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"Review on Design and Development of Robotic Arm Generation-1"

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Abstract:- This paper presents the design of Robotic arm which simulates the human hand movement to grip an object. The robotic arm is Arduino controlled robotic arm hence it can be implemented to a robot which can analyze hazardous area do a material handling. [1] In order to examine those torque characteristics, we consider a model of humanoid robot arm and simulate typical object lifting and transferring tasks by using the robot arm. [2] The majority of current robotic hands does not completely replace the functionality of a hand and cannot be used in environments which are designed for the use of human hand. This paper concludes with some possible applications of 4 D.O.F robotic arm mechanism based on type of end effector attached to the robotic arm.

Keywords:- *Robotic arm, Arduino, Humanoid robot, DOF, End effector.*

I. INTRODUCTION

Now a Days, Robotic arms had been mostly used for industry automation and operation in the hazardous environment. Many robotic controls are very expensive, due to high-precision actuators and custom machining of components. We recommend that robotic control research can advance more rapidly if robotic arms of valuable performance were highly reduced in price. Increased affordability can lead to wider acceptance, which in turn can lead to faster progress. However, drastic cost reduction will require design tradeoffs and compromises. There are number of dimensions on which robotic arms can be evaluated, such as backlash, payload, speed, repeatability, compliance, human safety, and cost. In robotics research, some of these dimensions are more important than others: for grasping and object manipulation, high repeatability and low backlash are important.

Human-safety is difficult if the manipulator is to be used in close to the people. Arduino UNO A000066 is used as the brain of the robotic arm, force sensors are placed at the gripper for finding the force applied on the object, and potentiometers are used at the joints for detecting the position of the motor shaft. We used the exact model of the developed robotic arm built using Aluminum due to its characteristics such aslight weight, do not wear out easily, cheaper and machining is easier.

II. LITERATURE REVIEW

- A survey on Arduino Controlled Robotic Arm by Ankur Bhargava

In this paper a 5 Degree of Freedom (DOF) robotic arm have been developed. It is controlled by an Arduino Uno microcontroller which accepts input signals from a user by means of a set of potentiometers. The arm is made from four rotary joints andend effector also, where rotary motion is provided by a servomotor. Each link has been first designed using Solid works Sheet Metal Working Toolbox and then fabricated using a 2mm thick Aluminium sheet. The servo-motors and links thus produced assembled with fasteners produced the final shape of the arm. The Arduino has been programmed to provide rotation to each servo motor corresponding to the amount of rotation of the potentiometer shaft. A robot can be defined according to the nature ofthe relative movements between the links that constituteit.

- Review on development of industrial robotic arm by Rahul Gautam

This selective operation robotic control method is need to be overcome the problem such as placing or picking object that at distant from the worker. The robotic arm has been developed successfully as the movement of the robot can be controls precisely. It is expensive to change the cable and therefore the designing to reduce the friction on table, is crucial to increase time between maintenance.

- Survey on Design and Development of competitive low cost Robot Arm With Four Degrees of Freedom by Ashraf Elfasahany

In this paper the representation of the design, development and implementation of robot arm is done, which has the ability to perform simple tasks, such as light material handling. The robotic arm is designed and made from acrylic

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material where servo motors are used to perform links between arms. The servo motors consist of encoder so that no need to use controller. However, the rotation range of the motor is less than 180º span, which greatly decreases the region reached by the arm and the possible positions. The design of the robot arm was for four degrees of freedom. The end effector is not considered while designing because a readily available gripper is used as it is much easier and economical to use a commercial.

III. WORKING PRINCIPLE

The robotic arm works on the principle of electrical input energy to perform some mechanical works effectively with the help of some automation and program based operations. The pick and place robotic arm consist of major hardware components such as strips & motors and arm gripper, switches, battery, piece of metal, and other discrete mechanical and electrical components. This project is designed for developing a pick and place robotic arm with a soft catching gripper. This soft catching gripper is used for safely handling an object carefully while Catching and placing.

The robotic arm consists of servo motor which is used for angular rotations of the arm for catching items (to hold items, to release, to rotate, to place). This servomotor used is works on the principle of Fleming's left-hand rule and is controlled using Arduino circuit board.

IV. COMPONENTS

- *Mechanical Gripper*

A mechanical gripper is used to grip the objects and hold it while transferring it from its location to the destination . the gripper has its inbuilt mini servo in it so it can open or close its jaws to grip the objects. The gripper is made from the acrylic by the LASER cutting operation .the shaft of the servo is fixed to the end of first jaw which meshes with the gear on the second jaw . as the motor rotates the gear rotates and this in turn rotates the gear in mesh and the jaws open or close to release or hold the objects. A gear link is attached to a servomoter which is meshes with another geared link to provide a smooth action of gripping of different objects according to there sizes the movement of both of figures of the grippers is synchrinize well to hold the object.

Fig 1:- mechanical gripper

- *Base With Bearing*

The base is made so strong so that it can support the whole assembly and balance the centre of gravity of whole arm .the base let the arm do movements in the require directions flawlessly and the arm can cover the hemispherical volume. Bearing fixed in the base and complete load of the base is taken by the bearing, the bearing also provides the rotational movement from the base to the robotic arm.

- *Servo Motor*

The three major servo motors are used in the robotic arm, one for the base movements and two on the side of the base plate two transmit the motion through the various links to the arm. The servo motor is bolted to the base plate it keeps it fixed and it avoids vibrations during the actual operations.

A rotary actuator is consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Fig 2:- servo motors

- *Controller*

By sending a servo signals a servo control can be obtained, a series of repeating pulses of variable width where either the width of the pulse (most common modern hobby servos) or the duty cycle of a pulse train (less common today) determines the position to be achieved by the servo. Controller

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integrate the digital command signal into the analouge parameter like movement of the servo motor shaft.with the help of controller we can upload the programme regarding the movements of the servos.by using the controller we can control the number of servos at a time and syncronise the operation of the servo for

-operation of any servo in any sequence and
-to syncronise actuation of four servos sequentially in a loop programme.

Fig 3:- Controller

- *Connectors*

The device that used to join electrical terminations and create an electrical circuit is called as an electrical connectors. These are an electro-mechanical devicesconsist of plugs called male ended and jacks called female ended. The connection may be temporary, as for portable equipment, require a tool for assembly and removal, or serve as a permanent electrical joint between two wires or device.In our project we used only the male to male connectors or the plugs for the connections.

V. MECHANICAL LINKS

The movement from the servo motor to the tool holding assembly or gripper is transmitted through the various linkages. The design of linkages is such that the power is transmitted with minimum load on the servo motor .the linkage design is made very light weight by using the proper material. The basic concept behind using the links instead of rigid parts is to avoid waste of energy required to perform the motion of the arm. The links in the arm are made from the aluminum Alloy 6061.

VI. CONCLUSION

This report presents the design and the development of robotic arm, which has the ability to perform simple tasks, such as light material handling. The robotic arm is designed and built from aircraft grade aluminium material where servo motors were used to perform arm movements. The design of the robotic arm limited to the four degrees of freedom The design of a Robotic arm has been complete. A prototype was built and confirmed functional. This system would make it easier for man to unrivalled the risk of handling suspicious objects which could be hazardous in its present environment and workplace. Complex and complicated duties would be achieved faster and more accurately with this design.

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