A Software Based Fingerprint Liveness Detection Using Image Quality Assessment (IQA)

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Abstract

Fingerprint based authentication systems have developed rapidly in the recent years. Conventional biometric authentication methods use feature extraction methods and pattern matching techniques. However, these systems are vulnerable to spoofing attacks. Image Quality Assessment (IQA) is one of the statistical techniques used in image processing to determine whether the liveness sample is live or fake. The objective of the proposed system is to improve the liveness recognition security. In this paper, seven different Full – Reference (FR) IQA Pixel-wise difference measures are proposed, which are Mean Squared Error (MSE), Normalized Absolute Error (NAE), Average Difference (AD), Signal to Noise Ratio (SNR), Peak Signal to Noise Ratio (PSNR), Maximum Difference (MD), and Structural Content (SC). These seven measures give us seven feature vectors, and then these feature vectors are classified using SVM classifier. As the image quality measures are used in the proposed method, the originality of the captured image is preserved as much as possible. In order to get feature vectors with more features without affecting much the original image, the unsharp masking (USM) method is used for sharpening the image. The features extracted using the proposed method are compared with the results from scale-invariant feature transform (SIFT), and the comparison reveals that the proposed IQA method gives much better results than the SIFT.

Keywords - Image Quality Assessment, Image Quality Measure, Pixel-wise Difference measures, Full - Reference IQA