基于动力学的Stewart平台振动控制策略研究 Stewart Platform Vibration Control Strategy Based on Dynamics

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关键词： 道路模拟振动台 Stewart平台 振动 耦合控制 多体动力学

摘 要： 针对利用基于运动学控制方法的大负载、高质心Stewart平台实现某一姿态下的单自由度正弦振动时将引起其他自由度上的耦合振动问题，提出了一种在位置闭环控制条件下基于动力学的振动控制策略。该控制策略利用动力学模型所计算的各液压缸出力控制平台振动，提高了控制精度。最后利用Stewart平台在15°俯仰姿态下对该方法进行了实验验证，通过比较运动学和动力学两种控制方法的振动响应，表明提出的控制方法能够有效抑制由负载引起的耦合振动，实现了Stewart平台在任意姿态下的精确振动控制。 With heavy load and high center of gravity, the Stewart platform based on kinematics control strategy vibrated in one degree of freedom will cause the vibration in other degrees of freedom. To solve this problem, a vibration control strategy used in the position closed loop was presented based on the Stewart platform dynamics. According to this control strategy, the actuator force, calculated by the dynamics model, was used to control the platform vibration, and the control precision was improved. At last this vibration control strategy was validated with the Stewart platform in 15° pitch posture. Comparing the vibration response of the Stewart platform controlled by kinematics and dynamics respectively, the results showed that the proposed control strategy could reduce the coupling vibration caused by the platform load effectively, and could achieve the precise vibration control in any platform pose.

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