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PII: S0923-5965(17)30036-X
DOI: http://dx.doi.org/10.1016/j.image.2017.03.001
Reference: IMAGE15185

To appear in: *Signal Processing : Image Communication*

Received date: 1 November 2016
Revised date: 2 March 2017
Accepted date: 2 March 2017

Cite this article as: Yong Ding, Yang Zhao and Xinyu Zhao, Image Quality Assessment Based on Multi-Feature Extraction and Synthesis with Suppor Vector Regression, *Signal Processing : Image Communicatio* http://dx.doi.org/10.1016/j.image.2017.03.001

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Abstract
Serving as quality monitor and evaluator, image quality assessment (IQA) plays an important role in various image processing systems. With humans on the receiving end of these systems, it is evident that desirable IQA methods should correlate well with subjective sensations. Yet traditional methods are usually either inaccurate for lack of consideration on human visual system (HVS) or too complex due to excessive effort on HVS simulation. To the pursuit of both accuracy and efficiency, we propose a method based on the exploitation of features closely related to image inherent quality. Specifically, in the novel method, Sobel operator, log Gabor filter and local pattern analysis are employed for complementary representation of image quality to make use of the properties of the primary and secondary visual cortex in HVS. Finally, support vector regression is implemented for the synthesis of the multiple distortion indices and mapping the quantification into an objective quality score. Experiments conducted on four large-scale databases, i.e. LIVE, TID2008, TID2013, and CSIQ prove that the objective evaluation of image quality by our method is highly consistent with subjective perception, and it is robust across different databases and distortion types.

Keywords
Image quality assessment; full reference; feature extraction; Sobel operator; log Gabor filter; local pattern analysis

1. Introduction

The rapid development of image processing technology has given rise to the indispensable applications of high-quality images, yet quality of digital images suffers from potentially substantial loss during procedure of image acquisition, processing, compression, transmission, and reproduction. Therefore, it is practical to develop image quality assessment (IQA) methods to serve as quality monitors or evaluators in image processing systems (Wu *et al.*, 2016). The quality of images should be evaluated according to human's sensation, yet subjective IQA is too consuming in terms of time and labor and is therefore impossible to be implemented in practical real-time systems (Zhang *et al.*, 2015). Because of the deficits of subjective IQA, researchers have been working on objective IQA methods and have explored plenty of effective schemes with good accuracy in predicting subjective evaluation (Wang *et al.*, 2004).

Objective IQA methods can be divided into three categories, namely no reference (NR), reduced reference (RR) and full reference (FR), according to their dependency on reference