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## *Mathematical Simulation of Human Visual Acuity*

Optical characteristics of the human eye may be modeled by an orthogonal polynomial series known as the Zernike series. We present a formulation which allows a Zernike representation of the eye to be calculated from second-order aberrations, i.e, spherical defocus and astigmatism, which are found in the ubiquitous eyeglass prescription. Using this representation, we calculate a convolution kernel, known as the point spread function (PSF), which may be convolved with an image to render it as viewed through the optical system of that eye. The result is a systematic method for rendering a virtual scene viewed by a patient with given optical aberrations.

Qualitative behavior of our model agrees with intuition and the physical characteristics of light. This model can be easily extended to account for higher-order ocular aberrations, which may be measured by Shack-Hartmann aberrometry. Thus, this system may find practical applications in clinical ophthalmology, particularly in a qualitative pre- and post-operative analysis of a patient's vision.

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