DARK-FIELD IMAGING WITH AN INTEGRAL MICROSCOPE

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Based in the concept of integral photography (IP) postulated by Lippmann [1], a new microscopy technique has been recently proposed. The technique, known as lightfield microscopy, and also as integral microscopy, is based in the insertion of a microlens array (MLA) at the image plane of a conventional microscope [2]-[3]. With this architecture, any pixel of the CCD (which is set at the back focal plane of the microlenses) collects a ray with specific spatial-angular information. This information is collected into a 4D radiance map, from which it is possible to calculate different perspective views, and also irradiance 2D distributions at different depths.

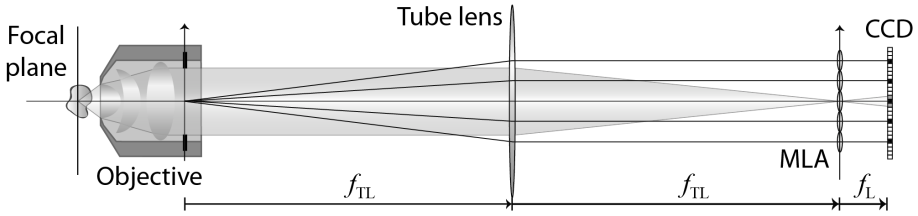

Figure 1.- Scheme of an integral microscope. The central pixel of any micro-image collects the ray passing through the center of the Fourier plane.

Apart from 3D image rendering, the IP technology has demonstrated to have many other important applications. One is the insertion of a MLA at the focal plane of the primary mirror of an astronomic telescope, aiming the easy implementation of wavefront sensing with adaptive-optics purpose. Our proposal here is, somehow, similar but applied to the microscopic world. It is based in the fact, shown in the figure, that the central pixel of any micro-image collects the ray passing through the center of the aperture stop of the objective. So, an integral microscope can spread its applicability to dark-field imaging by simply darkening such specific pixels before the application of rendering algorithms.

In the presentation we show the experimental setup of the integral microscope, and demonstrate that a simple post processing of the micro-images permits to obtain dark-field images of amplitude and phase objects.

References

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