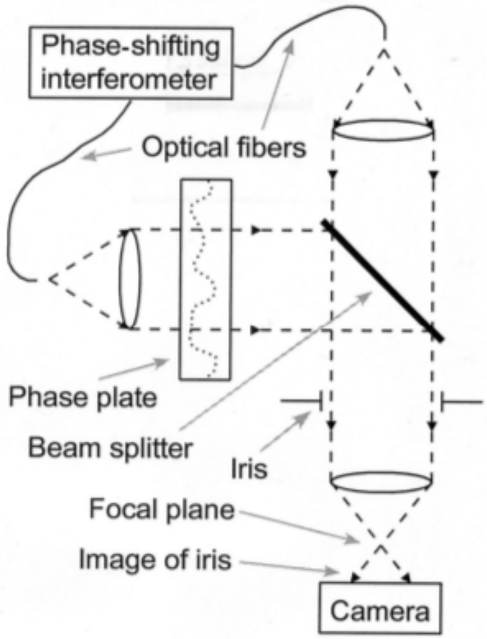

Fig. 1. Experimental setup used to record the true amplitude and phase variations, introduced by a plastic screen, and the phase-diverse focal-plane data.

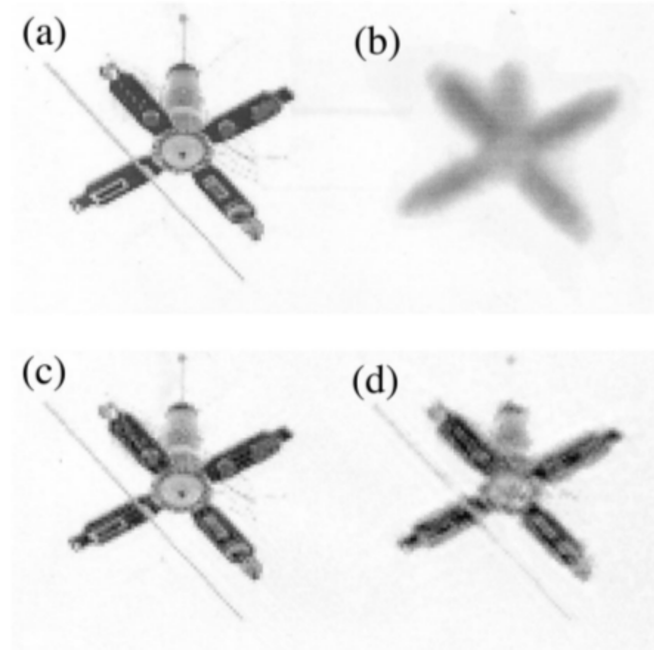

Fig. 8. (a) True object used for numerical simulation of object reconstruction. (b) Blurred image with photon and read noise added (best-focus frame from phase-diverse image set). (c) Reconstructed image with both phase and amplitude pupil-plane estimation. (d) Reconstructed image with phase-only estimation.

Sensing wave-front amplitude and phase with phase diversity

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We show in benchtop experiments that wave-front phase estimation by phase diversity can be significantly improved by simultaneous amplitude estimation. Processing speed, which will be important for real-time wave-front control applications, can be enhanced by use of small-format detectors with pixels that do not fully sample the diffraction limit. Using an object-independent phase-diversity algorithm, we show that, for both pointlike and extended objects, the fidelity of the phase and amplitude estimates degrades gracefully, rather than catastrophically, as the sampling becomes coarser. We show in simulation that the same algorithm also improves the fidelity of image reconstruction of complex targets.

OCIS codes: 010.1080, 100.3190, 100.5070, 120.5050.