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论文

一种在二步相移数字全息中实现准确相移的方法

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摘要:

相移数字全息中的相移准确性决定了重建结果的质量,本文提出了在二步相移数字全息中实现准确相移的方法.该方法使用数字电压源开环控制普通的压电陶瓷微位移器,通过连续以微小的间隔来改变施加在压电陶瓷微位移器上的电压,可以获得一系列对应于不同相移角的全息图像,进而可以利用这些全息图像重建出来物光波在全息面上的强度分布.实验中采用已被CCD直接记录的物光波在全息面上的强度分布作为标准来评价前面重建结果的质量,计算了这些重建结果和评价标准之间的相关系数,结果表明相关系数达到最大时对应的全息图具有准确的相移角π/2.实验中比较了使用所确定准确相移角和理论相移角分别重建出来物光波的质量,计算机模拟和实验的结果证实了该方法的有效性.

关键词: 全息术 数字全息 准确相移 相关系数

A Method for Accurate Phase Shift in Two-step Phase-shiftingDigital Holography

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Abstract:

The quality of reconstruction in phase-shifting digital holography was determined by the accuracy of phase shift.An approach to obtain accurate phase shift in two-step digital holography was proposed.This approach employed an ordinary open-loop controlled piezoelectric actuator,and a serial of phase shift holograms corrisponding to different phase shift angles would be obtained by means of changing the volgate exerted on the piezoelectric actuator continuously.Then the holograms could be used to reconstruct the object intensity on the CCD plane.The object intensity on the CCD plane that already recorded by CCD would be used as a criterion to evalutae the quality of the reconstuction.The correlation coefficients between the criterion and the same intensity reconstructed with different phase shift holograms were obtained.The correlation coefficient reached its maximum when the phase shift hologram is with the accurate phase shift angle.Simulation was carried out and thereafter the approach was employed in experiment.The quality of the reconstructed field by using the accurate value and the nominal value were compared.The feasibility of this method has been verified by both computer simulations and experiments.

Keywords: Holography Digital holography Accurate phase shift Correlation coefficient

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