

Measurement of refraction distribution in the human eye opens new opportunities to make photorefractive surgery more accurate due to accounting imperfections not only of the cornea, but of the eye as an optical system. To calculate the to-be-ablated cornea layers, mathematical relations must be found between measured coordinates of retina ray tracings and transfer function of an eye. A new concept for modelling eye optical system is proposed using four phase transparencies, each of them exercising its own function: accommodation (equivalent to varifocal system), image focusing on the retina (optical system with constant optical power), regular aberrations (spherical and chromatic, astigmatism), and irregular phase distribution. It is shown, how the parameters, necessary for phase transparencies description, can be derived from direct and indirect measurements. Results of modelling experiment with simplified set of test points showed good sight correction. Investigated methodology proved to be fruitful even with limited number of test points and restricted length of polynomial approximation. In our refraction mapping system, transfer function reconstruction will use initial information from 65 points.

Keywords: eye model, phase transparency, retina ray tracing technique.

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