光学精密工程 » 2015, Vol. 23 » Issue (3): 639-644 DOI: 10.3788/OPE.20152303.0639

使用高精度三坐标测量仪实现透镜定中心

杜洋[1], 高志山[2]

1. 上海卫星工程研究所, 上海 200240;
2. 南京理工大学 电子工程与光电技术学院, 江苏 南京 210094

Lens centering using high-precision three coordinate measuring machine

DU Yang[1], GAO Zhi-shan[2]

1. Shanghai Institute of Satellite Engineering, Shanghai 200240, China;
2. School of Electronic and Photoelectric Engineering, Nanjing University of Science and Technology, Nanjing 210094, China

摘要 图/表 参考文献 相关文章 (8)

全文: PDF (1401 KB) RICH HTML NEW

输出: BibTeX | EndNote (RIS)

摘要 传统的光学测量定中心法受限于光源、转台大小和装调误差传递性而不适用于大口径、多透镜光学系统的装调,为此本文提出了使用三坐标测量仪接触式测定透镜中心的精密机械测量法。介绍了使用三坐标测量仪测量大口径透镜中心偏的原理,即在测量透镜上表面与基准轴等距离各点坐标的基础上拟合得到透镜光轴与基准轴的夹角,从而解算出透镜的中心偏。通过大口径长焦距镜头的装调对该方法进行了检验。检验结果表明:该透镜的装调偏差为6.47",重复性误差为(1.16×10^{-4})"。该方法将光学测量变为机械测量,利于装调,可在保证装调精度的同时简化装调难度,提升装调效率,满足大口径多透镜光学系统对高精度装调的要求。

关键词 : 光学装校, 中心偏测量, 透镜定中心, 光轴一致性, 三坐标测量仪

Abstract : Due to the limits of light sources,the sizes of rotating platforms and the propagation of assembling errors, traditional methods of lens centering are not suitable for the assembly of large-aperture and multi-lens optical systems. Thus a new high-precision mechanical measurement method for lens centering was proposed based on a three Coordinate Measuring Machine (CMM). Principles and algorithms for measuring off-centering of the large aperture lens using the high-accuracy CMM were introduced. In the measurements, the angle between the optic axis of lens and the reference axis was calculated after the figure fitting of the measuring points, and then the centering of deviation was calculated. The method was verified by the assembling of a long focal length and large aperture imaging system. The assembling result shows that the lens off-centering is 6.47" and the repeatability error is (1.16×10^{-4})". As changing the optical measurement into a mechanical measurement, this proposed method ensures the accuracy, reduces the difficulty and improves the efficiency of lens assembly. It is able to be applied to the high-precision assembly of large aperture transmitting optical systems.

Key words : optical assembly off-centering measurement lens centering coaxiality three Coordinate Measuring Machine(CMM)

收稿日期: 2014-07-08

中图分类号: TH706

TH72

基金资助:国家973重点基础研究发展计划资助项目(No.2014CB744200);国家自然科学基金资助项目(No.60977008,No.61377015);中国科学院重点实验室开放基金资助项目(No.2008DP173445)

作者简介: 杜洋(1988-),男,江苏徐州人,硕士,2010年,2013年于南京理工大学分别获得学士、硕士学位,主要从事光学系统设计、光学精密装调等方面的研究。E-mail:sky_duyang@163.com

引用本文:

杜洋, 高志山. 使用高精度三坐标测量仪实现透镜定中心[J]. 光学精密工程, 2015, 23(3): 639-644. DU Yang, GAO Zhi-shan. Lens centering using high-precision three coordinate measuring machine. Editorial Office of Optics and Precision Engineering, 2015, 23(3): 639-644.

链接本文:

http://www.eope.net/CN/10.3788/OPE.20152303.0639 **或** http://www.eope.net/CN/Y2015/V23/I3/639

服务

把本文推荐给朋友

加入我的书架

加入引用管理器

E-mail Alert

RSS

作者相关文章

杜洋

高志山

访问总数:6365280

版权所有 © 2012《光学精密工程》编辑部

地址: 长春市东南湖大路3888号 邮编: 130033 E-mail: gxjmgc@sina.com

本系统由北京玛格泰克科技发展有限公司设计开发