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ROBOTIC ARM

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Abstract: *Today, technology is developing within the same direction in line with rapidly increasing human needs. The work done to meet these needs makes life easier a day, and these studies are concentrated in robotic arm studies. Robot arms work with an outside user or by performing predetermined commands. Nowadays, the foremost developed field of robot arms in every field is the industry and medicine sector. Designed and realized in the project, the robot arm has the power to maneuver in 4 axis directions with 5 servo motors. Thanks to the holder, you'll take the specified material from one place and carry it to a different place, and also mix it with the material it receives. While doing this, robot control is provided by connecting to the Arduino Uno microcontroller to send signals from hand to the arm.*

Keywords: *Maneuver, Servo Motors, Arduino Uno Microcontroller.*

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I. Introduction

The robotic arm may be a sort of a mechanical arm, usually programable, with similar functions to a person's arm; the arm could also be the sum of the mechanism or may be the part of a more complex robot. The servo motors are used at joints allowing either rotational motion or translational displacement. It can perform a wide variety of functions and perform the tasks where humans can't go. In space as well as in vacuum metallic parts specially those which are subjected to friction gears and bearings wear out very fast. The robotic arm can handle the chemical particles in the chemical laboratories and used it for security purpose. It can also helpful in the medical applications. Through programming arm can handle the hole automatic industrial process. Due to the high weight of the structure and designed techniques the robotic arm can use for under water applications in the underwater submarine. The four most advantage of the design could be very high-speed manipulation supply manipulation due to extremely high weight design and very low inertia.

Hardware Requirements*:*

- Servo Motor
- Arduino Uno

- Power Supply
- Glove Attached With PCB
- Insulating Materials
- Position Sensor
- Variable Resistors
- Metallic Threads

II. Servo Motors:

A servomotor may be a linear actuator or positioner that permits precise control of linear or position, acceleration, and velocity. It consists of a motor coupled to a sensor for position feedback. It also requires a comparatively sophisticated controller, often a fanatical module designed specifically to be used with a servomotor.

There are some special sorts of applications of an electrical motor where the rotation of the motor is required for just a particular angle. For these applications, we require some special sorts of the motor with some special arrangement that creates the motor rotates a particular angle for a given electrical input (signal). For this purpose, the servo motor comes into the image .

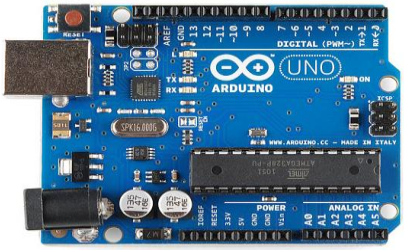
The servo motor is typically an easy DC motor controlled for specific angular rotation with the assistance of additional servomechanism (a typical closed-loop feedback control system). At present days, servo motors are used widely in industrial applications.

The main reason behind employing a servo is that it provides angular precision, i.e. it will only rotate the maximum amount we would like then stop and await subsequent signal to require further action. The servo motor is unlike a typical motor which starts turning as once we apply power thereto , and therefore the rotation continues until we cut the facility . We cannot control the rotational progress of electrical motor, but we'll only control the speed of rotation and should turn it ON and OFF. Small servo motors are included many beginner Arduino starter kits, as they're easy to work as a part of a little electronics projects

III. Arduino Uno:

The development of Arduino UNO board is taken into account as new compared to other Arduino boards. This board comes up with many features that help the user to use this in the project. The Arduino UNO uses the Atmega16U2 microcontroller that helps to extend the transfer rate and contain large memory compared to other boards. No need for extra devices in the Arduino UNO board like joystick, mouse, keyboard and lots of more. The Arduino UNO contain SCL and SDA pins and even have two additional pins fit almost RESET pin.

The board contains 14 digital input pins and output pins in which 6 pins are used as PWM, 6 pins as analog inputs, USB connection, reset button and one power jack. The Arduino UNO board are often attached to computing system buy USB port and also get power supply to board from computing system . The Arduino UNO contains non-volatile storage of size 32 KB that's wont to the info in it. The other feature of the Arduino UNO is compatibility with other shield and can be combined with other Arduino products



a. Programming Environment:

• The Arduino Uno are often programmed with the Arduino software IDE(integrated development environment).

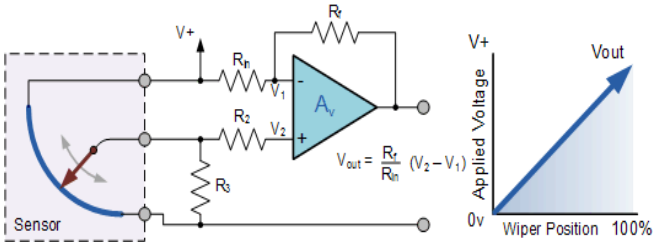
• The Atmega328 on the Arduino Uno comes pre-burned with a Bootloader that permits you to upload new code thereto without the utilization of an external hardware programmer

• You also can bypass the Bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header.

• Arduino IDE works on windows, linux also as Mac lion X platforms.

IV. Position Sensor:

A position sensor is sensor that facilitates measurement of mechanical position. A position sensor may indicate absolute position (location) or relative position (displacement), in terms of linear travel, rotational angle, or three-dimensional space. Common sorts of position sensors include: Motion sensors detect the movement of an object and may be wont to trigger action (such as illuminating a floodlight or activating a security camera). Proximity sensors also can detect that an object has come within range of the sensor. Both sensors, therefore, could be considered as a specialized sort of position sensors. One distinction with position sensors is that they're for the foremost part concerned with not only the detection of an object but also with the recording of its position and therefore involve the utilization of a feedback signal that contains positional information. Position sensors are utilized in many applications, they're used across industries such as; automotive, motorsport, medical, agriculture, robotics, industrial processing, mobile vehicle, test and lab applications, food & beverage, packaging, machine tool, wrapping and many more. The position sensor used in this project is potentiometer.



a. **Potentiometric Positional Sensor**:

Potentiometric Position Sensors are resistance-based sensors that use a resistive track with a wiper that's attached to the thing whose position is being monitored. Movement of the thing causes the wiper to vary its position along the resistance track and thus alter the measured resistance value between the wiper position and therefore the end of the track. In this manner, the measured resistance are often used as an indicator of the object's position. This is accomplished by employing a potential divider where a hard and fast voltage

is applied across the ends of the resistance track, and therefore the measured voltage from the wiper position to one end of the track yields a worth that's proportional to the wiper position. This approach works for both linear displacements and rotary displacements.

The most commonly used of all the "Position Sensors", is the potentiometer because it is an inexpensive and easy to use position sensor.

Potentiometers are available a good range of styles and sizes like the commonly available round rotational type or the longer and flat linear slider types

When used as an edge sensor the moveable object is connected on to the rotational shaft or slider of the potentiometer.

V. Structure and Working Model:

The robotic arm is designed in such a way that the movement of the arm is flexible in suitable directions. The Arduino is mounted on top of a plastic plate of dimensions 11cm*10.5cm. For the movement of the fingers, servo motors play a crucial role. The servo motor consists of propellers that help in the motion of fingers. The propellers on the servo motor are attached with a string to each finger using strips. The five servo motors are placed at the bottom of the plastic plate which acts as a mainframe of the robotic arm. The plastic PVC pipe is cut into small parts which is the outer frame of the finger. The PVC pipe is joined with screws for the movement .

The robotic arm is manually controlled by using a human hand. A glove is designed with potentiometers placed on the palm of the glove. The five potentiometers of 10k resistance is placed on the glove and the tip of the potentiometer is attached with plastic stick so that the movement of the fingers gives a rotational movement in the potentiometer. All the connections are made with the help of breadboard.

Connections:

The potentiometer on the glove has three terminals namely: ground, output and Vcc. The ground and Vcc (power) of the five potentiometers is connected on the either side of the breadboard on Bus Strips. All the ground connections of the five potentiometers is connected to one side of Bus strip and Vcc(power) on the other Bus strip. The output wire is connected to the Analog Input pins on the Arduino.

Similarly, the servo meter is connected with a wire. The wire is tri-coloured which consists of orange (PWM), red (+5V) and brown (Ground). The PWM is connected to the Digital I/O pins of the Arduino uno. The +5V and ground of the five servo motors is connected on the either sides of the Bus strips on the breadboard. At the end, the battery power supply of 9V is given to the breadboard. The negative terminal of the battery is given to the bus strip where the ground is connected and positive terminal on the other bus strip for power source.

Execution:

The Arduino Uno is programmed using the Arduino Software (IDE), our Integrated Development Environment common to the board. The installation of the Arduino Desktop IDE is required to run the program. The Arduino is connected to the laptop using the USB port. The program is dumped into the Arduino for the functioning of the robotic arm. Before dumping code, the code is verified to check for errors in the program.

VI. Applications of Robotic arm:

- The robotic arm is used in multiple industrial applications, for welding, material handling, and thermal spraying, painting and drilling.
- The robotic technology also provides human-like skills in a variety of environments.
- These may include servicing atomic power stations, welding and repairing pipelines on the ocean bottom, remote servicing of utility power lines, or cleaning up radioactive and other hazardous wastes.

VII. Conclusion:

Robotic arms are developed and deployed in many sectors. With the help of robotic arms, many tasks are made easier and the resulting error level has been reduced to a minimum. For example; some pharmacy-

based drug-giving robots and a projected robot arm are developed. In addition to this, the ability to move the robot arm is further increased, and the sensitivity is increased, it can be used in a wide range of applications from the medical sector to the automation systems. With the robotic arms developed during this way, the danger of infecting the patient within the medical sector is minimized, while the human errors are minimized during the surgical intervention. Despite the very fact that the robotic arm made by this project is of prototype quality, it's a top quality which will be improved for more robotic systems. Besides these, robotic arm sector, which is hospitable development, will keep its importance within the future. The purpose of the project is to provide flexible movement of the robotic arm with a suitable microcontroller. The necessary theoretical and practical information for this purpose has been obtained and therefore the necessary infrastructure has been established for the project. During the method of creating and developing the project, tons of theoretical knowledge has been transferred to the practice and it's been ensured that it's suitable for the purpose of the project. Robotic arms are developed and deployed in many sectors. With the help of robotic arms, many tasks are made easier and the resulting error level has been reduced to a minimum. For example; some pharmacy-based drug-giving robots and a projected robot arm are developed. In addition to this, the ability to move the robot arm is further increased, and the sensitivity is increased, it can be used in a wide range of applications from the medical sector to the automation systems. With the robotic arms developed during this way, the danger of infecting the patient within the medical sector is minimized, while the human errors are minimized during the surgical intervention. Despite the very fact that the robotic arm made by this project is of prototype quality, it's a top quality which will be improved for more robotic systems. Besides these, robotic arm sector, which is hospitable development, will keep its importance within the future. The purpose of the project is to provide flexible movement of the robotic arm with a suitable microcontroller. The necessary theoretical and practical information for this purpose has been obtained and therefore the necessary infrastructure has been established for the project. During the method of creating and developing the project, tons of theoretical knowledge has been transferred to the practice and it's been ensured that it's suitable for the purpose of the project.

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