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Simultaneous digital holographic microscopy and Fourier transform spectroscopy

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Abstract
Digital holographic Microscopy is a non-destructive and label-free method that provides quantitative phase information in biological and industrial applications. High coherence light sources, such as lasers, are commonly used in digital holographic microscopes. Parasitic -interference fringes and speckle noise in high-coherence sources as well as complex configurations reduce the accuracy of the phase measurements. In this paper, a common-path and low-coherence digital holographic microscopy with a Fourier transform-based spectroscopy is introduced. The low-coherence source used here is an LED and the common path configuration is used based on splitting the wavefront by Fresnel biprism. Reconstruction of the hologram is analyzed using the Fourier method. In addition, The spectral line shape of the LED is obtained simultaneously with the Fourier transform of the visibility of the recorded fringes. The ability to simultaneously perform quantitative phase imaging and Fourier transform spectroscopy makes this system unique in the real-time study of biological samples in micron size.

Keywords: digital holographic microscopy, low coherence sourses, common path holography, Fresnel biprism, Fourier transform spectroscopy

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