REAL-TIME 3D DISPLAY FOR LIGHT-FIELD MICROSCOPY

G. Scrofani, N. Incardona, M. Martínez-Corral, and G. Saavedra,
3D Imaging and Display Laboratory, University of Valencia, Burjassot, Spain.
e-mail: gabriele.scrofani@uv.es

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Integral photography (IP), firstly introduced by Lippmann [1] is a growing topic in the scientific and also industrial world. Lately it has been applied also in microscopy [2]. This technique, called integral or lightfield microscopy, in its most simple design is built after modifying a conventional microscope by inserting a microlens array (MLA) at the image plane and moving the sensor up to the back focal plane of the MLA. Behind each microlens an image is captured, which is called microimage. Each pixel of a specific microimage records the angular information of a point of the 3D object. Recently, in [3, 4] a different set up was proposed. Here the MLA is placed at the Fourier plane of the objective lens, and therefore it has been called Fourier integral Microscope (FiMic). As a result, differently from before, the pixels behind each microlens are capturing the spatial information of a different perspective of the sample. From the collected information many techniques can be applied such as 3D rendering from defocus, depth-map calculation [5, 6, 7] and projection of the sample in a 3D integral display [8].

In this work, we show how the system can be designed to directly display, in real time, the 3D information in a light-field display. It is achieved a significant improvement of speed up of the system by skipping the calculation of the point cloud as in [8]. Therefore, it is much more useful now for the potential users of the FiMic in their daily routine, since no off-line computation is needed.

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