TRAJECTORY PLANNING FOR 6-DOF ROBOT MANIPULATOR BASED ON OFFLINE ROBOT PROGRAMMING APPROACH

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Degree of Master of Science

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ABTRACT

Industrial robot manipulators are highly involved in modern manufacturing industries. Robot programming is the procedure to carry out generating a sequence of robot instruction. Teaching method is highly applied where a teach pendent is used to generate the robot programme by teaching one point at a time. This process tends to consume more time and the accuracy can be varied depends on the application. Several other methods are used to program robot movement nevertheless industrial applications of these systems are still developing. Programming tends to be difficult and restricts the productivity and industrial application. Hence, requirement of flexible programming methods is still challenging for inexpert robot operators. Trajectory planning for a robot system is still a developing area where the accuracy, productivity and high quality on various operations are highly concerned. To address these limitations, off-line programming systems can be used where computer systems with realistic graphics, interfaces and features can be used to plan and program robot motions without using robot hardware. The research is aimed to present methods for finding a better mathematical way of optimized trajectory planning of 6-DOF industrial robot manipulator. Computer Aided Design software systems are used to implement off-line programming technique by developing human robot interface in order to create robot moving sequence and achieve required data for further calculations. Welding process of machine head cover using a 6 DOF robot manipulator is used to demonstrate and evaluate the proposed method. Methods for Point allocation along the robot moving path and data extraction are presented. Inverse kinematic model for the 6 DOF manipulator is developed and implemented in order to get joint space data represented by joint angles. Derived data is studied to analyze the manipulator motion behavior while moving along predefined path via points allocated. Robot path planning and trajectory planning with CAD system involvement as off-line programming technique is analyzed by comparing results in order to evaluate the performance of the proposed method.

Keywords: Offline robot programming, Computer Aided Design, 6 DOF robot manipulator, inverse kinematics, Human robot interface

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