Higher-Order Image Statistics for Unsupervised, Information-Theoretic, Adaptive, Image Filtering

Suyash P. Awate and Ross T. Whitaker

UUCS-05-005

School of Computing
University of Utah
Salt Lake City, UT 84112, USA

Abstract

The restoration of images is an important and widely studied problem in computer vision and image processing. Various image filtering strategies have been effective, but invariably make strong assumptions about the properties of the signal and/or degradation. Therefore, these methods typically lack the generality to be easily applied to new applications or diverse image collections. This paper describes a novel unsupervised, information-theoretic, adaptive filter (UINTA) that improves the predictability of pixel intensities from their neighborhoods by decreasing the joint entropy between them. Thus UINTA automatically discovers the statistical properties of the signal and can thereby restore a wide spectrum of images and applications. This paper describes the formulation required to minimize the joint entropy measure, presents several important practical considerations in estimating image-region statistics, and then presents results on both real and synthetic data.