Materials: Create detailed documentation covering assembly instructions, operational procedures, and maintenance protocols for users and technicians.

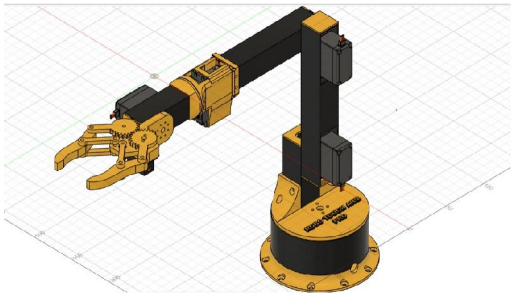
IV. COMPONENTS AND SPECIFICATIONS

Sr. No.	Components	Specifications
1	Lithium-ion Battery	12V,1200 mAh
2	Microcontroller	Arduino UNO
3	MG995 Servo Motor	4.8V to 7.2V
4	MG90s Servo Motor	4.8V to 6V
5	Bluetooth Module	Range up to <100m
6	Jumperwires	$1mm^2$,$1.5mm^2$

V. SYSTEM DEVELOPMENT

A. CAD Model of Robotic Arm:

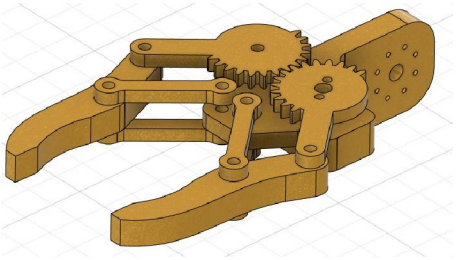
We have designed and successfully build the body that is made up of PLA material that reduces the weight of the body. The design of the body is successfully developed by the help of Fusion 360 software. The upper part body has an elevation of 45 degree, from the rectangular body, which is designed for the Tablet to place and is very helpful for the person to view the tablet (screen).



IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 5, April 2024

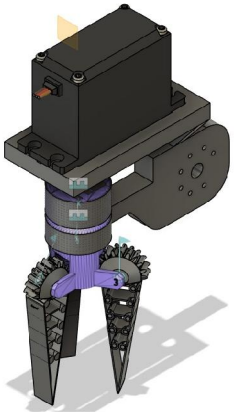
B. Two Finger Gripper:

We have designed the two finger gripper to grasp minor products. The design of the two finger gripper is successfully developed by the help of Fusion 360 software.



C. Three Finger Gripper:

We have designed the three finger gripper to grasp major products. The design of the three finger gripper is successfully developed by the help of Fusion 360 software.



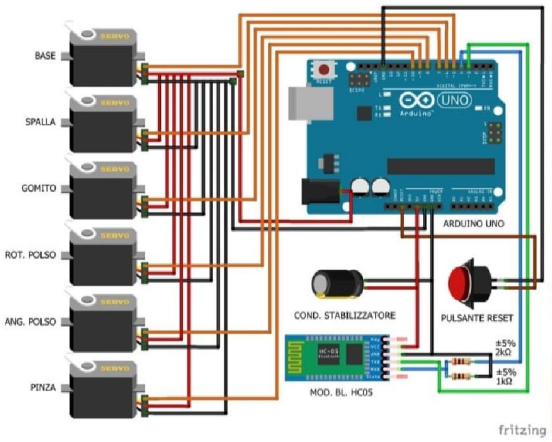
D. GUI Interface:

The GUI Interface that we have developed is a website-based GUI interface which helps to movements of Robotic Arm. The App Interface developed for the robot is developed through use of MIT App Inventor which is a free platform to develop the applications.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 5, April 2024

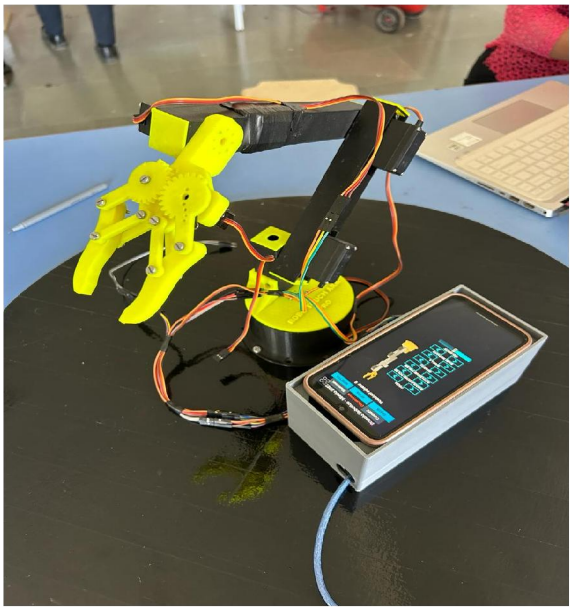
VI. CIRCUIT DIAGRAM

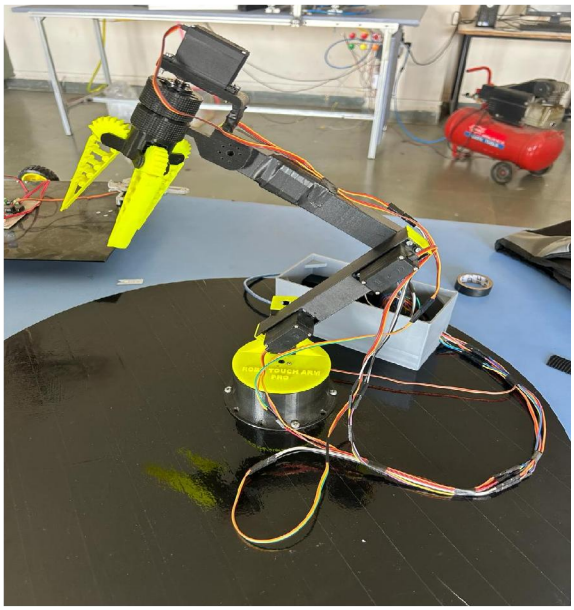
We Select Microcontroller as a Arduino UNO, the board is connected to the bluetooth module and servo motors (MG995 & MG90s) with the help of jumper wires.



VII. RESULTS

We have successfully design and developed the prototype of robotic arm controlled by touch interface with two finger and three finger gripper for pick and place major & minor products.





VIII. ACKNOWLEDGMENT

We express our sense of gratitude towards our Project Guide Prof. A. S. Kotakar for her valuable guidance and suggestions at every step of study of this Project.

We are thankful to Prof. Y. R. Ingole, Head of the Department of Robotics & Automation Engineering. We are very much thankful to respected Principal Prof.(Dr.) A. M. Kate, for his support and providing all facilities to complete the project.

Finally, we want to thank to all our friends for their support & suggestions. Last but not the least we want to express our gratitude to our families for giving us support and confidence at each and every stage of this project.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 5, April 2024

IX. CONCLUSION

We have design & develop a prototype of robotic arm controlled by touch interface represents to pick and place major & minor products, Specifically two finger gripper can grasp minor products and three finger gripper can grasp major products. When designing the robot arm, they focused on making it light so it can move easily but still strong enough to do its job. This project successfully designed and built a prototype of an industrial robotic arm controlled by a touch interface. This means instead of complex buttons or joysticks, an operator can directly interact with a screen to guide the robot's movements. This intuitive approach has several advantages.

REFERENCES

[1]. "Design and Implementation of an Arduino-Based Robotic Arm with Touch Screen Interface" by P. K. Patel et al. (2017)
[2]. “A Novel Approach to Controlling a Robotic Arm Using Touchscreen and Brain-Computer Interface” by Muhammad Imran, Farhan Ahmed, and Muhammad Usman (2021)
[3]. “User Preferences for Touch-Based Interfaces in Robotic Arm Control” by O. Hassan, A. El-Shawi, and M. Ali (2022)
[4]. “Arduino Based Robotic Arm with Touch Screen Interface and Bluetooth Communication” by P. C. Patel et al. (2021)
[5]. "Open-Source Software for Touch-Based Robotic Arm Control" by Muhammad Imran, Farhan Ahmed, and Muhammad Usman (2022)