

论文

曲率波前传感器探测高斯光束时的信号误差

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摘要:

曲率波前传感器已被用于天文自适应光学和光学度量等领域。在这些领域使用时都假设入射波前光强均匀,但这种假设与曲率传感技术的基本原理不一致。利用傅里叶光学理论,给出了光强不均匀情况下曲率波前传感器的曲率信号解析式,并利用光强均匀和不均匀情况下的信号表达式对探测高斯光束时的信号误差进行了数值分析。结果表明:曲率波前传感器探测高斯光束时存在一定误差,相位分布为4阶Zernike多项式时,误差最大,且阶数越高,误差越小;分区平均曲率信号误差较小,一般在10%以下。

关键词: 自适应光学;曲率波前传感器;高斯光束;信号误差

Signal error of wavefront curvature sensor for detecting Gaussian beam

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Abstract:

Wavefront curvature sensor is used in the fields of adaptive optics and optical metrology. It is assumed that the intensity of the incident wavefront is uniform in these fields, which does not conform with the fundamental theory. The signal expression of wavefront curvature sensor under nonuniform intensity was presented by means of Fourier optics theory. The numerical analysis of signal error for Gaussian beam was conducted using the signal expression under uniform intensity and nonuniform intensity. The analysis indicates that there is an error when wavefront curvature sensor is used to detect Gaussian beam. The error reaches the maximum when the phase distribution is 4th Zernike polynomials. The error decreases as the order of Zernike polynomials increases. The error of divisional mean curvature signal is small and below 10% generally.

Keywords: adaptive optics; wavefront curvature sensor; Gaussian beam; signal error

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