Pick and Place Robotic Arm

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***Abstract* -The project is designed to develop a system in which is used for pick and place application. in this highly developing society, time and man power are critical constrains for completion of task in large scales. the automation playing important role to save human efforts in most of the regular and frequently carried works. the pick and place robot is one of the technologies in the manufacturing industries which is designed to perform pick and place operation. the system is designed in such a way that in which the human error are eliminated to get more precise work. The project deals with implementing a pick and place robot using Arduino microcontroller. here, the robot which is implemented have an ability to locate itself to the location where the object to be lifted is available with the help of DC motors which not only perform the movement of robot but also movement of robotic arm became possible and with the help of robotic arm it can hold the object and place it at desired destination**

Keywords — Arduino; Electrical Devices; Servo Motor;

I. INTRODUCTION

In today's rapidly advancing technological landscape, robotics has emerged as a pivotal force revolutionizing industries across the globe. One remarkable application of robotics is the development of pick and place robotic arms, which are transforming the efficiency and productivity of various manufacturing processes. These robotic arms have the ability to automate repetitive and labor-intensive tasks involved in picking up objects from one location and accurately placing them in another. This Pick and Place robot does very basic things but this is widely used in the industries and it will never go extinct.

II. METHODOLOGY

Requirements: Requirements of the pick and place task, including the payload capacity, reach, speed, precision, cycle time, and any unique constraints.

Prioritize Design Iterations: Plan of the design process in iterative stages, focusing on key design elements such as arm configuration, actuator selection, and end effector design. Prioritize the most critical design iterations and conduct early simulations and analyses to identify potential issues

Utilizing Advanced Simulation and Visualization Tools: Employ advanced simulation and visualization tools to model the robotic arm's behavior and performance accurately. We Used physics-based simulations on Autocad and Tinkercad to validate the arm's kinematics, dynamics, and collision avoidance before physical implementation. This approach can save time and resources by reducing trial-and-error during the physical design phase.

Implementing Modular Design: We Utilized a modular design approach to enhance flexibility and scalability. Design the robotic arm in modules that cana be easily replaced or upgraded, allowing for future enhancements or adaptations to changing requirements.

Leverage Existing Components and Frameworks: We Utilized off-the-shelf components, such as actuators, sensors, and control systems, wherever possible. This approach reduces development time and leverages proven technology. Additionally, consider adopting existing robotic arm frameworks or software libraries to accelerate the development process.

Optimize Control Algorithms: Employ advanced control algorithms and optimization techniques to improve the arm's performance. These can include trajectory planning, adaptive control, and machine learning-based algorithms. Optimize the control parameters to achieve

fast, accurate, and smooth movements while minimizing energy consumption.

Installing servo motors : installing motors strategically to enhance the arm's movement . For example, we used mg995 for the arms to move and as it provides the required power .Effectively, we also used servo motor sg90 for the gripper .

Conduction of Rapid Prototyping and testing: Utilize rapid prototyping techniques. This approach facilitates faster iteration and validation of design concepts and testing the initial condition for the movement of arm and synchronisation with the microcontroller.

a. Materials

To implement the project we used the following hardwares:

1. Servo motor(Mg995)

FIG 1.0 SERVO MOTOR

A Servo motor is a type of motor that rotates at great precision. It provides feedback on the motor shaft's current position, which helps to increase the precision of the motor. To rotate an object at a specific angle for a specific distance servo motors are used. Servo motors work on DC as well as AC power supply. There are other types of servos too which are based on motors gear management and operating characteristics. servo motors position is decided by it's electrical pulse which is placed beside the motor.

2. Plywood

Fig1.1 LED (Light Emitting Diode)

Plywood is a material manufactured from thin layers or "plies" of wood veneer that are glued together with adjacent layers having their wood grain rotated up to 90 degrees to one another. It is an engineered wood from the family of manufactured boards which include medium-density-fibreboard (MDF), oriented strand board (OSB) and particle board (chipboard).

3. Jumper Wires

Fig1.4 Jumper wires

In Robotic arm, jumper wires are frequently used to link parts and establish electrical connections between them.

4. Battery

Fig 1.5 Battery

In robotic arm frequently use batteries to offer a dependable source of power in locations with intermittent or restricted access to electricity.

5. Arduino Uno

Fig1.5 Arduino -Uno

A microcontroller board called Arduino Uno can be used to watch and control the parts and operations of automatic street light systems.

III. RESULT AND DISCUSSIONS

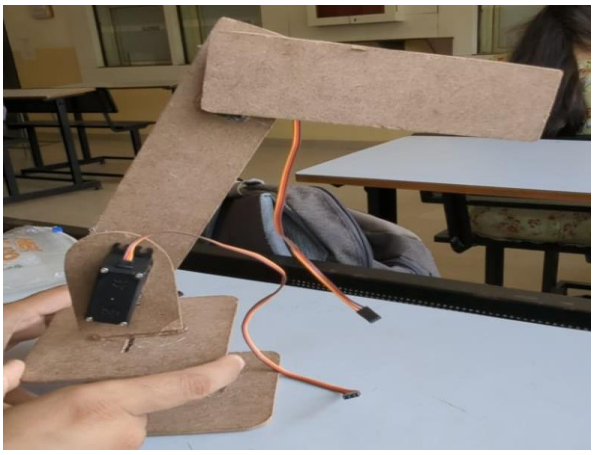

Fig 2.0 working of the prototype part-1

IV.FUTURE SCOPE

The pick and place robotic arm can be made versatile and more efficient by providing the feedback and making it more autonomus, lowering the chances of human interventions. This eliminates the chances of human errors. Pick and place robots are usually mounted on a stable stand, strategically positioned to reach their entire work envelope. Advanced vision systems enable them to grasp and move objects on a conveyor belt, which can be used in a variety of different ways.

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