

摘要：针对离轴数字全息图受记录器件像元尺寸的限制而在数字再现时存在再现像受零级项串扰的问题,提出了一种抑制离轴数字全息零级项的方法。根据图像灰度可由图像照度及表面反射率共同决定的原理,将全息图看作入射分量和反射分量的乘积,利用入射分量变化缓慢且集中在低频段,反射分量反映图像细节并集中在高频段的特性,用同态滤波方法处理数字全息图。设计了同态滤波器,其上下限分别为0.001和1,直径为300 pixel。用该方法实现了对衍射距离为34 cm的非涅尔数字全息图的零级项抑制,并对重构出的物光对比度以及物体的细节信息进行了增强。

关键词：离轴数字全息 同态滤波 再现像 零级项

Suppression of zero-order image in off-axis digital holography based on homomorphic filtering

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Abstract: In consideration of the crosstalk between reconstructed image and zero-order image existed in the digital reconstruction for off-axis digital holography, this paper presents a method to suppress the zero-order image. Based on the principle that the pixel gray-scale of the image is decided both by the image illumination and surface reflectance, the hologram is considered as a product of the incident and reflected components. The incident components which change slowly are mainly concentrated in the low-frequency region, and the reflected components which determine the detail of the image are concentrated in the high-frequency region. A reasonable homomorphic filter with the upper and lower limits of 0.001 and 1 respectively and a diameter of 300 pixel is designed and processed into the hologram. The results show that the zero-order image can be suppressed with only one Fresnel digital hologram at a distance of 34 cm. Meanwhile, the contrast and the details of reconstructed image at the same distance are improved.

Keywords: off-axis digital holography homomorphic filtering reconstructed image zero-order image

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