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论文

离轴无透镜傅里叶变换数字全息的分辨率分析

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摘要:

基于离轴无透镜傅里叶变换数字全息的原理,分析了影响离轴无透镜傅里叶变换数字全息分辨率的两个重要因素,一是物的大小和记录距离,二是参考点光源的大小.指出在满足三像分离与采样定理的条件下,恰当选择成像区域、记录距离和参考点光源尺度,可提高成像分辨率.在此基础上分别使用线度为2 μm、6.5 μm和15 μm的参考点光源,对USAF 1951分辨率板中心的1.0×1.0 mm2和1.5×1.5 mm2的成像区域,在不同记录距离进行了相应的实验,获得了与理论分析相符的结果,证明了理论分析的正确性.

关键词: 数字全息 无透镜傅里叶变换 分辨率 参考光源

Resolution Analysis of Off-axis Lensless Fourier Transform Digital Holography

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Abstract:

Based on the off-axis lensless Fourier transform digital holography principle,two main determining factors,which effect the imaging resolution of the Fourier transform digital holography are discussed in this paper.One is the recording distance and the size of the object.The other is the size of reference light source.The 1.0×1.0 mm2 and 1.5×1.5 mm2 areas in the center of an USAF 1951 Style Resolution Target serve as the objects.Corresponding experiments are performed employing three reference light sources with the sizes 2 μm,6.5 μm and 15 μm respectively,at different recording distances.Both the theory and the experimental results show that as in meeting three terms (twin images and zero order in reconstructed image) separation from each other and sampling theorem conditions,shortening the recording distance or decreasing scale of the reference light source may improve the system resolution of lensless Fourier transform digital holography of micro object.

Keywords: Digital holography Lensless Fourier transform Resolution Reference light source

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