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Speckle intensity and phase gradients: influence on fringe quality in spatial phase shifting ESPI-systems

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Abstract

Spatial phase shifting (SPS) is a good method to exclude time-dependent phase variations from interferometric phase measurements, since the phase shifted data are acquired simultaneously but from different points. This leads to problems when SPS is applied to electronic speckle pattern interferometry. The speckled object wave contains a multitude of phase and intensity gradients that violate the assumption of constant object intensity and phase on adjacent data points, from which most phase reconstruction formulas are derived. Based on today's knowledge of second-order properties of speckle fields, some phase retrieval algorithms specially adapted to SPS are proposed that improve the phase maps obtained. Quantitative experimental results are given to estimate the amount of improvement.

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Keywords: Spatial phase shifting; Speckle statistics; Phase reconstruction; Electronic speckle pattern interferometry

1. Introduction

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