Mesh-based computer generated hologram and its display using waveguide type near-eye-display configuration

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Near-Eye-Displays have been attracting growing attention recently due to its wearable form factor and potential applications in augmented or mixed reality. In the near-eye-displays, the accommodation-vergence mismatch is one of the important issues to be solved for realistic three-dimensional image presentation and long-term safety. Holography provides a promising solution in presenting realistic three-dimensoinal images which are free from the accommdation-vergence mismatch and therefore is suitable for the near-eye-displays. However, the contents generation and system implementation for the holography still require extensive research.

In this talk, we explain our recent work on the holographic contents generation and the holographic near-eye-display. Holographic contents can be synthesized from the real-existing three-dimensional objects or computer graphics models.[1] We introduce the hologram synthesis from computer graphics models which are represented by a collection of triangular meshes.[2] In this method, the angular spectrum of each triangular mesh is calculated analytically and added in the hologram plane to form the hologram of whole three-dimensional scene. What we introduce mainly is the removal of the dark line artifact on the mesh boundary which occurs due to phase mismatch between the neighboring meshes.[3] We also explain the enhancement of the shading effect on the mesh surface to achieve more realistic representation of the three-dimensional images.

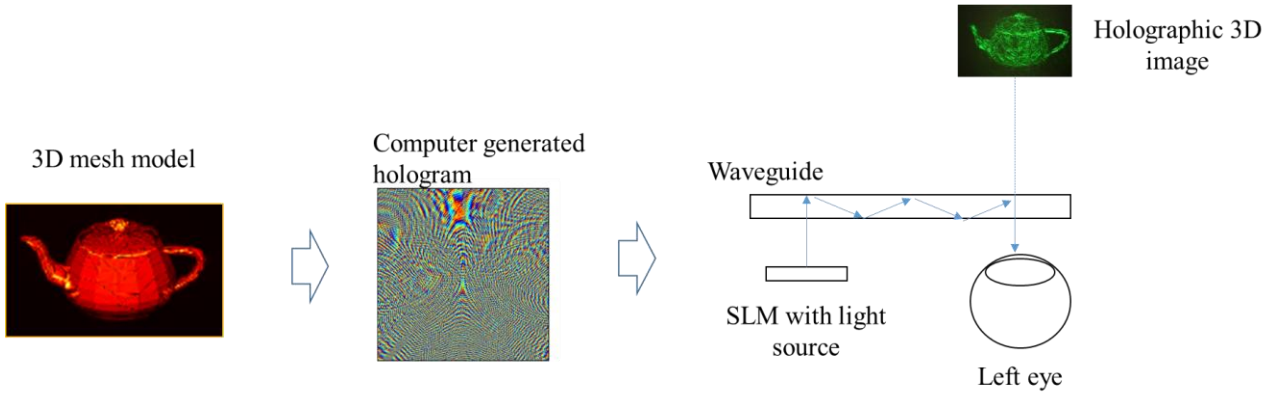

Fig. 1. Concept of mesh-based hologram calculation and its display

For the near-eye-display, we introduce the waveguide type structure as shown in Fig. 1. The holographic three-dimensional images displayed by a spatial light modulator are delievered to the observer's eye through total internal reflections in the waveguide. The input-output coupling of the holographic images to the waveguide and the system design are discussed with the preliminary experimental results in the talk.

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References

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