Integral Imaging (InI) is a technique for the imaging and display of 3D macroscopic scenes. Based on an old concept published by Lippmann more than one century ago [1], InI produces auto-stereoscopic 3D images which can be observed directly with no need of additional viewing devices such as special goggles.

An InI device codifies the 3D information in an array of 2D elemental images, which are obtained through an array of microlenses. In fact the set of elemental images is nothing but a 2D matrix that stores the lightfield emitted by the 3D object. The lightfield is a map with precise information of position and inclination of sampled rays proceeding from the object. From this map, and by proper use of ad-hoc algorithms, it is possible to recover topographical information of the 3D scene. In other words, InI is the incoherent counterpart of digital holography.

As in the case of digital holography, it is possible to apply InI concept to record the lightfield obtained in the intermediate space of a light microscope. Also in this case, it is very difficult to reach the resolution levels that are obtained by conventional bright-field microscopy.

What we report here is a new realization of InI microscopy in which we improve the resolution and the axial segmentation capacity through what we call as the synthetic-apodization InI. In our preliminary experiment we have improved the resolution and the segmentation capacity by factor 2 by simply recording 2x2 snapshots, after displacing laterally the sample with a piezo actuator unit. In the below figures we show one set of elemental images of a microscopic sample and the reconstructed field in two planes.