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论文

柔性冗余度机器人改善频率特性的研究

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Study on Improvement for Frequency Property of Flexible Redundant Manipulator

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摘要 对改善柔性冗余度机器人的频率特性进行了研究。首先分析了影响柔性机器人固有频率的因素,得出了在结构参数不变的情况下可以通过适当调整关节运动参数来提高机器人固有频率的结论。然后分析了机器人的自运动与关节运动参数之间的关系。在此基础上,提出了在保证末端名义运动不变的情况下通过规划柔性冗余度机器人的自运动调整关节运动参数来提高系统的固有频率,以避开动力奇异并改善机器人动态性能的方法,此外给出了相应的优化算法。最后通过数值仿真验证了该方法的有效性。

关键词： 柔性机器人 固有频率 关节运动参数 动力奇异

Abstract： A method for improving the frequency property of flexible redundant manipulator is studied. Firstly, the factors which influence the natural frequencies of a flexible manipulator are analyzed and a conclusion is drawn. The conclusion is that the natural frequencies of a flexible manipulator can be increased through adjusting some joint kinematic parameters （e.g., joint-angle and joint-velocity） properly while its structural parameters remain unchanged. Then, the relationship between a flexible redundant manipulator's self-motions and its joint kinematic parameters is studied. On this basis, a method to adjust a flexible redundant manipulator's joint kinematic parameters by planning its self-motions properly is proposed. The natural frequencies of a flexible redundant manipulator can be increased by this method while its end-effector's nominal motion remains unchanged. And this method can be used for avoiding dynamic singularity and enhancing dynamic performance of a flexible redundant manipulator. Furthermore, the corresponding algorithm is suggested. Finally, by carrying out some simulations, the method is verified to be feasible.

Keywords： flexible redundant manipulator natural frequency joint kinematic parameter dynamic singularity

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