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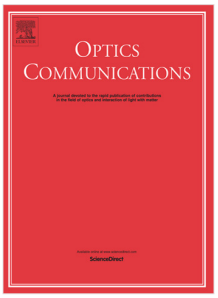

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Computer Generated Full-parallax Synthetic Hologram Based on Frequency Mosaic

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Abstract: In this study, we demonstrate a practical synthetic hologram with a size of 30mm×30mm at resolution of 94340×94340. The high-definition large-scale computer-generated full-parallax synthetic hologram is achieved through frequency mosaic with different perspective images. The sparsity characteristics mosaic frequency of full parallax synthetic hologram is analyzed for reducing the complexity of computation. Following elimination of the sparsity, the hologram is calculated by normalization of 2D inverse Fourier transform of the mosaic frequency. The error and object point size are analyzed and we conclude that the error is sufficiently small for human visual perception given that parallax angle and object depth are within acceptable limits.

Keywords Full-parallax computer generated synthetic hologram; Computer generated hologram; Fourier Transform; Inverse Fourier Transform.

OCIS Codes 090.0090; 090.1705; 090.1760; 090.5640

1. Introduction

Holography is a promising three-dimensional(3D) display technology, which can fully reproduce wave-front of a 3D object [1, 2]. With the development of computing technique, it has enabled the simulation of recording process for hologram generation, which is called computer generated holography(CGH) [3, 4]. Driven by CGH, dynamic holographic 3D display [5, 6] and large scale high resolution static holographic 3D display [7, 8] have achieved significant progress. The low-bandwidth electronic devices such as spatial light modulator (SLM) are frequently used for dynamic holographic 3D display. However, the viewing angle and field of view of reconstructed 3D image are often too small for practical applications. The large-size, high-resolution, computer-generated holograms such as the Fresnel hologram [9] and the color rainbow hologram [10, 11] are known able to produce high definition 3D effect for monochrome or colored 3D display. However, the computation of large-scale high-resolution hologram is time-consuming despite that many algorithms have been proposed.

Holographic stereogram [12, 13] is another method to achieve holographic 3D display. In this method, the hogels are calculated only through approximations. Thus the selection of hogel size influences the reconstruction quality. To improve the display quality of stereogram, phase-added stereograms [14, 15], diffraction specific coherent panoramagram [16], and ray sampling plane

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