光电工程

一种用于光机热集成分析的新方法——干涉图插值法

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摘要　　Zernike多项式是光机热集成分析中实现光、机、热各分析软件之间数据传递的重要工具。许多光学元件表面形状并不满足Zernike多项式的正交性条件，使有限元分析不能精确拟合光学元件表面变形及变形产生的各项像差。讨论影响Zernike正交性的几个因素，详细介绍将有限元分析得到的光学表面变形数据导入光学分析软件的一种新方法——干涉图插值法。该方法避开Zernike多项式拟合，在去除镜面刚体位移后将镜面畸变精确地表示成干涉图数据，直接生成数据接口。

关键词　　Zernike多项式　干涉图插值法　正交性　有限元分析　光机热集成分析

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New data transform method for thermal/mechanical/optical integrated analysis:interferogram interpolation

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Abstract Zernike polynomial is an important data transmission tool for thermal/mechanical/optical integrated analysis, which can be used to implement data transmission between optical, structural and thermal analysis program effectively. However, for many optical surfaces, finite element analysis(FEA) is unable to accurately fit their surface distortion and the various aberrations generated by such distortions because they could not meet the orthogonality condition required by Zernike polynomial, such as a mirror with a central hole. The factors effecting orthogonality of Zernike polynomial were discussed. A new method for importing FEA deformation data of optical surface into optical analysis software, interferogram interpolation, was presented. This method transforms the surface distortion data into the interferogram data accurately after removing the displacement of the mirror body and directly implements them into the optical software.

Key words Zernike polynomial　interferogram interpolation　orthogonality　finite element analysis　thermal/mechanicall/optical integrated analysis

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