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High resolution wavefront control using a photocontrolled deformable mirror in closed loop

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Abstract content :

Using a photocontrolled membrane deformable mirror it is possible to control and correct the wavefront with unprecedented resolution. Our novel design of deformable mirror is an electrostatic membrane mirror actuated through the change of resistivity of a photoconductor substrate rather than using a conventional matrix of electrodes. The Optically addressable Deformable Mirror (ODM) is composed by a Bismuth Silicon Oxide (BSO) photoconductive crystal, and a nitrocellulose metallized membrane. The light pattern which controls the mirror shape is emitted by a commercial DLP projector with 800 x 600 pixels. The main advantages of this device are the extreme reduction of hardware complexity, since just one high voltage line is used and the high resolution addressing of the DM instead of the array of high voltage lines used for standard electrode matrix geometries. We demonstrated those advantages through its use in a closed loop system, by the Zernike characterization exploiting a flexible light addressing up to an equivalent of 15x15 actuators. As a demonstration of the flexibility of use and high spatial resolution of this deformable mirror the mirror has been used as a simulator of atmospheric turbulence and to simulate the design of the ideal deformable mirror for the correction of thermal lensing in high power lasers.

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