# Multistep optimization of Point-of-Care Microscopy in Microfluidic Settings

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Abstract

Microscopy is one of the most important fields of the medical science. Over the last half century, eventhough significant improvements have been accomplished, still several limitations of the physical components indicate the limits of the imaging technique [1]. Recently an increased focus is observed in settings that require rapid and accurate image acquisition and analysis of large data throughput and this is made possible with optimized experimental instruments in point of care microscopy [2, 3]. Sometimes the physical limitations could be overcome by using computational imaging. Fourier Ptychography microscopy is a relatively new branch of microscopy, but in the short time since its introduction, the benefits that it has brought have been enormous. The essence of this method lies in the reconstruction of images that go up to gigapixels using series of low-quality images. The traditional microscopic technique involves illumination by white light of the samples that are fixed on uniform glass slides. Here we report results of Fourier Ptychography while operating on microfluidic chambers which imply unique challenges. Images of the same sample using different illumination sources with different optical pathlengths are fused in the reciprocal domain and then a higher resolution image is acquired. The first improvement that we propose is the refocusing for every different light source. Secondly, we tested whether the quality of the reconstructed image depends on the illumination wavelength. We conclude that the refocusing improved the quality of the image and a shorter wavelength leads to a higher resolution of the images that are reconstructed.

**References**

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