# Extending the eyebox of holographic near-eye displays with holographic optical elements

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Augmented reality (AR) stands at the forefront of next-generation computing platforms, offering a plethora of potential applications across various sectors. Among the technologies explored, holography has emerged as a promising method capable of achieving both a wide field of view (FOV) and a compact eyeglass-style form factor for AR near-eye displays. Despite its capability to fundamentally address the vergence-accommodation conflict, holographic near-eye displays encounter a persistent challenge: the trade-off between the FOV and eyebox. Existing holographic near-eye displays with expansive fields of view often suffer from impractically small eyebox, limiting usability. In response, we propose novel methodologies leveraging holographic optical elements (HOEs) to overcome this limitation. By integrating additional optical functions into specially designed HOEs, we can miniaturize near-eye displays, achieving a form factor akin to eyeglasses while maintaining wide fields of view and expanded eyebox. Our approach includes the design and implementation of a HOE fabrication system utilizing time-multiplexing exposure with RGB lasers. Leveraging the fabricated HOEs, we successfully developed prototypes of holographic near-eye displays capable of simultaneously providing wide fields of view and expanded eyebox. Furthermore, we employ a camera-in-the-loop optimization method to enhance image quality using our homemade HOEs. Looking ahead, we aim to further refine these design concepts to realize eyeglass-style near-eye displays, opening new avenues for immersive augmented reality experiences.

**Short Bio:**

Xinxing Xia received his PhD in Optical Engineering from

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