총회초청강연 I 7월 19일(목) 10:20~11:10 그랜드볼룸(지하 1층)

Digital Holographic Microscopy

M. K. "Paul" Kim
Professor
Dept. of Physics, PHY305 University of South Florida Tampa, FL 33620
813-974-5223 e-mail : mkkim@cas.usf.edu
http://shell.cas.usf.edu/~mkim

Since the invention of holography by Dennis Gabor in 1948, many novel techniques and applications of holography have been developed, from microscopy, metrology, data storage, optical processing, device fabrication, and even fine arts. The conventional process of holography using photographic plates, however, is time-consuming and cumbersome. In digital holography, the optically generated holographic interference is recorded by CCD or other electronic camera and the holographic image is reconstructed inside a computer using the diffraction theory, which completely and accurately describes the propagation of optical fields. Digital holography offers a number of significant advantages such as the ability to acquire images rapidly, availability of both amplitude and phase information of the optical field, and versatility of the image processing techniques that can be applied to the complex field data. Indeed, digital holography by numerical diffraction of optical fields allows imaging and image processing techniques that are not feasible or practical in real space holography. This talk presents an overview of recent developments in digital holography techniques. For example, quantitative phase microscopy is especially straightforward with digital holography and readily yields optical thickness profiles with nanometer accuracy. Superposition of phase images using two or more wavelengths provides optical phase unwrapping technique that is fast and without topology-dependent ambiguity, a problem common in numerical algorithm-based unwrapping. In wavelength-scanning digital interference holography(DIH), a large number of holographic images are accumulated using a range of wavelengths. This in effect synthesizes a short coherence as in optical coherence tomography, butthe full-field acquisition of two-dimensional images and holographic reconstruction provide distinct advantages over the conventional raster-scanned OCT techniques. Digital holography of total internal reflection is used to study the interface between cellular surfaces. Its history has been relatively short, but the development of novel techniques and applications of digital holography has been seeing exponential growth in recent years. This owes not in small part to the ever-continuing increase in the digital imaging and computational capacities.

• Biograph

M.K. Kim was born in Seoul, Korea and moved to U.S. after graduation from high school.

He obtained B.S. degree in physics and mathematics from U.C.L.A.(1979) and Ph.D. in physics from U.C. Berkeley(1986). After two and half years as a postdoctoral fellow at SRI International in Menlo Park, CA, he moved to Michigan for an assistant professor position at Wayne State University(1988). In 1995, he moved to Florida for an associate professor position at University of South Florida, where he has since been and became a full professor in 2004.

His research interests are in digital holography and applications in biomedical microscopy, as well as laser spectroscopy and quantum optics. He is married and has two teenage children.