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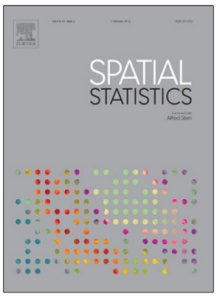

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An Image Quality Index Based on Coefficients of Spatial Association with an Application to Image Fusion

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Abstract

In the last decade, image quality indices have received considerable attention to quantify the dissimilarity between two images. The codispersion coefficient, commonly used in spatial statistics to address the association between two processes has also been used for this aim. Here we introduce an image quality index (CQ_{max}) that is based on codispersion. This new coefficient is a directional evaluation of the spatial association, and consists on computing the maximum codispersion for a finite set of spatial lags on the plane, which also allows to obtain the direction associated with the maximum codispersion. From the CQ_{max} index, a pseudo-metric that can be used as a cost functional for related optimization problems is defined. We carry out Monte Carlo simulations to explore the performance of the proposed index and its capability to detect directional contaminations. Additionally, we introduce a novel algorithm to restore directionally contaminated images and present an application with real data in the context of image fusion.

Key words: Image similarity, **SSIM index**, CQ_{max} index, Spatial lag, Image fusion.

1. Introduction and Motivation

The enormous development of the technological resources of the last decades has been a determining factor in the construction and implementation of different coefficients and quality measures to quantify the similarity between two digital images. In spite of the different initiatives that have been developed so far, this line of research is a recent one; and therefore the design, definition, and study of new ideas remain as objectives of notable interest in mathematics, computation and statistical image processing.

Similarity and quality are strongly related notions when comparing digital images. The image quality analysis (IQA) is linked to the assessment of image quality derived from human judgment. In general, IQA can be classified into subjective IQA and objective IQA (Wang and Bovik, 2009). The subjective perspective is widely accepted as the most accurate approach to measuring quality, since the human eye is the ultimate