POSTER

31 | Comparison of Speckle Formation in Double Pass Images of Real Eyes with Different Light Sources

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Using the double pass (DP) technique, the point spread function of a patient's eye can be determined, including information about aberrations of higher orders as well as scattering, to obtain an overall estimation of the optical quality of a patient's eye. It requires a sufficiently powerful, directional and point-like light source like e.g. a laser. However, if a laser is used, images suffer from speckle formation, which hinders their interpretation.

In the past, we have compared light sources with different degrees of temporal coherence, namely a laser diode (LD), a light emitting diode (LED), and a superluminescent light emitting diode (SLED) in terms of speckle formation in DP images of a static eye model to evaluate their usefulness.

Now, we present results of speckle reduction in measurements of real eyes. For this, we compare the radially evaluated speckle contrast of one single DP image and six averaged images, with and without a vibrating mirror in the beam path, which is a conventionally used technique to remove speckle in DP images.

With the help vibrating mirror, the mean speckle contrast between 0 and 2.4 arcmin of the eye is reduced from 0.11 to 0.08 in averaged DP images of real eyes with a laser as light source. This is a lot less speckle reduction than in the eye model (0.39 to 0.11), which we attribute to the movement (microsaccades) of real eyes. When comparing averaged images with the SLED as source, speckle reduction by the vibrating mirror is hardly noticeable (0.10 to 0.09) because the spectrally broader source is less coherent and thus less speckle is formed.

In our future work, we plan to use a laser diode subjected to optical feedback to reduce coherence and thus speckle in DP imaging in a cost-effective and stable way.