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Research note

Suppression of zero order diffraction from the reconstructed images in digital holography

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Abstract

The numerically reconstructed images in digital holography contain two undesirable features. After reconstruction, the zero order diffraction as well as the complex conjugate image will be present in pictures and drastically reduce their qualities. Practical applications of digital holography in the context of characterization and measuring the physical properties of objects require the suppression of these two features, before starting the reconstruction phase. In this work, using the required mathematical functions for suppressing the zero order diffraction and by transforming them to their discrete form, numerical filters for passing over the CCD images have been constructed. After passing these filters over the experimentally recorded CCD images, the reconstruction phase has been completed applying the discrete Fresnel transform. Carefully investigating the quality of various reconstructed images, we came to the conclusion that if a filter covers a smaller neighborhood of the recorded CCD images, it will have a better performance in suppressing the zero order diffraction. Among the used filters in this work, a 3×3 average filter showed the best performance in suppressing the zero order diffraction from the reconstructed images.

Keywords: digital holography, fourier optics, holographic interferometry, signal processing, wave propagation

For full article, refer to the Persian section