Optimization of Computer generated holography rendering and optical design for a compact and large eyebox Augmented Reality glass
計算機ホログラムの最適化と光学設計手法の探求

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This is a thesis for a design and rendering method for large eye-box, fully parallax, depth of field included near-eye augmented reality (AR) display. As developments in AR progress, field of view and sense of depth are one of the most crucial factors for rendering convincing virtual objects into real environments. I propose computer generated holography (CGH) that is able to reconstruct image with real world depth of field faithfully as rendering method. Previous studies have proposed various near-eye optic design such as the use of beamsplitter and Holographic Optical Element with 4f lens system. However pure beamsplitter design suffers from the narrow field of view while 4f lens system has lens aberration as well as minimal focusing issues that leads to smaller eyebox. Having a wide field of view that matches our eyes is crucial for having an immersive experience and often narrow field of view may even leads to nausea and negative impacts on comfortability. I propose a design that utilizes a Dihedral Corner Reflector Array and a novel beamsplitter embedded optics as our eyepiece. Our primary contribution is having a reasonably large eyebox while maintaining the simple optical design as well as rendering of virtual objects with depth of field in real time without any special optics or moving parts.

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