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Abstract
Content-based image retrieval (CBIR) has become a significant research topic in the visual computing area. Generally speaking, when a query image is submitted to the CBIR system, the features of the query image have been extracted and compared within the image database. Intuitively, the system should return the relevant images near the query images in the feature space. However, the gap between the low-level feature and the high-level semantic meaning of an image makes the retrieval result unsatisfactory. To improve this situation, a user intervention technique called relevance feedback is adopted. The most commonly used relevance feedback is called “query point movement” (QPM). The QPM, which means to move the query point to the desired location by using the Rocchio’s formula. When the user marks the relevant and non-relevant images on the retrieval images, the QPM moves the succeeding queries away from the negative examples and proceeds towards the positive examples. The QPM has a major drawback that if the marked positive examples are scattered across many clusters; the new query is a mixture of the old queries and therefore an unsatisfactory non-relevant result is caused.

In this thesis, we propose a progressive conception guided searching scheme based on the relevance feedback framework. We first perform the feature space subdivision by using K-means algorithm according to the color and texture features. This operation divides the image database into several feature clusters. The retrieved image in the first querying step is constructed in accordance with the proportion of the cluster sizes. This step is called “first feedback”, which aims to give the user the overview for all images.with category browsing. In the following steps, the user marks some positive and negative examples on the returned images. In order to avoid the mixture of the positive examples that mislead the query direction, the parallel searching mechanism called “multi-query” for each positive example is performed. That is, we treat every positive example as a new query point. The clusters with more positive examples would have the larger probability to return more images. Therefore, the relevance feedback which uses positive and negative examples evaluated by the user is utilized to improve the indexing performance. The probability of an image which is returned as a relevant example is computed by means of interpolating the scores given by user during the feedback stage. To achieve a stable retrieval result, we employ simulated annealing as a decision-making mechanism.

The proposed method is implemented with an on-line image retrieval system which allows user to retrieve the proper images via a sequence of progressive relevance feedbacks. The experimental result shows the multi-query mechanism avoids the drawback of the misleading of the query direction. Other performance evaluations such as APR (average precision rate), ARR (average recall rate) and NRS (Normalized Rank Sum) are also carried out to verify the efficiency of the proposed method.
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