Object and Sound Field Visualization using Digital Holography

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Digital holography (DH) and transport of intensity equation (TIE) are the two major techniques of imaging in the research fields of Information Photonics [1,2]. In DH, the interference pattern is optically generated by superposition of object and reference waves. It can visualize the 3D characteristics of object of interest in terms of intensity and phase information [1]. Sound field imaging and visualization is an important application of DH where phase image reconstruction property of it has been used [3]. Based on these simultaneous phase and intensity retrieval property of DH, in this paper, we present sound and voice field visualization method based on DH with single image sensor. For this purpose, an off-axis holographic setup is employed. An object wave passes through the sound and image, the phase retardation is occurred in the object wave. The phase retarded object wave due to sound and object fields interferes with a reference wave. This temporal phase retardation can be measured using DH and some data processing techniques. The presented technique can successfully visualize the sound and object fields at the same time without any extra components. We will present experimental results to demonstrate object and sound field visualization technique. Experiment is performed using off-axis DH geometry and the preliminary results are shown in Fig. 1.

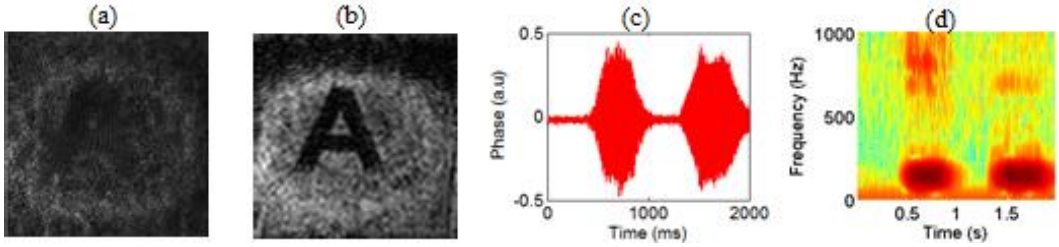

Fig. 1. (a) One of the recorded hologram, (b) reconstructed 2d intensity image from (a), (c) plot of phase values against time (optical voice), and (d) spectrogram of obtained optical voice.

References

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