Phase Retrieval for an Undersampled Thermal Infrared System

Matthew R. Bolcar and Eric Mentzell
NASA Goddard Space Flight Center, Greenbelt, MD 20771
matthew.bolcar@nasa.gov

Abstract: Phase retrieval was used on an undersampled, thermal infrared system to estimate focal plane displacement (defocus) across the field of view. We compare phase-retrieval estimated defocus values to those obtained using an independent technique.
OCIS codes:

1. Introduction

Image-based wavefront sensing techniques, such as phase-diverse phase retrieval (PDPR), have increasingly become common methods of aligning complicated optical systems, as well as performing optical metrology at the component level [1, 2]. Generally speaking, image-based techniques perform best when the detected point-spread function (PSF) intensity data is critically sampled ($Q = 2$, where $Q = \lambda\left(F/\#\right)/\left(\text{pixel size}\right)$). Recent work has been done to extend the range of image-based techniques to undersampled data [3, 4].

We used one of these undersampled techniques, a nonlinear-optimization based, PDPR algorithm [3], to sense the low-order wavefront error of a thermal infrared system across the field-of-view. Of particular interest was the defocus term of the wavefront as it indicated the relative displacement of the detector at each field point.

2. References

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