
Abstract

This paper proposes a novel image deblurring method that integrates Local Binary Pattern (LBP) as a regularizer within the MAP framework. LBP, an image texture descriptor, is leveraged to enhance blur kernel estimation, particularly for images affected by mixed blur types. Taking the three-segment prior as our baseline, our approach addresses its limitations by improving the accuracy of blur detection and kernel estimation through LBP regularization. Experimental results using a multi-scale implementation demonstrate that incorporating LBP features improves PSNR and SSIM on the Köhler dataset, achieving up to 19.58 dB and 0.733. While performance on the Levin dataset slightly trails the baseline, it narrows the gap compared to the single-scale version. This multi-scale approach contributes to clearer reconstructions by effectively reducing jagged artifacts and producing smoother object edges. However, visual inspection reveals that the proposed method sometimes over-smooths the image, especially in the Köhler dataset, resulting in a loss of fine, high-frequency details despite higher quantitative metrics. This highlights a trade-off between structural fidelity and texture preservation. Future work could focus on adaptive parameter tuning and incorporating perceptual-based metrics to better balance quantitative performance and visual quality.

Keywords: image deblurring, Maximum a Posteriori (MAP), Local Binary Pattern (LBP)
