VOICE CONTROL ROBOTIC ARM AS A PHYSICAL ASSISTANT FOR PARALYZED PERSON

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Abstract: **This project present a system whereby the human voice may use to command the robotic arm for specific need. Individual with motor impairments such as those with quadriplegia, hemiplegia, spinal cord injuries, war time injuries or amputations rely on other to assist them in their daily activities. The affected patients would have a voice controlled robotic arm which would assist them in their daily feeding activities. This will partially fill their some of the basic needs like eating foods, Drinking water, controlling electric switches etc. Patient can play indoor games such as chess, carom, snake & ladder. This arm can be fixed on either wheelchair or on a bed as per individual needs.**

Index Terms – Quadriplegia, Hemiplegia, Arduino, Matlab.

1.INTRODUCTION

Robotic Arm is a first invented in 1954 by American inventor **George Devol,** which is used in operation on general motors assembly line at the Inland Fisher Guide Plant. Basically, a robotic arm resembles a human arm, usually programmable with similar functions to a human arm. Robotic Arm are very useful in many industry for pick and place the component. Nowadays, the arm is also used in home appliance for performing the different tasks.

Kinematics has play important role while modeling a robotic arm. Kinematics concern with the robotics motion. Kinematics of robotic arm deals with geometric and time based property of the motion and gives the relation between links, how one link rotate with respect to another link.

This project presents the robotic arm using voice control. The main aim of this robotic arm is to provide a care to disable person. He can fulfill his need by this voice control robotic arm

.Robotic arm has basically five types, they are as follows:

- Cartesian
- Cylindrical
- Spherical
- Articulated
- SCARA

1.1 Cartesian:-These robot are made of three linear joints that position the end effector, which are usually followed by additional revolute joints that orientate the end effector.

Fig.1 Cartesian robot

1.2 Cylindrical:-Cylindrical coordinate robots have two prismatic joints and one revolute joints for positioning parts, plus revolute joint for orientating the part.

Fig.2 Cylindrical robot

1.3 Spherical:- Spherical coordinate robots follow a spherical coordinate system, which has one prismatic and two revolute joints for positioning the part, plus additional revolute joints for orientation.

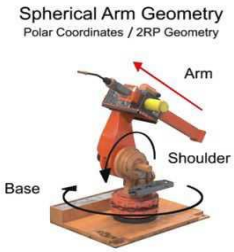


Fig.3 Spherical robot

1.4 Articulated:- An articulated robot's joints are all revolute, similar to a human's arm. They are most common configuration for industrial robots.

Fig.4 Articulated Robot

1.5 SCARA:- SCARA robots have two revolute joints which are parallel and allow the robot to move in horizontal plane, plus an additional prismatic joint that moves vertically. SCARA robot are very common in assembly operations.

Fig.5 SCARA robot

2.PROBLEM DEFINITION

Nowadays most of the person are getting paralyze due to harmful environment, and also at the time of war, so he is not able to move his upper limb/entire body. Hence, a paralyzed person faces difficulty in fulfilling his basic need like eating a food, drinking water, etc. This problem is very much common today for person suffering from upper limb/entire body paralyzed but having his voice control. Thus they has to depend on other to fulfill their basic needs. Thus an artificially voice assistant Robotic Arm can be used to fulfill their some of the basic need like helping in eating food, drinking water, opening and closing doors, switch off on the lights and fans playing games like chess etc.

3.THEORY

In this project, we have used many component for making a robotic arm like Arduino Mega micro-controller, Servo Motor, Vision Sensor, Voice Control module, Ultrasonic distance sensor etc.

3.1 Arduino mega controller (2560)

Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It is used for the controlling the motions of the actuator. It has 54 digital input and output pins. It is a brain of the robotic arm.

Fig.6 Arduino Mega 2560

3.2 Servo Motor

Servo motor is an electrical device which can push or rotate an object with great precision. It works on the servo mechanism. Due to its high torque in small weight make this motor reliable in robotic arm.

Fig. 7 Servo Motor

3.3 Web Cam:

A Web Cam is a video camera that feeds or streams its image in real time to or through a computer to a computer networks. When 'captured' by the computer the video stream will be saved.

Fig. 8 Web cam

3.4 Voice Control Module

Voice control module use voice of user to make it go forward, back, left and right also it can move up and down. By this, height of the arm can be altered.

Fig. 9 Voice control module

3.5 Ultrasonic Distance Sensor

An ultrasonic distance sensor is an instrument that measure the distance to an object using ultrasonic sound waves. It uses transducer to send and receive ultrasonic pulses that relay back information about the object proximity.

Fig. 10 Ultrasonic distance sensor

4.METHODOLOGY

- **Forward kinematic**
- **Inverse kinematic**

Forward kinematic: Forward kinematics refers to the use of the kinematic equations of robot to compute the position of the end effector from specified values for the joint parameters. The kinematics equation of robot are use in robotics, computer games, and animation.

Inverse kinematic: Inverse kinematic is the mathematical process of recovering the movements of an object in the real world from some other data, this is useful in robotics and in film animation. It makes the use of kinematic equation to determine the joint parameters that provide a desire position for each of the robot's end effector.
Equation:

$$\theta_1 = tan^{-1}\left(\frac{Py}{Px}\right)$$

$$\theta_{234} = tan^{-1}\left(\frac{a_z}{C_1 a_x + S_1 a_y}\right)$$

$$C_3 = \frac{(P_x C_1 + P_y S_1 - C_{234} a_4)^2 + (P_z - S_{234} a_4)^2 - {a_2}^2 - {a_3}^2}{2 a_2 a_3}$$

$$S_3 = \pm\sqrt{1 - {C_3}^2}$$

$$\theta_3 = tan^{-1}\left(\frac{S_3}{C_3}\right)$$

$$\theta_2 = tan^{-1}\frac{(C_3 a_3 + a_2)(P_z - S_{234} a_4) - S_3 a_3 (p_x C_1 + p_y S_1 - C_{234} a_4)}{(C_3 a_3 + a_2)(p_x C_1 + p_y S_1 - C_{234} a_4) - S_3 a_3 (P_z - S_{234} a_4)}$$

$$\theta_4 = \theta_{234} - \theta_2 - \theta_3$$

$$\theta_5 = tan^{-1}\frac{C_{234}(C_1a_x + S_1a_y) + C_{234}a_z}{S_1a_x - C_1a_y}$$

$$\theta_6 = tan^{-1}\frac{-S_{234}(C_1n_x + S_1n_y) + C_{234}n_z}{-S_{234}(C_1o_x + S_1o_y) + C_{234}o_z}$$

5.MODEL

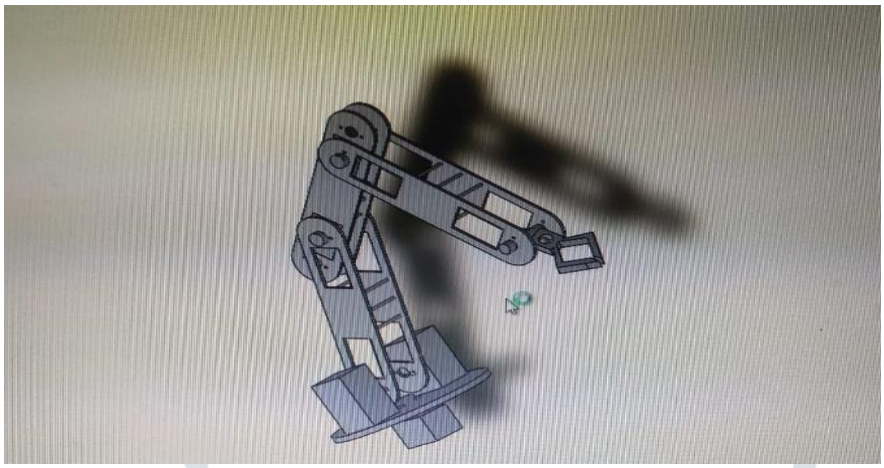
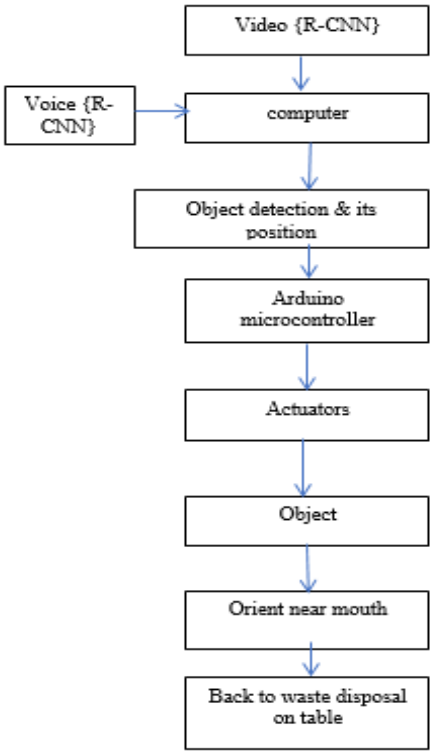
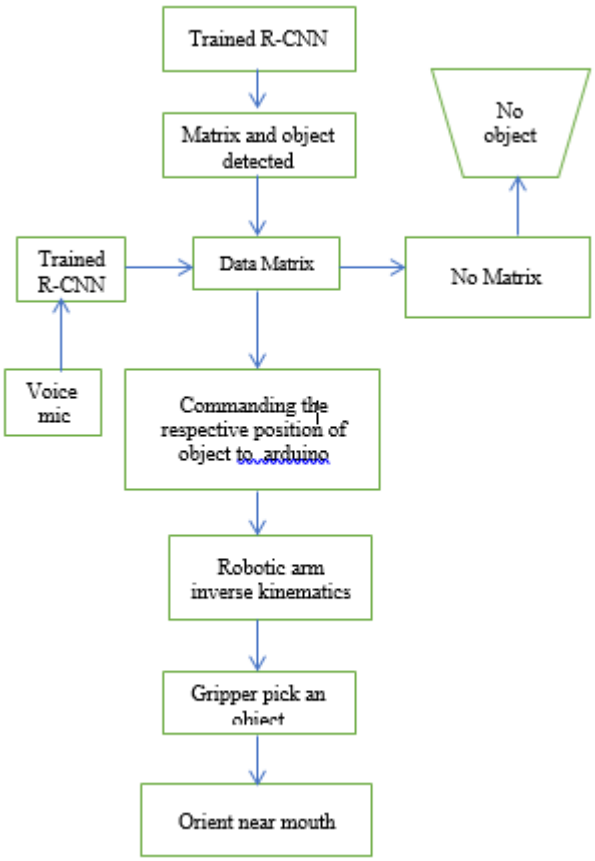


Fig.11 Robotic arm model

6.SYSTEM BLOCK DIAGRAM



7.Object And Its Position Detection flow diagram:



Using camera the object co-ordinate can be determine, the working algorithm and object and it's position detection is shown in flow diagram

8.Software use:
we have used a two software for making model and to give the motion to robotic arm:

8.1.Matlab:
Matlab is high performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. It is use for math and computation, algorithm development, modelling, simulation, data analysis, visualization etc.,

8.2. Solidworks :
Solidworks is very productive 3D CAD software tool, with its integrated analytical tools and design automation to help simulated physical behaviour such as kinematics, dynamics, stress, deflection, vibration, temperature or fluid flow to suit all types of design.

9.CONCLUSION:
We have design the robotic arm for paralyze person to fulfil his basic needs by giving voice command. It is very similar to the human arm, and this robotic arm have a 6 D.O.F. The prepared mechanism has been successfully constrained and executed to carry out the required work of picking up and the weight of object like apple, glass etc.

10.FUTURE SCOPE:
Robotic arm has a wide scope of development. In the near future the arms will be able to perform every task as humans and in much better way. Imagination is the limit for its future application. It can be real boon for handicapped people who are paralyze or lost their hands in some accident.

11.ACKNOWLEDGEMENT:

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13.REFERANCES

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