Scattering correction through a space-variant blind deconvolution algorithm.

Abstract:
Scattering within biological samples limits the imaging depth and the resolution in microscopy. We present a prior and regularization approach for blind deconvolution algorithms to correct the influence of scattering to increase the imaging depth and resolution. The effect of the prior is demonstrated on a three-dimensional image stack of a zebrafish embryo captured with a selective plane illumination microscope. Blind deconvolution algorithms model the recorded image as a convolution between the distribution of fluorophores and a point spread function (PSF). Our prior uses image information from adjacent z-planes to estimate the unknown blur in tissue. The increased size of the PSF due to the cascading effect of scattering in deeper tissue is accounted for by a depth adaptive regularizer model. In a zebrafish sample, we were able to extend the point in depth, where scattering has a significant effect on the image quality by around 30??m.