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Modal deformable mirror optimization in sensorless Optical Coherence Tomography

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Abstract content
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We demonstrated that the modal sensorless correction can be used in Optical Coherence Tomography (OCT) with the use of a modal deformable mirror [Optics Communications, 284(13), 3467-3473 (2011)] exploiting a recent optimization method based on the cancellation of one aberration at a time. This strategy presents many advantages such as the use of few iterations and the absence of local maximum [Opt. Letters, 32(1) (2007)]. Sensorless optimization plays an important role in adaptive optics development thanks to the reduced hardware complexity. The use of sensorless optimization has been demonstrated in some fields such as laser focalization and in the improvement of image quality. In the most of the cases the optimization was carried out by the use of an optimization strategy, such as for example the genetic algorithm or others, which maximizes the value of a merit function which can be either the intensity in the focal spot for the laser optimization case or an image sharpening function in the case of the optimization of an image quality. The Modal Deformable Mirror (MDM) is an electrostatic membrane DM where the actuators are composed by a resistive layer which continuously distributes the electrostatic pressure on the membrane designed in order to directly generate low order aberrations such as defocus, astigmatism, coma and spherical aberration. To test the performance of our Sensorless Adaptive Optics - Optical Coherence Tomography system we tried to improve image quality of the Air Force Test target aberrated by some trial lenses.

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