Design and Implementation of Six Axis Robotic Arm

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Abstract: Multi-degree of freedom robots are playing very important role in different application of automation. They are providing much more accuracy in carrying out a typical procedure as compared to the manual work done by human. In recent years the design, fabrication and development of robotic arms have been active research areas in robotics all around the world. So keeping need of automation and industry in mind, we have praposed design and implementation of Six axis robotic arm which should perform industrial task such as pick and place of fragile objects operation. This robot arm being controlled by micro-controller has base, shoulder, elbow, wrist rotation and a functional gripper.
The microcontroller implement forward kinematics and position control of DC motors. The design aims to provide fine manipulation in performing pick and place task, while still maintaining the simplicity of design.

Keywords: Six Axis, Bluetooth Module, Micro-controller, Stepper Motor.

I. INTRODUCTION

The robotic arm is a programmable mechanical arm that works similar to a human arm. Robotic arms played a significant role in the process of industrial automation. The human-like dexterity of these robotic arms makes them efficacious in diverse applications in a variety of industries - manufacturing, atomic power plants, space exploration, material handling, painting, drilling, agriculture deployments,assistive robotics applications and numerous other applications. The robotic arm typically comprises an end effector that is designed to manipulate and govern with the surroundings. The 6 axis robot arm is designed to manipulate and govern with the surroundings. The 6 Axis is to pivot in 6 different ways that mimic a human arm. The major issues concerned in an industrial robotic arm are its mechanical structure and the control mechanism. The control mechanisms can be effectuated by 3 options: keyboard, joystick and slider-based control. Design of a lightweight robotic arm which can be compatible with any kind of robotic system. In the research, all the proffered control mechanisms adopted inverse kinematics, which makes it easier to control. The proposed control mechanisms are compatible with any other complex robotic systems of the same degrees of freedom. The dexterity of the robotic manipulator depends on the degree of freedom.

II. PROPOSED METHODOLOGY

A robotic arm sometimes referred as to as an industrial robot is often describe as a mechanical arm it is device that operation in a similar way to a human arm with number joint that either move along an axis as can rotate in certain direction.Robotics is the branch of technology that deal with design construction operation structural disposition manufactures & application of robot.A robotic arm is a robotic manipulator usually programmable with similar function to a human arm. Robotics is related to the sciences of electronics engineering mechanics and software. A project model should be beneficial to the society & reduce this problem. The basic methodology of praposed methodology is explain below-

A. Axis 1

This axis allows the rotation of wrist in angle of 240. It powering the movment of the lower arm

B. Axis 2

This axis allows the lower arm of the robot to extend forward and backward. It is the axis powering the movement of the entire lower arm.

C. Axis 3

The axis extends the robot's vertical reach. It allows the upper arm to raise and lower. On some articulated models, it allows the upper arm to reach behind the body, further expanding the work envelope. This axis gives the upper arm the better part access.

D. Axis4

Working in conjunction with the axis 5, this axis aids in the positioning of the end effector and manipulation of the part. Known as the wrist roll, it rotates the upper arm in a circular motion moving parts between horizontal to vertical orientations.

E. Axis 5

This axis allows the wrist of the robot arm to tilt up and down. This axis is responsible for the pitch and yaw motion. The pitch, or bend, motion is up and down, much like opening and closing a box lid. Yaw moves left and right, like a door on hinges.

F. Axis 6

This is the wrist of the robot arm. It is responsible for a twisting motion, allowing it to rotate freely in a circular motion, both to position end effectors and to manipulate parts. It is usually capable of more than a 360 degree rotation in either a clockwise or counterclockwise direction.

Fig. 1 Basic Mechanism of a Robotic Arm
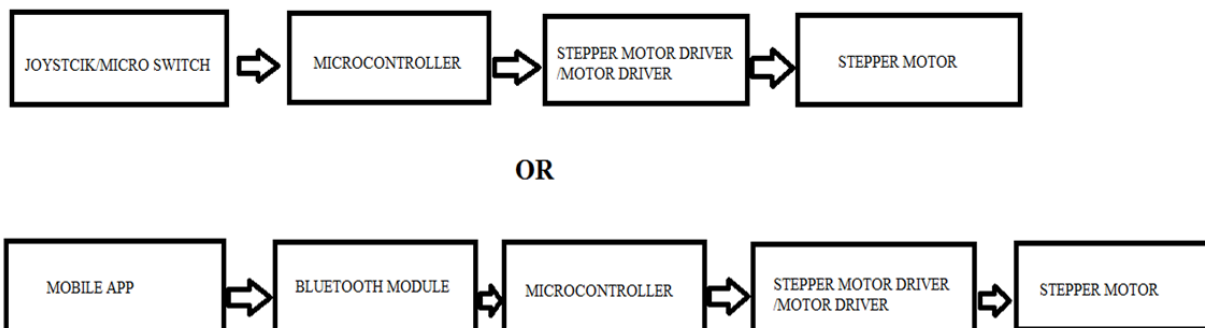
III. BLOCK DIAGRAM AND WORKING

Fig. 2 Block Diagram of ARM

Here in these sytem Mobile app installed in your handset are intiallising the command with the help of bluetooth model. Bluetooth model of system recived command and that command is forwarded to the system hart i.e. Micro-controller and microcontroller intiallised the command and operations are finished.

IV. COMPONENT USED

A. IC 7805

The LM7805 is of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, Hefei, and other solid state electronic equipment. Although designed primarilyas fixed voltage regulators these devices can be used with external components to obtain adjustable voltages and currents. The LM78XX series is available in an aluminum TO-3 package which will allow over 1.0A load current if adequate heat sinking is provided. Current limiting is included to limit the peak output current to a safe value. Safe area protection for the output transistor is provided to limit internal power dissipation.

B. A4988 Stepper motor Driver

The A4988 is a complete Microstepping Motor Driver with built-in translator for easy operation. The driver has a maximum output capacity of 35 V and ± 2 A. It can operate bipolar stepper motors in full-, half-, quarter-, eighth-, and sixteenth-step modes.

C. Arduino UNO

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging 2.1mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

D. Bluetooth Module

It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications.It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions. It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air.It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART).HC-05 is a Bluetooth module which is designed for wireless comunication. This module can be used in a master or slave configuration.Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.

V. ADVANTAGES

- Low cost/simple
- Easy to operate – reliable
- End-to-end connectivity and affordability
- Notification and alert
- Easy to Install
- Remote location monitoring

VI. CONCLUSION

This paper presents the design, development and implementation of a robotic arm, which can accomplish simple yet repetitive tasks, such as sorting. The project can work successfully and segregates different objects using sensors. The sensor handling system drives the pick and place robot to pick up the product and place it into designated place with good accuracy and low time consumption

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