Chapter 48
Four Degrees of Freedom Robot Arm, Low-Cost Competition in the Design and Development

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ABSTRACT

The focus of this work is to design, develop and implement enhanced control and competitive robot arm thick and short cost. Design of four degree of freedom and talent of robot arm is to complete the accurate and simple tasks, such as optical materials processing, will be integrated into the mobile platform, as an assistant for the industrial labor force. Between the robot arm equipped with weapons and arm movements associated with the plurality of servo motor. Servo motor, encoder, so as to realize no controller includes. To control the robot, using Lab view, to the computation of the inverse kinematics of serial communication and proper angle, a micro controller, servo motor and drive ability of modify the location, velocity and acceleration. The robot arm was tested and verified, results show that, its normal work.

1. INTRODUCTION

The term is actually a robot manufacturing (Manipulating industrial robots – Vocabulary, ISO standard 8373, 1994) is defined as the robot system research, design and use. Robots are usually used to perform unsafe, dangerous, repetitive, unpleasant tasks. They have many different functions such as material processing, assembly, arc welding, resistance welding, machine loading and unloading functions, painting, spraying, etc.

There are mainly two different types of robot service robot and an industrial robot. Service robot is a semi- or fully autonomous robots perform services useful to the well-being of the human operator and equipment, excluding manufacturing operations (Industrial and service robots, IFR International Federation of Robotics, 2010). The industrial robot, on the other hand, is defined formally by the ISO programmable in three or more axes (Manipulating industrial robots – Vocabulary, ISO standard 8373, 1994) as an automatic control and multi- robot. Industrial robot design, mobile material, parts, tools or

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special devices through variable programmed motions to perform various tasks. The industrial robot system includes not only industrial robots, and robots capable of performing its required tasks, and communication interfaces sequencing or monitoring any equipment and / or sensors.

In 2007 the global market growth of 3%, while approximately 114,000 new installed industrial robots. In late 2007, there are about one million industrial robots used compared with an estimated 50,000 service robots industrial use (http://www.ifrstat.org/downloads/2008_Pressinfo_english.pdf).

Due to the increased its use of industrial robot arm, began trying to mimic human movements in verbose mode evolved to the topic. For example, a group of students in South Korea made a design innovation consider dancing robot hand, weightlifting, Chinese calligraphy and color classification (Wang et al., 2009). Another group of U.S. engineers to develop eight degrees of freedom robot arm. This robot is able to grasp the many objects, from the shape of a pen a lot of balls, but also simulate the human (Duc et al., 2007) hand. In space, such as the Space Shuttle remote control system, known as the SSRMS or Canada are, and its successor degrees of freedom robot arm has been used to perform various tasks, such as checking the space shuttle using a specially deployed boom camera and the sensor is connected at the end effects and satellite deployment and retrieval maneuvers from the cargo space shuttle (Carignan, Gefke, & Roberts, 2002).

In Mexico, scientists are in the orbit design and develop many robotic arm, and the Mexican government estimates that there are about 11,000 in Mexico robotic arm used in various industrial applications. However, experts believe that the heyday of the robot arm is not only higher quality, and accurate, reproducible, stubby costs.

Most robots are set to operating techniques to teach and repeat. In this mode, a trained operator (programmer) typically use a portable control device (teaching) the task of teaching the robot manually. These programming session robot's speed is slow.

The current work is a two-stage project, which requires a mobile robot is able to transport tools, industrial district from the storage room part. Monterrey, Mexico, University of Science and Technology projects carried out at this stage, the main focus is the design, development and implementation of an industrial robot arm stubby cost, accurate and superior control. The robot arm is designed with four degrees of freedom and talent to accomplish simple tasks, such as light material handling, will be integrated into the mobile platform, as an assistant for the industrial labor force.

2. MECHANICAL DESIGN

According to the mechanical design of the robot, arm robot manipulator [6-8] is with similar functions in the human arm. The manipulator such links, the links of the manipulator allows the rotational motion of the joint connection is considered to form a kinematic chain. Known as the chain motion of manipulator business manipulator end effector or at the end of the, it is similar to the human hand. Figure 1 shows a free body diagram of mechanical design of the mechanical arm. As shown, the end effector is not included in the design, because the use of commercially available fixture. This is because of the end effector, the most complex system in turn, it is very easy to use and the economy is not to build a business.

Figure 2 shows the work region of the robotic arm. This is the typical workspace of a robot arm with four degree of freedom (4 DOF). The mechanical design was limited to 4 DOF mainly because that such a design allows most of the necessary movements and keeps the costs and the complexity of the robot

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