DESIGN OF 3 DEGREES OF FREEDOM (3-DOF) ROBOT ARM CONTROL SYSTEM USING INVERSE KINEMATICS METHOD

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ABSTRACT

The needs of various industries for the automation process of robotic arms are the main background for the continued development of intelligent robotic arm systems. The inverse kinematics method is one of the kinematics modeling methods for robotic arms to obtain angular configuration values based on position input. This study will focus on the analysis and implementation of the inverse kinematics method for robotic arms with 3 degrees of freedom (DoF). The research was carried out with several systematic steps, namely determining the topic and formulation of the problem, determining the research objectives, literature studies, creating a system design, conducting an inverse kinematics analysis based on the system design that has been made, testing the system by implementing the inverse kinematics model, and compiling a project report. System testing is carried out in several stages starting from testing the servo motor, testing the stepper motor, and testing the gripper. Then as the main test is to test the accuracy of the angle and position based on the results of the calculation and analysis. The results of the angular configuration test obtained the percentage error $\theta_1 = 1{,}69\%, \theta_2 = 6{,}12\%, \theta_3 = 7{,}81\%$ *and* $\theta_4 = 14{,}56\%$*. Meanwhile, the percentage error for the accuracy of the end effector position is x = 1.52%, y = 1.78% and z = 19.6% or if expressed in millimeters of x = 1.65 mm, y = 3.87 mm, and z = 7.83 mm.*

Keywords*: 3 DoF Arm Robot, Robot Control System, Inverse Kinematics*