

## **DESIGN AND FABRICATION OF PICK AND PLACE ROBOT WITH ARM MECHANISM**

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### **Abstract**

The popular concept of a mechanical arm is of a machine that looks and works like a human arm. The industry is moving from current state of automation to Robotization, to increase Productivity and to deliver uniform quality. The industrial robots of today may not look the least bit like a human being although all the research is directed to provide more and more anthropomorphic and humanlike features and super-human capabilities in these. One type of robot commonly used in industry is a robotic manipulator or simply mechanical arm. It is an open or closed kinematic chain of rigid links interconnected by movable joints. In some configurations, links can be considered to correspond to human anatomy as waist, upper arm and forearm with joint at shoulder and elbow. At end of arm a wrist joint connects an end effector which may be a tool and its fixture or a gripper or any other device to work. Here how a pick and place mechanical arm can be designed for a workstation where loading and packing of lead batteries is been presented. A robotic arm is a robotic manipulator, usually programmable, with similar functions to a human arm.

**Keywords:** Automation, Robotization; Anatomy; Anthropomorphic

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### **Introduction**

Robotics develops machines that can substitute for humans and replicate human actions. Robots can be used in many situations and for many purposes, but today many are used in dangerous environments manufacturing processes, or where humans cannot survive (e.g. in space, underwater, in high heat, and clean up and containment of hazardous materials and radiation). Robots can take on any form but some are made to resemble humans in appearance.. The concept of creating robots that can operate autonomously dates back to classical times, but research into the functionality and potential uses of robots did not grow substantially until the 20th century. Throughout history, Today, robotics is a rapidly growing field, as technological advances continue; researching, designing, and building new robots serve various practical purposes, whether domestically, commercially, or militarily. Many robots are built to do jobs that are hazardous to people, such as defusing bombs, finding survivors in unstable ruins, and exploring mines and shipwrecks. Robotics is also used in STEM (science, technology, engineering, and mathematics) as a teaching aid.

### **Objectives of the study**

- To develop a prototype pick and place robot with 5 DOF arm mechanism.

### **Review of Literature**

1.Dr. S.k Talakyala demonstrated [1] The project covers the procedure for selection of the servos used to power each joint of the arm in details. The torque exerting at each of the joints is going to calculate in this project and a servo with the required torque rating is being selected for each joint. Selecting a suitable servo controller and control software for the robotic arm is developing using micro soft's C++ programming language.

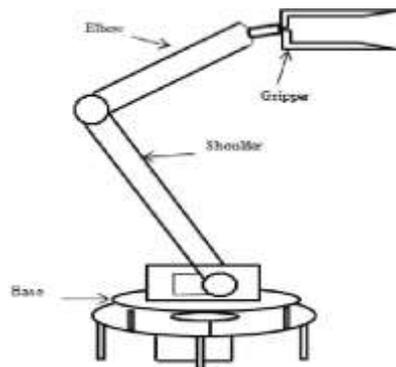
2. Balamurugan Rajendren elaborate ( IJESD 2016) [2]Operation of various arm linkages and the robotic arm has been extensively tested and the required corrective measures were taken. Robot manipulator is an essential motion subsystem component of robotic system for positioning, orientating object so that robot can perform useful task.

3.Md Mashum Bilal ( ICMIME 2017)[3] have accumulated a mechanical arm with a line follower robot which will be able to pick an object from a certain place then carry it to the defined place by following a predefined line. The robot will be used in factories, industries to reduce labour and cost of carrying objects. Besides following fixed line, the robot will carry the necessary amount of load it will be greatly useful to RMA industry, super market, library, healthcare and home application.

### **Working of a Basic Pick and Place Robot**

- The basic function of a pick and place robot is done by its joints.
- Joints are analogous to human joints and are used to join the two consecutive rigid bodies in the robot.
- Degrees of freedom implement the linear and rotational movement of the body and degrees of movement implement the number of axis the body can move

### **Diagram of a Simple Pick and Place Robot:**



### **Methodology**

This work covers material selection, design and fabrication of a basic robotic arm system. It also covers the implementation of the kinematics of the arm but does not consider the details of the derivation of the kinematic equations

- select a suitable material for the fabrication of a 5-DoF robotic arm;
- Obtain suitable design parameters for the robotic arm;
- Fabricate the robotic arm
- Calculate the torque required
- Calculate the power required.

### **ROBOTICSMOUMENT**

- Rotational movement
- Radial movement
- Vertical movement

## **DC Motor:**

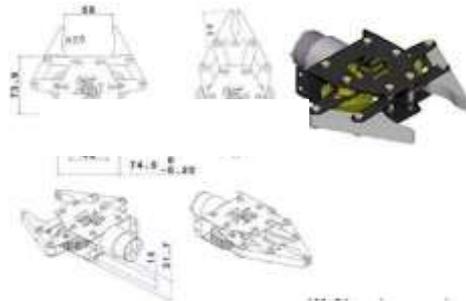
This is very commonly used in robotics. DC motors can rotate in both directions depending upon the polarity of the current through the motor.

These motors have free running torque & ideally zero current. These motors have high speed which can be reduced with the help of gears.

Speed- 45 RPM,

Shaft Diameter- 0.7 mm

For DC Motor torque Formula:



DC Motor 10 RPM

## **GRIPPER ARM:**

The gripper module is state of the art robotic arm which can be used in various 'pick and place' kind of robots. It works on DC Motor (9to12V DC).

- The DC motor can be easily be controlled with the help of DPDT Switch(manual mode)orwiththehelpofanymicrocontrolleralongwithL293D MotorDrivermodule.
- L-63.5mm,B-10mm, FEx-112mm

## **LIFTER ASSEMBLY:**

It is made from laser cut Metal and acrylic. There is a worm gear and spur gear assembly which is attached with a provide torque so that gripper can pick and lift the load.



(Diagram of worm gear and spur gear assembly, Pick N Place Robot)

### Wheels:

In order to design a perfect robot, you will need lots of components one of them is the Robot Wheels. Here you can find a range of robot wheels including Omni, Mecanum, RC Car, Heavy Duty, Caster Wheels. Wheeled robots are robots that navigate around the ground using motorized wheels to propel them.

### Dummy Wheel:

These dummy motors are used to attach wheel just like a real motor. Use them where you don't need powered wheels. For example, in a four-wheel (car like) robot you can use two motors at the back which power to the robot while you can attach 2 non-powered wheels on the front using the dummy motor.



### Lithium-Ion Batteries:

This LG 18650 MH1 3200mAh 10A 3.7V Battery is a single cell compact and powerful battery cell with 3200 mAh capacity. It is very convenient to install in your project where 3.7 Volt with high capacity is needed. The battery terminals can use in any compatible battery adapter/holder or it can be permanently soldered to your application's power source wires

### DPDT Switches:

The switch box is used to accommodate two DPDT Rocker Switches. It is a perfect makeshift remote for your robot. This is Remote Control Box for Wired Hobby Robot Control. To make the anti-clockwise motion of the motor, the polarity of supply must be inverted in a clockwise motion. For "Polarity Reversal" DPDT switches are generally used. A Double Pole Double Throw (DPDT) switch is an electromechanical switch that has 2 inputs and 4 outputs and each input has 2 corresponding outputs that it can connect to.

### Assembly:

The Dimension of Frame is designed to 1.5feet \*1 feet, which is supported with aluminium frame and covered by wood ply. And the motor are installed in lower part of rover to be balance whole body of rover.

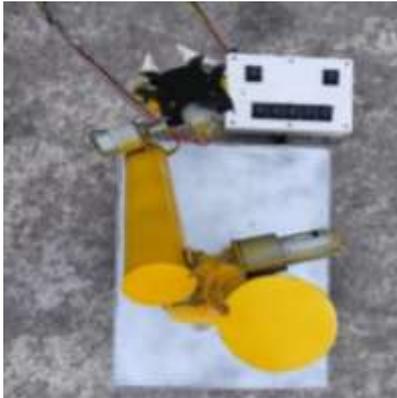


Assembly of Rover Body



Ply sheet Rotator

## **RESULTS AND DISCUSSIONS:**



This robot is used for pick & place the object from one place another places. Concepts of automobile and robotics are combined in this project. It issued for assembly line, material handling etc. This robot does all those things it mainly reduces the manual work.

## **CONCLUSIONS:**

All the various problems and obstructions for the loading process has been deeply analysed and been taken into consideration while designing the pick and place robot. The study and understanding“ Robotics” interdisciplinary with mechanical in the domain and other stream similar to electrical, electronics and computer, organism the additional and necessary for the engineering robot to be flexible, well-organized and exact in process.

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