

4 × 4 Time-division multiplexing of full-parallax holographic display using the light-source switching technique

Ryo Nishikawa*, Tomoaki Tsuchioka, Kyoji Matsushima
Department of Electrical and Electronic Engineering, Kansai University
3-3-35 Yamate-cho, Suita, Osaka 564-8680, Japan

ABSTRACT

It is theoretically possible for any display device to reconstruct a holographic movie. But, in practice, the resolution of currently-available spatial light modulators (SLM) is not high enough to meet the space-band product necessary for reconstructing high-quality holograms. The space-band product is interpreted into the product of the screen size and the viewing-angle in computer holography. Therefore, to reconstruct a large hologram with a wide viewing-angle simultaneously, it is necessary to expand the resolution of the SLM using a multiplexing technique.

We have proposed a time division multiplexing technique called light-source switching to ease the problem of the space-band product in holographic display. This technique uses a light-source array composed of many pigtail laser diodes (LD). By sequential switching the LDs, images whose position depends on the position of the switched-on LD are reconstructed sequentially by the SLM. Thus, the images can be multiplexed by displaying patterns on the SLM synchronously with the light source switching. This technique has an advantage of unnecessary of any mechanical part in the system, which is usually used to scan images in other systems. Higher-order diffracted images commonly degrade the reconstructed image in this kind of system. However, in the proposed holographic display, combination of polarized light sources and polarizer masks prevents deterioration due to higher-order diffraction.

In this paper, we report a holographic display with 4 × 4 multiplexing by the light-source switching technique with digital mirror device (DMD) used as a high-frame-rate-SLM.

Keywords: Spatial light modulator, time division multiplexing, DMD, full-parallax holographic display

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*nishikawa@laser.ee.kansai-u.ac.jp; phone +81-06-6368-1121(ex.5722); fax +81-6-6368-0933