Discussion on Low-Coherence Digital Holography-Based Profilometry: Problems and Solutions

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Digital holography (DH) is a powerful technique for recording and reconstructing three-dimensional (3D) information of an object. The interference pattern formed by the object wave and a reference wave is captured by an image sensor, and this pattern can then be used to reconstruct the complex amplitude of the object in a computer. The interference pattern appears only when the optical path difference between the object and reference arms is shorter than the coherence length of the light source. The interference pattern made by a light source with a wide range of wavelength is known as low coherence DH (LC-DH). LC-DH reduces coherent noise, offering advantages in providing depth information with high resolution and sensitivity. However, despite its development for various scientific and engineering applications, LC-DH is limited by the short coherence length related to the spectral bandwidth of the light source. As a result, LC-DH is best suited for measuring objects with relatively small depths within the coherence length. In this study, we will review and discuss methods to enhance the advantages of LC-DH while mitigating its limitations for profilometry of objects with long depths.

Short biography:

Quang Duc Pham received PhD from Utsunomiya University, Japan in September 2013. He was a researcher in Center for Optical Research and Education (CORE) of Utsunomiya University from October 2013 to September 2017. He was manager of Laboratory for Research and Application of Fiber Laser in National Center for Technological Progress (NACENTECH) of Ministry of Science and Technology (MOST) from February 2019 to June 2021. At present, he is a Lecture and Acting Head of the Department of Electronics and Computer Engineering at University of Engineering and Technology (UET) a member university of Vietnam National University Hanoi (VNU). He is an optical system designer in the fields of digital holography, optical metrology and Computational imaging. Recently, he is focused to integrate both optical metrology and quantum computing.