Dual Arm Robot Manipulator and Its Easy Teaching System

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Abstract. The dual arm robot manipulator has been developed and its easy teaching system has been developed also. The manipulator consists of two industrial 6-DOF arms and one 2-DOF torso and it was designed for the assembly automation of the automotive parts. Two-arm robot system has more advantageous than the traditional single arm robot system. But it is more difficult to teach the dual arm robot system. In this paper, the research results on the dual arm robot manipulator and its easy teaching system will be introduced.

1 Introduction

Traditional single arm robot has just one arm to handle the object so it can’t perform its role in the workplace where the human worker does his jobs with his two arms. The robot manipulator needs to have two arms to have the function of cooperation to assembly mechanical parts. Recently, this is motivating some robot company to develop the robot system with two arms on one torso. With the same reason, industrial dual arm robot manipulator for precision assembly of mechanical parts has been developed by the authors and its research results have been already introduced [1]. The developed manipulator has two industrial 6-DOF arms and one 2-DOF torso. Left-arm and right-arm can be used to manipulate the workpiece in the cooperation task and each single arm can be used as a stand-alone 6-DOF manipulator at the same time.

The robot manipulator is very accurate and has enough power to lift up big and heavy workpiece. But it is difficult to make the manipulator understand the
operator’s intention because it does not have enough intelligence. Usually, teaching pedants are used to teach the manipulator. But it is not easy to use them for the naive operators. So, the intuitive teaching methods have been introduced by many researchers and the direct teaching is one of the good candidates [2-6].

Two-arm robot system has more advantageous than the traditional single arm robot system as mentioned above. But it is more difficult to teach the dual arm robot system because the left arm and the right arm and the torso have to be taught separately. Furthermore it is very difficult the relative motion between the left arm and the right arm using the traditional teaching pendants. With the traditional teaching pendant system, the operator has to define the motion of the left arm. And then he has to teach the motion of the right arm. If the torso is worked while the two arms are working, the teaching process gets more complicated. So the easy teaching system for the developed dual arm robot manipulator has to be developed. For this reason, the industrial dual robot manipulator that it is possible to easily teach using easy teaching system has been developed. In this paper, the research results and experimental results will be introduced.

2 Robot Design and Analysis

The developed dual arm manipulator has been developed for the automation of the mechanical parts. Transmission assembly and constant velocity joint assembly (Fig 1) are the first application target of the developed dual arm robot manipulator. The assembly is composed of the parts of Table 1. The major parts of the assembly are shown in Fig. 2.

Fig. 1 Transmission assembly line(left) and constant velocity joint assembly line (right)