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微纳技术与精密机械

用于薄镜面主动光学的音圈力促动器设计

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摘要: 根据薄镜面主动光学存在的实际问题, 提出了通过音圈电机对主镜面变形进行非接触面型校正的方法。讨论了音圈电机工作原理, 基于音圈电机设计了一种非接触、高线性、体积小且控制方便的力促动器, 并对其进行了仿真分析和实验验证。对常见类型力促动器结构进行对比, 根据应用特点和音圈电机原理设计了该力促动器的总体结构, 建立了物理模型与数学模型, 根据应用要求提出了参数指标。最后, 进行了实验验证。实验结果表明, 该音圈力促动器是一个非接触式高线性系统, 输出力可达 ± 0.5 N, 在此范围内, 线性度小于0.09%。

关键词: 光学望远镜 主动光学 薄镜面 力促动器 音圈电机 磁场分析

Design of voice coil force actuator in thin mirror active optical system

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Abstract: A contactless surface correction method for the surface deformation of a primary mirror was designed based a voice coil motor to improve the performance of a thin mirror active optical system. The working principle of the voicecoil motor was discussed, the contactless voice coil force actuator with high linearity and a small size was designed, then the performance of the force actuator was simulated and verified. After comparing the structures of traditional actuators, the overall structure of the voice coil force actuator was designed according to the requirements of application in the thin primary mirror experiment system, the physical model and mathematical model were also established and the parameters of voice coil force actuator were proposed. The experimental results show that the voice coil force actuator is a contactless linear system, and its output force is up to ± 0.5 N. Whin this range, the linearity is less than 0.09%.

Keywords: Optical telescope Active optics Thin mirror Force actuator Voice coil motor Magnetic field analysis

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