

Ultra-Large Field-of-View Retinal Projection Display with Corrective Lens

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We propose a retinal projection display (RPD) [1] that is able to merge with the vision correction for myopia. Our solution is highlighted by a corrective lens coated with an array of tiled organic light-emitting diodes (OLEDs), and a transmissive spatial light modulator (SLM). Its design rules are set forth in detail, followed by the results and discussion regarding the field of view (FOV), modulation transfer function (MTF), contrast ratio (CR), distortion, and simulated imaging.

Fig. 1 is a schematic drawing of the proposed RPD, which involves four major components, *i.e.* a corrective lens, an array of OLEDs, a transmissive SLM, and an eye. The corrective lens is used for compensating the refractive anomalies [2]. Preferably, its outer surface is concave, while its inner surface is flat, upon which OLEDs can be easily fabricated or laminated. Figure 2 shows the imaging simulation that takes into account the effects of distortion, aberration blurring, diffraction blurring, and relative illumination for both real and virtual images. Based on the simulation, its key performance, including FOV, MTF, and distortion, has been studied. For the real image, FOV is 114° (diagonal), MTF is above 0.4 at 280 cycles/mm, CR is 666, and distortion is less than 0.04%. For the virtual image, FOV is 117° (diagonal), MTF is above 0.4 at 120 cycles/mm, CR is 31, and distortion is less than 0.73%. As opposed to the combiner and waveguide based NEDs [3-4], RPD exhibits several unique features. First, instead of using an eyepiece or ocular lens, RPD relies on the eye itself in imaging the virtual objects. Second, a more compact form factor is expected as no folding optics are needed for RPD. Third, the distance and size of virtual objects hinge on the status of eye, including its diopter and pupil. Fourth, hopefully, its ultra-large FOV could be a trump card in playing the game of thrones of NEDs.

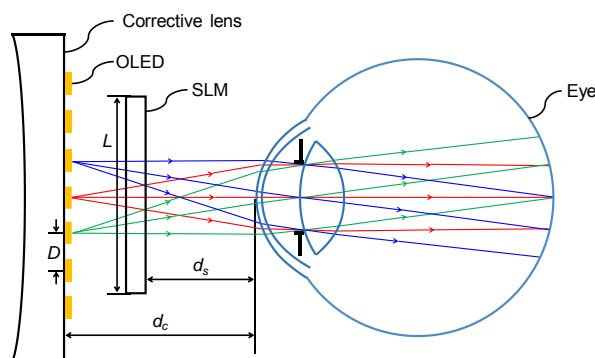


Fig. 1. Schematic drawing of the proposed RPD.

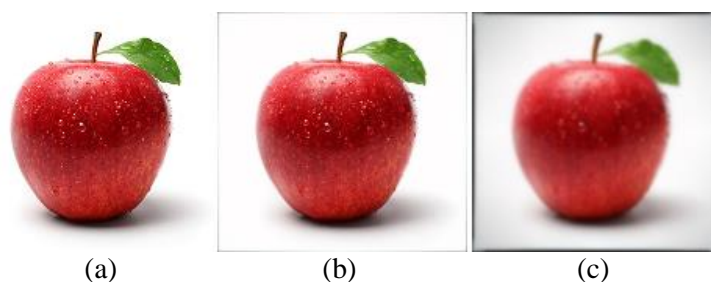


Fig. 2. Imaging simulation of (a) original, (b) real, and (c) virtual images.

References

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