Review on development of Pick & Place Arm Robot

ABSTRACT:

This study describes a robotic arm design that mimics how a human hand would move to grasp an object using Arduino as controller.

As a result, it can be applied to a robot that can analyze dangerous areas and perform material handling. We take into consideration a model of a humanoid robot arm and simulate common object lifting and transferring jobs by employing the robot arm to investigate such torque characteristics. Most robotic hands now in use cannot fully replace a hand's capabilities and cannot be employed in settings where a human hand would normally be used. Based on the type of end effector coupled to the 4 DOF robotic arm mechanism, this study closes with various potential applications.

INTRODUCTION:

Robotic arms are now mostly employed for automation in the industrial sector and operations in hazardous conditions. The high cost of many robotic controls is caused by high-precision actuators and specialized component machining. We suggest that if robotic arms with valuable performance were significantly more affordable, robotic control research would proceed more quickly. Wider acceptability may result from more accessible options, and this may speed up development.

But significant cost reduction will necessitate sacrifices and design considerations. Robotic arms can be assessed on a variety of criteria, including backlash, payload, speed, repeatability, compliance, human safety, and cost. Some of these factors are more crucial than others in robotics research: high repeatability and low backlash are critical for grasping and object manipulation.

LITERATURE REVIEW:

Ankur Bhargava's analysis of an Arduino-controlled robotic arm.

In this study, a robotic arm with five degrees of freedom (DOF) has been created. A series of potentiometers on an Arduino Uno microcontroller, which controls the device, allow user input. The arm is constructed of four rotary joints and an end effector, both of which utilize a servomotor to produce rotational motion. Each link was constructed using a 2 mm thick aluminum sheet after being first developed using Solid Works Sheet Metal Working Toolbox. The final shape of the arm was created by assembling the servomotors and links that were thus produced with fasteners. Each servo motor will rotate according to how much the potentiometer shaft rotates thanks to programming on the Arduino. The robotic arm is created and constructed of acrylic, and the linkages between the arms are performed by servo motors. The servo motors use encoders, preventing any utilize a controller The motor's limited range of rotation, therefore, significantly reduces the area that the arm can reach and the range of conceivable postures. Four degrees of

freedom were incorporated into the robot arm's design. Because it is much simpler and more practical to use a commercial gripper, the end effector is not considered when developing.

WORKING PRINCIPLE:

With the aid of some automation and program-based operations, the robotic arm operates on the idea of electrical input energy to effectively carry out some mechanical tasks. The pick and place robotic arm are made up of several discrete mechanical and electrical parts, including strips and motors, an arm gripper, switches, a battery, and a piece of metal. This project aims to create a robotic arm that can pick and position objects and has a soft catching grasp. Using this gentle catching gripper, an object can be handled safely while being caught and placed. The robotic arm is powered by a servo motor that rotates it in an angular manner to capture objects (hold, release, rotate, position).

COMPONENTS:

1. Machine Gripper: -

The objects are held in place by a mechanical gripper as they are moved from one place to another. The gripper features a built-in tiny servo that allows it to open and close its jaws as needed to grasp items. The gripper is created using a LASER cutting process on acrylic. The second jaw's gear meshes with the shaft of the servo that is fastened to the end of the first jaw. To release or hold the objects, the jaws open or shut as the motor rotates the gear, which in turn rotates the gear in mesh. A servomotor is equipped with a gear link that meshes with another gear link to generate a smooth motion.

Fig 1: - Mechanical Gripper

2. Bearing Base

The base is constructed to be extremely sturdy so that it can sustain the entire assembly and maintain the balance. The arm can perfectly move in the necessary directions thanks to the base, which also allows it to cover a hemispherical volume. The bearing is anchored in the base and

carries all the base's weight in addition to enabling rotational movement from the base to the robotic arm.

3. The Servo Motor: -

The robotic arm has three main servo motors: one for base motions and two on either side of the base plate to send motion to the arm's different linkages. The base plate of the servo motor is fastened using bolts.

Fig 2: - Servo motors

4. Controller: -

A servo control can be activated by delivering a servo signal. The location that the servo will reach is determined by a series of repeating pulses of variable width, where the width of the pulse (used by most modern hobby servos) or the duty cycle of a pulse train (less frequently used today). The servo motor shaft movement is an example of how the controller integrates the digital command signal into the analogue parameter. We can upload a program pertaining to the servo movements using the controller. By using the controller, we can regulate how many servos are active at once, synchronize their actions, and operate any number of servos in any order, as well as sync the sequential actuation of four servos in a loop program.

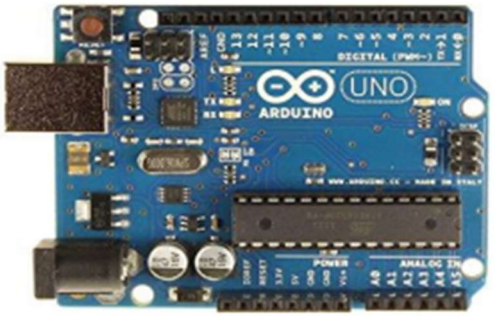

Fig 3: - Controller

5. Connectors: -

Electrical connectors are the tools used to connect electrical terminations and build electrical circuits. These electromechanical devices comprise of jacks and plugs with male and female ends. The connection may be used as a temporary electrical joining between two wires or devices, as with portable equipment, need a tool for assembly and removal, or be a permanent electrical joint. For the connections in our project, we solely used male to male connectors or plugs.

MECHANICAL LINKS:

Through the different linkages, movement is transferred from the servo motor to the tool holding assembly or gripper. The power is passed through the links with the servo motor experiencing the least amount of strain possible. By employing the right material, the linkage design is created to be incredibly lightweight. The main idea behind using links rather than rigid components is to reduce the energy required to move the arm. The aluminum alloy 6061 is used to make the links in the arm.

CONCLUSION:

The design and development of a robotic arm, capable of carrying out straightforward tasks such light material handling, are shown in this article. The robotic arm was created and constructed from aircraft-grade aluminum, and the arm movements were powered by servo motors. The robotic arm's design was restricted to four degrees of freedom. An entire robotic arm has been designed. A prototype was created and found to be operational. With the aid of this technology, man would be better able to avoid the dangers associated with handling questionable materials in his current environment and place of employment. With this approach, complex and difficult tasks might be completed more quickly and precisely.

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