

论文

空间光学遥感器主镜加工过程中疲劳寿命研究

于善猛, 刘巨, 江帆, 杨近松, 关奉伟, 崔抗

中国科学院长春光学精密机械与物理研究所, 长春 130033

摘要:

针对空间光学遥感器主镜镜面加工过程中,磨盘与主镜间磨削动作往复运行引起的主镜柔性支撑结构疲劳寿命问题,通过建立主镜组件的有限元模型,利用MSC.Fatigue软件按应力-寿命(S-M)法对主镜组件进行了疲劳寿命分析,确定了支撑结构的薄弱部位,并对仿真过程进行了误差分析,讨论了影响仿真结果的各个因素.对比热真空试验和动力学试验前后主镜镜面面型数据,验证了支撑结构加工、设计参量的合理性.通过疲劳寿命仿真分析,可以有效预示光学结构在加工过程中的疲劳情况,为空间光学遥感器结构的设计、加工提供理论依据和参考.

关键词: 空间光学遥感器 主镜 疲劳仿真

Fatigue Study for Processing of Space Optical Remote-sensor Primary Mirror

YU Shan-meng, LIU Ju, JIANG Fan, YANG Jin-song, GUAN Feng-wei, CUI Kang

Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, Changchun 130033, China

Abstract:

During the primary mirror of space optical remote-sensor processing, grinding disc and the primary mirror moving back and forth which operation caused the flexible support structure fatigue life issue. Through the establishment of the primary mirror assembly finite element model, fatigue life of components was analyzed by MSC.Fatigue software with stress-life (S-M) method, the weak position of support structure was identified. Simulation error analysis was carried out, and factors affecting the simulation results were discussed. It is verified that the processing and design parameters of flexible support structure are rational through comparing the surface accuracy data of the primary mirror surface which collected before and after the thermal vacuum experiment and dynamic components test. The fatigue life simulation can predict the fatigue condition in the process of optical structure processing, and provide a theoretical basis for design and manufacturing.

Keywords: Space optical remote-sensor Primary mirror Fatigue simulation

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通讯作者:

作者简介:

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