Kinematic and Workspace Analysis of Spherical 3RRR Coaxial Parallel Robot Based on Screw Theory

Abstract

A kinematic and workspace analysis of Spherical 3-RRR Coaxial Parallel Robot are developed in this paper. Position and orientation was determined through the inverse and forward kinematics using geometric and numerical method, respectively. Velocity state and screw-coordinate Jacobian matrix was developed based on Screw theory. Likewise, the workspace and reciprocal index as a measure of the robot's sensibility, were calculated for a developed trajectory by track with the end-effector. The simulations were performed using MATLAB environment, and the results provides that, for the path planning created, the inverse and forward kinematics are good in agreement. Where the robot remains in the workspace with high accuracy, with errors not exceeding 15×10−4 rad. Furthermore, the sensibility analysis computed with the reciprocal index shown that this type of parallel robots are efficient inside their workspace, even at points close to the singularity.