Abstract:

Present research on simulating human vision and on vision correcting displays that compensate for the optical aberrations in the viewer's eyes will be discussed. The simulation is not an abstract model but incorporates real measurements of a particular individual's entire optical system. In its simplest form, these measurements can be the individual's eyeglasses prescription; beyond that, more detailed measurements can be obtained using an instrument that captures the individual's wavefront aberrations. Using these measurements, synthetics images are generated. This process modifies input images to simulate the appearance of the scene for the individual. Examples will be shown of simulations using data measured from individuals with high myopia (near- sightedness), astigmatism, and keratoconus, as well as simulations based on measurements obtained before and after corneal refractive (LASIK) surgery.

Recent work on vision-correcting displays will also be discussed. Given the measurements of the optical aberrations of a user's eye, a vision correcting display will present a transformed image that when viewed by this individual will appear in sharp focus. This could impact computer monitors, laptops, tablets, and mobile phones. Vision correction could be provided in some cases where spectacles are ineffective. One of the potential applications of possible interest is a heads-up display that would enable a driver or pilot to read the instruments and gauges with his or her lens still focused for the far distance.