

3自由度空间并联机器人机构设计与分析 Design and Analysis of a 3-DOF Spatial Parallel Robotic Mechanism

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摘要: 提出了一种新型3自由度空间并联机器人机构, 机构动平台具有两个移动和一个转动自由度。基于螺旋理论对机构的运动输出特性和自由度进行了分析与计算, 推导出机构的位置和速度解的解析表达式, 讨论了机构的奇异性 and 灵巧性。由于映射输出-输入速度矢量关系的Jacobian矩阵为单位阵, 所以此机构为无奇异完全各向同性并联机构, 故该机构具有良好的运动、力传递性能和潜在的应用前景。 A novel spatial parallel robotic mechanism with three degrees of freedom (DOF) was proposed, whose moving platform of the mechanism had two-translational and one-rotational DOF. Based on the screw theory, kinematics output property and mobility of the manipulator were analyzed, respectively, and analytical solutions of position and velocity for both direct and inverse kinematics were derived. Furthermore, the singularity and the dexterity were discussed. Since the Jacobian matrix, mapping the input velocity vector space into the output, is an identical matrix, the present mechanism is a free-singularity fully-isotropic one, which has good performances in motion and force transmission and potential applicable future.

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