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ANALYSIS OF BRAGG DIFFRACTION FILTERS APPLIED TO IMAGE PROCESSING

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In this work we study the properties offered by holographically recorded volume gratings when applied to image processing in imaging systems. Angular selectivity due to Bragg diffraction modifies the transfer function of the imaging system and spatial filtering operations are performed with no need of a Fourier plane. We use Kogelnik's coupled wave theory to calculate these transfer functions. We demonstrate both edge enhancement and image smoothing in amplitude objects and in phase-only objects. To obtain satisfactory processed images we analyze the influence of the characteristic parameters of the volume grating. Both experimental and simulated results are shown with an excellent agreement. In certain applications image processing by Bragg diffraction offers an interesting alternative with respect to Fourier plane based strategies.

TOPICS + KEYWORDS: Applied Optics, Optical Processing, Holography, Bragg diffraction, Volume gratings, Edge-enhancement.