Chen, Yang; Yu, Weimin; Li, Yinsheng; Yang, Zhou; Luo, Limin; Chen, Wufan
Bayesian image restoration using a large-scale total patch variation prior. (English)
Zbl 1235.94018

Summary: Edge-preserving Bayesian restorations using nonquadratic priors are often inefficient in restoring continuous variations and tend to produce block artifacts around edges in ill-posed inverse image restorations. To overcome this, we have proposed a spatial adaptive (SA) prior with improved performance. However, this SA prior restoration suffers from high computational cost and the unguaranteed convergence problem. Concerning these issues, this paper proposes a Large-scale Total Patch Variation (LS-TPV) Prior model for Bayesian image restoration. In this model, the prior for each pixel is defined as a singleton conditional probability, which is in a mixture prior form of one patch similarity prior and one weight entropy prior. A joint MAP estimation is thus built to ensure the iteration monotonicity. The intensive calculation of patch distances is greatly alleviated by the parallelization of Compute Unified Device Architecture (CUDA). Experiments with both simulated and real data validate the good performance of the proposed restoration.

MSC:
94A08 Image processing (compression, reconstruction, etc.) in information and communication theory
62F15 Bayesian inference
68U10 Computing methodologies for image processing
65D18 Numerical aspects of computer graphics, image analysis, and computational geometry

Software:
ForWaRD; CUDA; TwIST

Full Text: DOI

References:


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