VECTOR WAVE LATERAL SHEARING INTERFEROMETRY

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Measuring the phase of a beam with a digital holographic system demands an interfering coherent reference beam and measuring its polarization state typically requires several sequential acquisition. Measuring both the polarization state and the wavefront of a light beam in a single-shot acquisition appears as valuable, when not critical, in several applications such as optical and laser metrology, free-space telecommunications, optical imaging, super-resolution microscopy, or quantum optics. The simultaneous measurement of both parameters enables single-shot characterization of ultra-fast processes.

Thirty years ago, lateral shearing interferometry (LSI) has revolutionized phase imaging, allowing high-resolution wavefront sensing without requiring any reference beam. LSI consists in using a diffraction grating as a Hartmann mask, located at a close distance from a camera sensor. The wavefront gradient of a light beam is then converted into an intensity grid deformation at the camera plane. In analogy with this technology, we introduce here a vector wave LSI concept encoding not only the wavefront gradient but also the polarization state of the beam. The principle of this reference-free instrument allowing single-shot multiplexed phase and polarimetric imaging will be presented together with preliminary results.

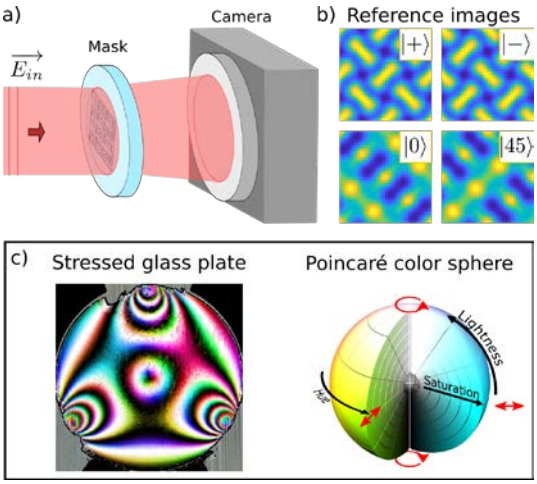

Fig. 1: Principle of vector-wave LSI (a). Different impinging polarization states yields different intensity patterns at the camera sensor (b). Color-coded polarization state image of a stressed glass plate (c).

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