Survey on Robotic Arm Controlling Technique

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Abstract – Robotic arm is a mechanical arm to perform the desired task. In today's world there is an increasing need to create artificial arms for different inhuman situations where human interaction is difficult or impossible. Humans pick things up without thinking about the steps involved. So the robotic arm is controlled manually by using wired and wireless. In this paper, various methods were studied to control robotic arm and also discussing about various drawbacks.

Index Terms – Robotic Arm, DOF, Human Arm.

1. INTRODUCTION

The robot industry penetrate a phase of rapid growth. Many institutions introduce programs and courses in robotics. Robotics courses are spread across mechanical engineering, electrical engineering, and computer science departments. A robot manipulator consists of links connected by joints. The links of the manipulator can be considered to form a kinematic chain. The business end of the kinematic chain of the schemer is called the end effector and it is analogous to the human hand.

The end effector can be a gripper or can be designed to perform any desired task such as welding, painting, assembly, etc. An end-effector is a tool or gripping mechanism attached to the end of a robot arm used to make intentional contact with an object or to produce the robot's final effect on its surroundings to accomplish some task. Tools are used in applications where the robot must perform some processing operation on the work-part. In each case the robot must not only control the corresponding position of the tool with respect to the work as a function of time, it must also control the operation of the tool.

The actions of the individual joints must be controlled in order for the schemer to perform a desired motion. The robot's capacity to move its body, arm, and wrist is provided by the drive system used to power the robot. The joints are moved by actuators mechanized by a particular form of drive system. Common drive systems used in robotics are electric drive, hydraulic drive, and pneumatic drive. In this survey, the main focus is controlling methods of the robotic arm. Recently many methods have been proposed for the robotic arm. Some of them methods has many problem. To reduce the noise, driven cable has been proposed in the related works. In cable driven robotic arm create many problems in industries.

2. LITERATURE SURVEY

In [1] described to developed a human-machine communication interface between the Leap Motion controller and the 6-DOF Jaco robotic arm. An algorithm was developed to allow an optimum mapping between the user hand movement, tracked by the Leap Motion controller. The system should allow for a more natural human-computer interaction and a smooth manipulation of the robotic arm. The applications of this human-robot interaction discussed in relation with Ambient Assisted Living, where some use case scenarios was introduced.

To build a robotic arm controlled by natural human arm movements whose data is acquired through the use of accelerometers [2] has been proposed. The development of this arm was based on ATmega32 and ATmega640 platform along with a personal computer for signal processing. Finally, this prototype of the arm may be expected to overcome the problem such as placing or picking hazardous objects or non-hazardous objects that were far away from the user.

In [3] to designing and developing of a microcontroller (ATmega) based robotic arm has been described. The robotic arm responds to the gesture as well as can be programmed to go along a definite path and task. The system feels the movement of user's arm and robotic arm replicates the given input gesture. The gesture is sensed by a number of potentiometers which are embedded onto a glove. The movement in potentiometer regulate the position for the servo motors driving the parts of the arm.

In [4] presented new developed natural interface for robotic arm remote controlling. The interface was built with use of inertial motion trackers. There are used two types of motion trackers. The first tracker is Xsens Xbus Kit tracker and the second is Razer Hydra Controller. Hydra controller is used to determine robotic arm localization in 3D space. One of the most difficult problem which was resolved in sufficient manner and represented in this article is processing acceleration data to estimate linear position of the robotic arm adequate to operator's motion. The results of algorithms' parameter values selections and results of practical evaluation of the interface.

In [5] proposed an accelerometer-based system to control an industrial robot. These accelerometers are attached to the human arms, capturing its behavior (gestures and postures). An Artificial Neural Network (ANN) schooled with a back-propagation algorithm was used to recognize arm gestures and postures. The robot starts the movement almost at the same time as the user starts to perform a gesture or posture (low response time). The results show that the system grants the control of an industrial robot in an intuitive way. The achieved recognition rate of gestures and postures (92%).

In [6],Gourab Sen Gupta,S. C. Mukhopadhyay and Matthew Finnie(2009)proposed the design of controlling an anthropomorphic robotic arm through a LAN or via the Internet. The user can control the robotic arm remotely and access its sensory feedback signals. The camera mounted on the robot arm takes images and transmits to the control station. The robot arm is controlled using a master-slave control methodology.

In [7],Sulabh Kumra,Rajat Saxena and Shilpa Mehta described the layout and development of a low cost and user friendly interface for the control of a 6-DOF anthropomorphic robotic arm. Articulation of the robotic arm is achieved about six single-axis revolute joints. Tele-operator, master, uses the Man Machine Interface (MMI) to operate in real-time the robotic arm. The MMI has simple motion capture devices that translate motion into analog voltages which bring about the corresponding actuating signals in the robotic arm.

In [8],Hye-Jong Kim,Yuto Tanaka,Akihiro Kawamura,Sadao Kawamura and Yasutaka Nishioka(2015) presented an inflatable robotic arm controlled by a joystick to be used for healthcare applications. The arm is constructed almost entirely of plastic elements: inflatable links, air bag actuators, and acrylonitrile butadiene styrene (ABS) joints. It is softer and lighter than typical robotic arms that are made of metal and heavy elements. A new control method is proposed to be controlled with a joystick. Here an inflatable robotic arm with four degrees of freedom (4 DOF) to obtain experimental results for the control performance of the inflatable robotic arm.

In [9], S.P. Praturu and J.N. Anderson proposed the position signal interface (PSI), which contribute the primary position feedback path in the RACS. It keeps track of all the joint positions and allows real-time access to the position and error data. The PSI is constructed on a single DIP plugboard and fits into the Unimation controller rack. Feedback signals from the six optical encoders are used by the PSI to determine absolute joint positions and for error detection. The PSI also provides joint position data to the VAL communication interface of the RACS for operation in a 'VAL-dependent' mode.

In [10] proposed a new concept of force feedback. The system can overcome the bottlenecks of other feedback system in a user friendly way. Force sensor and laser distance sensor communicates the information from the gripper's position to the teleoperator by using force feedback module on a glove. Pneumatic pressure gives the operator distance information, while a Magnetorheological Fluid (MR-Fluid) based actuator presents the gripper's force. It shows the possibility of usage of such force feedback glove in combination with a robotic arm.

In [11], G. Sen Gupta, R. Paddison, C.H. Messom and S.Demidenko(2006) described the effectiveness of the proposed method is available robotic arm which is controlled by a prototype 6-DOF master unit. The robotic arm mimics the dexterity of the human hand and wrist. The prospective master control unit is cost-effective and will have wide ranging applications in the fields of medicine, manufacturing, security, extreme- environment, entertainment and ROV (Remotely Operated Vehicle) teleoperation in undersea improvement or extraterrestrial exploration vehicle.

In [12],presented Raspberry Pi collects data in a database and analysis of stored data. This system was worked based on an algorithm developed to lift the object. Then, through a web-based user interface, internet users can control the robot arm in order to achieve at anywhere and anytime. The development of this robot is based on AT-mega platform.

3. CONCLUSION

From the above discussion to conclude the robotic arm controller is a very important factor in the industry. We presented the robotic arm controller by using microcontroller, Accelerometer, remote vision, Man Machine Interface. Even though they have several drawbacks during the control process. So in my future the new methods are proposed to control the robotic arm using web application and mobile application using ePC platform.

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