

Fusion Method Based on Association Rules for Image Retrieval

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Abstract: *Image mining deals with the extraction of image patterns from a large collection of images. Clearly, image mining is different from low-level computer vision and image processing techniques because the focus of image mining is in extraction of patterns from large collection of images, whereas the focus of computer vision and image processing techniques is in understanding and/or extracting specific features from a single image. In image re-ranking, it needs first to perform the search based on the text query. Then the returned list of images is reordered according to the visual features similarity. The retrieving method in this paper utilizes the fusion of the images' multimodal information (textual and visual) which is a recent trend in image retrieval researches. It combines the techniques like association rule mining, SVM classifier and saliency map detection for retrieving semantically related images. Proposed method trying to enhance the image retrieval performance by fusing i.e. textual and visual features for retrieving and narrow the semantic gap problem*

Keywords: CBIR, Association rule, SVM, Image Retrieval

1. Introduction

Discovering knowledge from data stored in typical alphanumeric databases, such as relational databases, has been the focal point of most of the work in database mining. However, with advances in secondary and tertiary storage capacity, coupled with a relatively low storage cost, more and more non standard data (e.g., in the form of images) is being accumulated. This vast collection of image data can also be mined to discover new and valuable knowledge. The problem of image mining combines the areas of content-based image retrieval, image understanding, data mining and databases. To our knowledge, no other work has been done with regard to mining knowledge from a collection of images from a database perspective.

Image mining denotes combination of data mining and image processing technology to aid in the analysis and understanding in an image-rich domain. Image mining deals with the extraction of image patterns from a large collection of images. Association rules mining is an important branch of data mining research, and association rules is the most typical style of data mining. [9] Association rules mining is to discover the associations and relations among item sets of large data.

Aim is to design system using fusion method with re-ranking. Due to "semantic gap" problem i.e. translation of high-level user perceptions into low-level image features of Content Based Image Retrieval (CBIR) systems, proposed method trying to enhance the image retrieval performance by fusing i.e. textual and visual features for retrieving image and narrow the semantic gap problem.

2. Literature Review

In [2], a Web application called MM Retrieval is proposed. It has an online graphical user interface system that brings image and text search together to compose a multimodal and

multilingual query. The modalities are searched in parallel, and then the results can be fused via several selectable methods. Fusion process consists of two components: score normalization and combination While [3] method deals with the clusters of the modalities, [4] proposed a method that constructs a semantic relation between text (words) and visual clusters using the ARM algorithm.

Raniah A. Alghamdi[1] proposed method that utilizes the fusion of the images' multimodal information (textual and visual) .It combines two different data mining techniques to retrieve semantically related images: clustering and association rules mining algorithm. The semantic association rules mining is constructed at the offline phase where the association rules are discovered between the text semantic clusters and the visual clusters of the images to use it later at the online phase and achieved the precision score among different query categories.

There is a huge amount of research work focusing on the searching, retrieval and re-ranking of images in the image database. The diverse and scattered work in this domain needs to be collected and organized for easy and quick reference. Relating to the above context, [5] gives a brief overview of various image retrieval and re-ranking techniques. It gives detailed information through the core architecture of image harvesting and retrieval system to the different Re-ranking techniques. These techniques are discussed in terms of approaches, methodologies and findings.

A.Kannan [6], describes the concepts of CBIR and Image mining have been combined and a new clustering technique has been introduced in order to increase the speed of the image retrieval system. The main objective of the image mining is to remove the data loss and extracting the meaningful information to the human expected needs. The images are preprocessed with various techniques and the texture calculation is highly focused.

Ramakrishna Reddy [7], proposed an enhanced relevance-feedback method to support the user query based on the representative image selection and weight ranking of the images retrieved. The support vector machine (SVM) has been used to support the learning process to reduce the semantic gap between the user and the CBIR system. From these experiments, the proposed learning method has enabled users to improve their search results based on the performance of CBIR system. In addition, the experiments also proved that by solving the imbalance training set issue, the performance of CBIR could be improved.

Method proposed in [8] for saliency map consists of four basic steps. First, method decomposes a given image into compact, perceptually homogeneous elements that abstract unnecessary detail. Based on this abstraction it computes two measures of contrast that rate the uniqueness and the spatial distribution of these elements. From the element contrast it then derive a saliency measure that produces a pixel-accurate saliency map which uniformly covers the objects of interest and consistently separates fore- and background.

3. Proposed Work

In this study, proposed system using fusion method with re-ranking trying to enhance the performance using textual and visual features for retrieving and narrow the semantic gap problem. Input image is processed and saliency map of image is generated then low level features are extracted like color map etc and by giving caption is saved to database. For retrieval of image, input image is given then its features are extracted and compare with saved images, based on caption and features, images are retrieved with respect to score.

4. Result Analysis

Here for performance measure, used the most common evaluation methods namely, Precision and Recall usually presented as a Precision v/s Recall graph. With this, the following formulae are used for finding Precision and Recall values.

$$\text{Precision} = \frac{\text{No. of Relevant Images Retrieved}}{\text{Total number of Images Retrieved}}$$

$$\text{Recall} = \frac{\text{No. of relevant images retrieved}}{\text{Total number of relevant}}$$

5. Images in the Database

The proposed method has been implemented using Matlab 7.13 and tested on database containing 64 images having 4 categories of images like Car, Rose, Beijing nest and Butterfly. So average precision value is as:

Table 4.1: Average precision value of proposed system

Parameters	[10]	[11]	Proposed Method
Test	1	2	3
Image Type	Jpg	Jpg	Jpg
Image Format	24 bit RGB	24 bit RGB	24 bit RGB

	Image	Image	Image
Retrieval Time	53.6 s	2.77 s	0.211 s

Table 4.2: Comparison of Result Analysis with respect to time

Category	Precision	Accuracy
Car	0.93	0.96
Beijing nest	1	1
Rose	0.95	0.88
Butterfly	0.82	0.91

6. Conclusion

The retrieval method proposed in this paper utilizes the fusion of the images' multimodal information (textual and visual) which is a recent trend in image retrieval researches for retrieving image, proposed method trying to enhance the image retrieval performance and narrow the semantic gap problem. The experimental result shows precision values of the proposed method. The proposed method is trying to improve accuracy and speed.

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