No-reference quality assessment of compressive sensing image recovery

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No-reference quality assessment of compressive sensing image recovery

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Abstract

Compressive sensing (CS) has been attracting tremendous attention in recent years. Extensive CS image recovery algorithms have been proposed for more effective image reconstruction. However, very little work has been addressed for the quality assessment of CS recovered images, which may hinder further development of CS image recovery techniques. The CS recovered images are typically contaminated by multiple distortions, particularly at low sampling rates. Unfortunately, the existing quality metrics are ineffective for evaluating multiple distortions, so they are limited in predicting the quality of CS recovered images. Motivated by this, this paper presents a no-reference CS Recovered Image Quality (CSRIQ) metric based on the measurement of both local and global distortions in CS recovered images. The local features consist of a local phase coherence based edge sharpness measure and a gray level co-occurrence matrix based texture measure. The global features are extracted based on the natural scene statistics and can be divided into two types. One type is obtained by calculating image naturalness parameters. The other type is computed based on the statistics of singular value decomposition coefficients. Support vector regression is employed to do model training and the subsequent quality prediction. Experimental results conducted on a CS recovered image database demonstrate the advantages of the proposed method. As a application, the proposed metric is used for automatic parameter selection for CS image recovery algorithms.