

Cell Three-Dimensional Imaging by Digital Holographic Microscopy

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ABSTRACT

Digital Holographic (DH) microscopy is a powerful and increasing tool for investigation of living cell in biology. DH allows to retrieve simultaneously amplitude and phase of the complex field scattered or reflected by an object. The interference pattern between the object wave and the reference wave is digitally recorded by a CCD camera, the Phase-Contrast and Amplitude-Contrast Image (PCI, ACI) are numerically reconstructed. The possibility to have PCI is very useful for 3D imaging of biological materials because they present low amplitude contrast for quantitative amplitude microscopy. The digital holographic microscope used here is based on a Mach-Zehnder interferometer in transmission geometry that provides the object phase map related to the object height. A detailed map of the internal structure of living cell can be obtained.

We will show that the high performance and the capability of DH are due to various intrinsic features such as the numerical removal of the aberrations introduced by the optical setup [1], the achievement of extended focused image without mechanical scanning [2] or the increasing of the resolution in the object plane. Moreover it's possible to follow in real time the evolution of in-vitro cells.

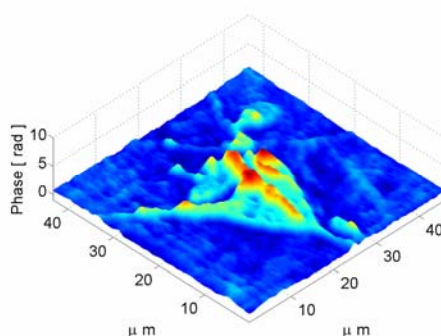


Fig.1: Phase-Contrast Image of in-vitro mouse cell.

References:

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