An Image Retrieval System Based on Wavelet Decomposition and Gradient Variation

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ABSTRACT

Texture gradient is a popular operation for extracting features used for content-based image retrieval (CBIR) of texture images. It is useful for depicting gradient magnitude and direction of adjacent pixels in an image. In this thesis, we proposed two methods for retrieving texture images. In the first method, discrete wavelet transform (DWT) and gradient operation were combined to extract features of an image with principal component analysis (PCA) used to determine weights of individual extracted features, while in the second method, only gradient operation without involvement of discrete wavelet transform was used to extract features. The Brodatz Album which contains 112 texture images, each has the size of 512×512 pixels, was used to evaluate the performance of the proposed methods. Before experiment, each image was cut into sixteen 128×128 non-overlapping sub-images, thus creating a database consisting of 1792 images. Regarding the number of features, a total of 126 features were extracted in the first method by calculating gradients after discrete wavelet transforms of the texture image, while in the second method only 54 features were extracted from each gradient image. By integrating useful features, image retrieval systems for retrieving texture images have been designed. The results show that the two proposed methods have been demonstrated to be able to achieve better retrieval accuracy than the method proposed by Huang and Dai. Additionally, our proposed systems, especially the second proposed method, use fewer features which significantly decrease the retrieval time compared to the previous investigation.

Keywords : Content-Based Image Retrieval ; Texture ; Gradient Operation ; Entropy ; DWT ; Principal component analysis

Table of Contents

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