WIDE-FIELD FLUORESCENCE SECTIONING MICROSCOPY
USING DYNAMIC SPECKLE ILLUMINATION

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Abstract: We present a novel wide-field fluorescence sectioning microscopy in which speckle
patterns are produced on the sample for illumination. The speckle pattern is dynamically
changed and a sequence of fluorescence images of the sample is recorded with a CCD camera.
Due to a large variation of fluorescence intensity of the in-focus light compared to that of the
out-of-focus light, special processing algorithms can be used to reconstruct the sectioned
fluorescence image. We calibrate the system and study the effect of the reconstruction
algorithms on the system performance. Fluorescence sectioned images of a few biological
samples, such as tissue and BPAE cell and plant leafs, are obtained. Our experiments show that
this wide-field fluorescence sectioning microscopy can be used to optically section tissue and
cell, and has potential applications in the clinics.

Keys: fluorescence, speckle illumination, fluorescence microscopy, sectioning