Phase from Defocused Color Images
Technology #13750

Applications

The proposed invention is useful for phase imaging apparatus. Phase information, which is derived from the optical density (refractive index), provides material properties such as physical density, distributions of pressure, temperature and humidity. Also topology of an object and surface profiling can be obtained, which is useful for imaging biological samples.

Problem Addressed

Most phase imaging methods involve interferometry, requiring strictly coherent illumination (lasers) and complicated experimental setups.

Technology

The Transport of Intensity Equation (TIE) is a wave-optical retrieval technique which involves measuring the derivative of intensity along optical axis by taking images at varying depths, then solving for phase. As the related intensity is function of axial distance z and wavelength λ, it is possible to derive a similar expression for the difference in intensity at a given defocus due to wavelength. The simple process is that after acquiring a defocused color image and separating it into spectral components using color filters, a calculation of intensity variation is performed to get phase information.

Advantages

- Does not require fully coherent illumination (laser is not a requirement)
- Simple experimental setup (possible with the camera’s built in color filter)
- Obtain phase from a single defocused color image

Categories For This Invention:

Photonics
Sensors (Photonics)
Cameras

Intellectual Property:

Phase from defocused color images
Issued US Patent
8,432,553
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Publications:
Phase from Defocused Color Images
Frontiers in Optics
2009

External Links:
BioSystems and Micromechanics (BioSyM) Inter-Disciplinary Research Group

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