MULTI-VIEW LIGHT-SHEET MICROSCOPY WITH CONFOCAL SLIT

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Selective-plane illumination microscopy (SPIM)[1] has proven to be a powerful imaging technique due to its unsurpassed acquisition speed and gentle optical sectioning. This allows for long time in vivo recordings of entire biological specimens, bridging the spatio-temporal scales between fast subcellular processes and organismal dynamics. However, light scattering inside tissues often severely impairs image quality even in the case of multi-view imaging techniques that illuminate the sample from multiple directions.

Here we combine multi-view imaging in a MuVi-SPIM setup[2] (similar to SimView, 4lens-SPIM)[3,4] with an electronic confocal slit detection (eCSD) on modern sCMOS sensors. We demonstrate eCSD capability of scattered light rejection for multi-view imaging through a diverse set of biological samples. In addition to improved imaging contrast[5,6], eCSD also doubles the acquisition speed in multi-view setups with two opposing illumination directions as it allows for simultaneous dual illumination without the otherwise inherent loss in image quality[7]. Thus no specimen-specific data fusion algorithms are required which greatly reduces image post-processing and furthermore eases data handling and storage. Finally, we discuss the implementation of eCSD in other multi-view SPIM setups.