PC-BASED DIGITAL HOLOGRAPHIC MICROSCOPE WITH IMAGE RECONSTRUCTION IMPROVEMENT SOFTWARE

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Microscope has been widely used to observe microscopic objects. The types of microscope are varied according to its function. The conventional optical microscope only provides intensity information of an object and it has some difficulties to provide information about the real shape of the object and the projection of the object in different depth and perspective. In addition, optical microscope is only able to produce two-dimensional image of an object. Then to answer the challenge was made microscope that uses electrons. Electron microscope has the function to project the object in different depth and perspective. However, electron microscope causes damage to the object. Electron microscope imaging instrument is also relatively very expensive. To overcome this problem, holographic microscope was developed. Digital Holographic Microscope (DHM) produces digital images called holograms. Holography is an imaging technique which is capable to record and reconstruct a three dimensional image by utilizing laser. The holography microscope works based on the principle of interference phenomenon that occurs between object wave and reference wave [4]. In conventional holography method, the holographic interference was recorded using a film plate. Researches on DHM have been conducted. DHM do not use chemical substance for recording, so it is safer for the object. DHM utilizes a digital camera (CCD-Charged Coupled Devices) to replace the usage of film plate [1]. The storage media is easier to access because it is using computer to store the data. However, data produced by DHM cannot be extracted directly. An image reconstruction algorithm is needed to represent the data in its magnitude and phase form.

We developed a simple off-axis DHM using a Michelson interferometer. A red laser diode (65 has been used as a coherence source and a CMOS digital camera has been employed to capture the hologram. In this experiments, we took digital hologram of silica gel particles of around 10 μm diameters. Although minimum optical component used in the Michelson interferometer affected the quality of the hologram, our experiments shows that by a suitable image processing, the image of the objects can be reconstructed numerically. In this research, improvement of the image reconstruction software for digital holographic microscope off-axis configuration was proposed.