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Joint De-blurring and Nonuniformity Correction Method for Infrared Microscopy Imaging

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Abstract

In this work, we present a new technique to simultaneously reduce two major degradation artifacts found in mid-wavelength infrared microscopy imagery, namely the inherent focal-plane array nonuniformity noise and the scene defocus presented due to the point spread function of the infrared microscope. We correct both nuisances using a novel, recursive method that combines the constant range nonuniformity correction algorithm with a frame-by-frame deconvolution approach. The ability of the method to jointly compensate for both nonuniformity noise and blur is demonstrated using two different real mid-wavelength infrared microscopic video sequences, which were captured from two microscopic living organisms using a Janos-Sofradir mid-wavelength infrared microscopy setup. The performance of the proposed method is assessed on real and simulated infrared data by computing the root mean-square error and the roughness-laplacian pattern index, which was specifically developed for the present work.

Keywords: Infrared focal plane array, Image reconstruction-restoration, Nonuniformity correction, Deconvolution, Microscopy

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