

Talbot apodization filter for binocular holographic three-dimensional display

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No-glasses type binocular holographic 3D displays provides realistic 3D hologram images, and unlike many stereoscopic 3D displays in issue, they do not cause dizziness or vomiting [1]. However, the phenomenon of inter-pupil crosstalk (IPCT) occurring in the conventional binocular holographic 3D display system is difficult to remove. It is a phenomenon that the image to be observed in one eye overlaps with the image to be observed in the other eye. In this paper, we proposed the Talbot apodization filter to reduce the IPCT occurring in binocular holographic 3D displays. The proposed design of IPCT reduction filter includes talbot super-gaussian cosine filter and talbot super-gaussian directional filter. The systems reduce the IPCT by using Talbot apodization filter to the conventional system [2]. Figure 1 and Figure 2 show the simulation results of the proposed systems. Fig. 1(a, b) and Fig. 2(a, b) show the result of conventional system. Fig. 1(c, d) and Fig. 2(c, d) show the results of applying Talbot apodization filter.

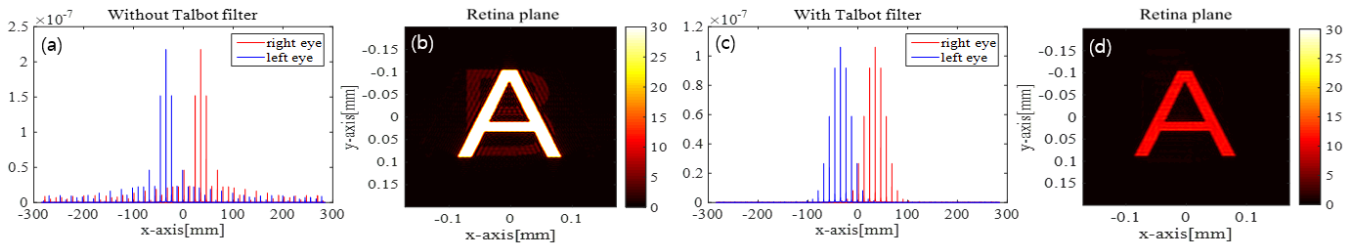


Fig. 1. Talbot super-gaussian directional filter system simulation result.

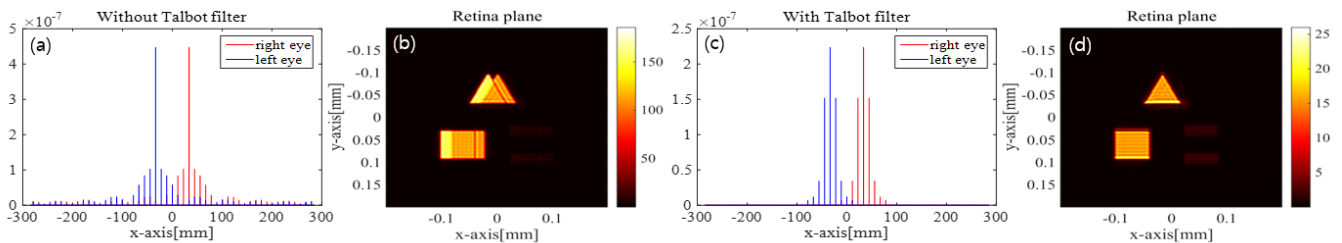


Fig. 2. Talbot super-gaussian cosine filter system simulation result.

From the simulation result of Figs. 1(a) and 2(a), it can be seen that noise is generated in both eyes by high-order diffraction. On the other hand, Figs. 1(c) and 2(c) show that the higher order diffraction is reduced and the IPCT is removed. The results of the 3D simulation also show that IPCT phenomenon appears in Figs. 1(b) and 2(b) because the image generated in the left eye overlaps with the image generated in the right eye, and IPCT is removed in fig. 1(d) and fig. 2(d). In conclusion, we demonstrate the removal of IPCT in the systems using Talbot apodization filter through simulation. Based on the simulation, we can observe the improved binocular 3D hologram without glasses.

Acknowledgment

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References

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