Multispectral Digital Holography

Martin Hernández-Romo¹,², Yoshio Hayasaki²

Universidad Politécnica de Tulancingo ¹, Center for Optical Research & Education (CORE) ²

E-mail: martin.hernandez@upt.edu.mx

Abstract: A multi-wavelength digital holographic technique is presented. The series of multi-wavelength is reconstructed to obtain phase distribution with a synthetic wavelength. The phase map is obtained by the numerical method of the Gabor Wavelet Transform which performs the information search by means of coefficients that correlate with the interference pattern of the. Experimental results are presented.

Keywords: (040401) Holography, (040405) multispectral imaging, (030309), digital holography

The numerical reconstruction technique obtained by means of a single quantitative phase map cannot satisfy the analysis of multiple wavelength recordings, the super resolution with two reference beams with different carrier frequency illumination and the investigation of ultra-fast events.

In this research a hologram set are recorder with an off-axis interferometer switching the light illumination from a supercontinuum white light laser.

The process of information retrieval traditionally depends on the effects of diffraction and angular shifting caused by the wavelength; therefore, this process is computationally exhaustive and requires a personalization for each holographic filter. A semiautomatic technique is the Wavelet Transform of Gabor GWT, because it performs a spectral search where the peak value of the transform corresponds to the information recorded in the hologram. Therefore, it is possible to process a single synthetic hologram which contains the information coming from the different wavelengths avoiding repetitive processes also avoiding the effects of the diffraction zero order and the twin images.

Figure (1) shows a series of recorded holograms using different wavelengths and the recovered information (amplitude and phase) of each hologram.

Fig. 1 Information retrieval from a hologram set
