PARTIALLY COHERENT PHASE RECOVERY BY KALMAN FILTERING

Tech ID: 23976 / UC Case 2014-118-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,228,554	03/12/2019	2014-118

BRIEF DESCRIPTION

Phase imaging has applications in biology and surface metrology, since objects of interest often do not absorb light but cause measurable phase delays (e.g. biological cells or uneven surface heights). Here, a new extension to an experimentally simple method for imaging quantitative phase information is described, which uses a Kalman filter algorithm with a stack of intensity images taken through focus. The extended method involves incorporation of information about the microscope source shape in Koeler configuration, so that the coherence of the illumination may be included into the phase retrieval algorithm in order to produce more accurate phase results with arbitrary source shapes and sizes.

Investigators have optimized and extended the Kalman filtering method to reduce computational complexity and to produce images using partially coherent illumination. This new software and method is faster and more efficient than previous methods, and in addition is robust to noise. It is compatible with a range of imaging systems, including optical, electron, X-ray and synchrotron, for example. Further, modifications are described for variations on the phase contrast mechanism, such that any complex transfer function (including but not limited to defocus) may be used.

SUGGESTED USES

» Medical imaging systems

» Wavefront reconstruction in a variety of imaging systems, (e.g., commercial optical microscopes, electron microscopes, tabletop X-ray, synchrotron, and lithography aerial)

» Diagnostic test for mask and wafer defects used in electrical and photonic circuits

ADVANTAGES

» Fast, efficient, high contrast, high detail, low blur

» Robust to noise (e.g., low photon counts)

» Able to handle arbitrary source shapes or illumination coherence

» Simple experimental setup and alignment

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OTHER INFORMATION

KEYWORDS

Imaging systems, Phase contrast microscopy, Quantitative phase imaging, Kalman filtering, Partially coherent illumination

CATEGORIZED AS

» **Optics and Photonics**

» All Optics and Photonics

» **Imaging**

» Software

» **Medical**

» Imaging

RELATED CASES

2014-118-0

PUBLICATION

Transport of Intensity phase imaging by intensity spectrum fitting of exponentially spaced defocus planes

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Compressive Plenoptic Imaging
- Hyperspectral Microscopy Using A Phase Mask And Spectral Filter Array
- System And Method For Noise-Enabled Static Imaging Using Event Cameras

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