



Fourier fringe analysis applied to metrology of extreme physical phenomena: A review

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How to extract the desired object information, with highest possible precision and speed, from a temporally and/or spatially modulated quasi-periodic fringe signal has been a critical issue common to all kinds of sensing and metrology that make use of physical waves, such as light waves, acoustic waves, electromagnetic waves, and material waves associated with electrons or atoms. A technique for fringe analysis, today known as Fourier fringe analysis or the Fourier transform method (FTM), was proposed and demonstrated in 1982. Since then, through worldwide participation of great many scientists and engineers, FTM has been critically analyzed, continuously improved and refined, and has created new areas of cross-disciplinary applications beyond its early applications to traditional optical interferometry and profilometry. This talk presents an overview on yet other applications of FTM to the measurements of extreme physical phenomena including ultrafast/short optical pulses, extremely small atomic displacements, and unconventional electron wave, X-ray and EUV interferometry, and shows how the advantages of FTM are exploited in these cutting edge application areas.

SHORT BIO:

Mitsuo Takeda is Adjunct Professor of Center for Optical Research and Education (CORE) at Utsunomiya University, and Professor Emeritus of the University of Electro-Communications (UEC), Tokyo Japan. He received the BE degree in EE from UEC in 1969, and the ME and PhD degrees in Applied Physics from the University of Tokyo, respectively, in 1971 and 1974. After working for Canon Inc., he joined the faculty of UEC in 1977. During 1985 he was a visiting scholar of Prof. J. W. Goodman's Group at Stanford University, and, for the years 2013-2014, an Alexander von Humboldt Guest Professor of ITO at Universität Stuttgart, Germany. He is Fellow of SPIE, OSA, and JSAP, and received Dennis Gabor Award (SPIE), Humboldt Research Award (AvH), Optics and Quantum Electronics Achievement Award (JSAP), and Chandra S. Vikram Award (SPIE).