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Retrieval of User Specific Images Using Semantic Signatures

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***Abstract*—**Image search engines rely on the surrounding textual keywords for the retrieval of images. It is a tedious work for the search engines like Google and Bing to interpret the user's search intention and to provide the desired results. The recent researches also state that the Google image search engines do not work well on all the images. Consequently, this leads to the emergence of efficient image retrieval technique, which interprets the user's search intention and shows the desired results. In order to accomplish this task, an efficient image re-ranking framework is required. Sequentially, to provide best image retrieval, the new image re-ranking framework is experimented in this paper. The implemented new image re-ranking framework provides best image retrieval from the image dataset by making use of re-ranking of retrieved images that is based on the user's desired images. This is experimented in two sections. One is offline section and other is online section. In offline section, the re-ranking framework studies differently (reference classes or Semantic Spaces) for diverse user query keywords. The semantic signatures get generated by combining the textual and visual features of the images. In the online section, images are re-ranked by comparing the semantic signatures that are obtained from the reference classes with the user specified image query keywords. This re-ranking methodology will increases the retrieval image efficiency and the result will be effective to the user.

***Keywords*—**CBIR, Image Re-ranking, Image Retrieval, Semantic Signature, Semantic Space.

I. Introduction

IMAGE RETRIEVAL is the process of finding the relevant images based on the user specified query keywords from the large image database. Nowadays, image collection scheme in web, is growing dynamically. Hence, finding the desired image retrieval from the rapidly growing web becomes a challenging task. This leads to necessitate for efficient image searching and retrieval.

CBIR (Content Based Image Retrieval) is a technique, where images are retrieved based on their content features such as shape, texture and color of the images. The CBIR distinguishes digital images exactly how human distinguishes the images. CBIR overcomes the difficulty in providing the retrieval image using the keywords alone while, this difficulty is encountered by the earlier text based images search engines as the images seemed to be in low level features with regard to Shape, Color and Texture.

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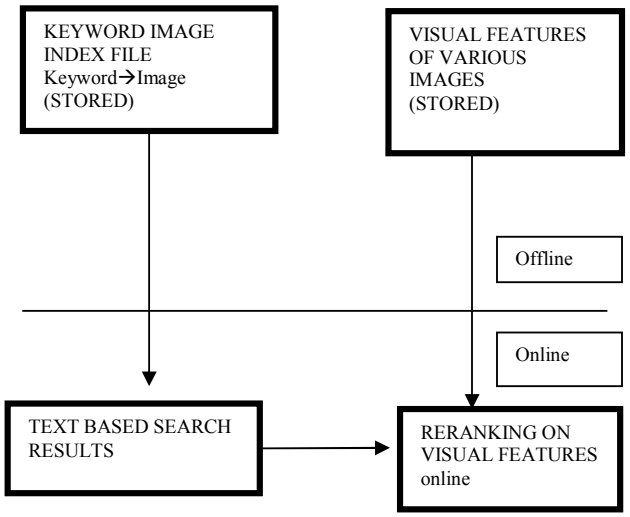

Fig. 1 Earlier Image Re-ranking Framework

In Fig. 1, when the user gives a query keyword, a group of images is retrieved based on the word image index file [1]. Next, the user selects one of the retrieved images which shows the user's desired image. Later, the images in the group are re-ranked based on the visual similarities with the user selected image. The offline part is already computed and stored.

II. Related Works

Bin Wang et al. proposed new algorithm to handle the duplicate images [2]. In order to eliminate the duplicate images, each image is represented by a hash code. Also efficient search methods are implemented to retrieve the database images in a very fast manner.

Lukasz Kobyli´nski et al. used the application of Binary Threshold Histogram (BTM), which describes the color characteristics of the images [3]. By using BTM, they created meta-database index for the different number of image databases. They tested their proposed method by comparing the huge number of clustering techniques.

Sanjay Silakari et al. proposed an unsupervised image clustering technique based on the color features of the image [4]. They did experiments on the feature databases of images, which are extracted using color moments and BTC. Clustering is done based on the K-Means Algorithm. Their results proved that BTC algorithm is best, when compared to color moments.

Kannan et al. proposed a new clustering technique to eliminate the loss of data and retrieve images in a fast manner, when compared to other existing clustering techniques [5]. They mainly focused on texture feature of the image.

Clustering is done based on the FUZZY C mean algorithm, RGB components and texture features. Image comparison is done with the help of entropy calculation.

Gal Chechik et al. presented OASIS algorithm for the purpose of learning similarity between the database images [6].Their proposed algorithm out performs with the large set of images and they proved it experimentally.

B. Ramamurthy et al. proposed the image retrieval techniques to retrieve the medical images from the large volume of image database [7]. They used canny edge detection algorithm for the shape retrieval, k-means classification algorithm for classifying the images in to different groups, Euclidean distance algorithm for retrieval of similar images.

Jingyu Cui et al. proposed a new image re-ranking framework for the text based search results. They used adaptive weight similarity for image re-ranking [8]. The user desired image is categorized in to one of predefined intention category of the user. Each intention category consists of definite similarity measure, which is used to combine image features. This leads to re-ranking of database images by a comparison with the query image provided by the user. They implemented their ideas in Google image search engine and Microsoft live image search engine and attained the best results.

Xiaoou Tang et al. proposed a method for the assessment of photo quality based on the content of concerned images [9]. To accomplish their idea, they used regional and global features of the photographic image. In order to combine their proposed features, they used an adaptive classifier, which is trained online. The classifier classified the photos based on the visual content without knowing which category that image belongs too. Their proposed method gave better results than existing methods.

Kalyan Roy et al. implemented newer techniques for the faster retrieval of images [10]. For extraction of color, they used color coherence vector and color histogram. For detection edges of images, sobel edge detection is used. Manhattan distance is used for retrieval of similar images.

Yin-Hsi Kuo et al. proposed methods for measuring image similarity and retrieval of similar images [11]. For images visual and textual features, graphs are drawn. Semantic features of images are automatically discovered in the generated graphs through propagation and selection.

III Existing Methodology: System Architecture

In Fig. 2, the existing system architecture consists of two sections. The first section is offline section and the second section is online section [1].

A. Offline Section

The offline section is already computed and stored. It consists of six major parts as follows:

1. Discovery of Reference Classes

The discovery of reference classes is done through the keyword expansion E (q). For example, when a query keyword q is given, a set of images S(q) is retrieved by the search engine based on the given keywords. From the S(q) images, words required for the keyword expansion is extracted. For instance, the word ‘e’ is extracted from the retrieved images, e, which belongs to E (q), is expected to appear frequently in S (q). The images for the reference classes can be found by combining the expansion of the keyword e with the original keyword q. Using this keyword combination of keywords, images are retrieved and the top M images are kept apart. K-means clustering algorithm is used for removing the outliers and using the binary SVM (Support Vector Machine) redundant reference classes are removed.

2. Query Specific Reference Classes

The query specific reference classes’ images can be found using the keyword expansion.

3. Classifiers of Reference Classes

The Multi Class SVM is trained to classify more than one reference classes based on their feature vectors. The Multi Class SVM is trained using the visual features of the image. Six categories of techniques are adapted for the classification of texture, shape and color of the image. They include color spatialet, which describes the spatial arrangement of color, GIST[14] that works best for scenery images and it is used for texture extraction, Wavelet is also characterizes the texture feature of the image[13], Attention guided color signature facilitates color composition of the image, histogram of oriented gradients, which is used for image edge detection [12].

4. Keyword Associated With Images

According to word image index file, an image is associated with multiple keywords. If any one of associated keyword is given as query, the concerned image will be retrieved and re-ranked.

5. Semantic Signatures over Reference Classes

The semantic signatures of reference classes can be computed and stored offline previously.

B. Online Section

1. User Query

The user gives a query keyword with the intention of finding the desired images.

2. Text Based Search Results

The search engines retrieve images based on the keywords given by the user.

3. Re-Ranking Based On Semantic Signatures

The images are retrieved from the database based on the user keywords. Once, the user clicks on the preferred image, the remaining images in the database are re-ranked based on the comparison with semantic signature with the query image. Rank boost framework algorithm is used for ranking the database images. Images are ranked based on the photographic quality.

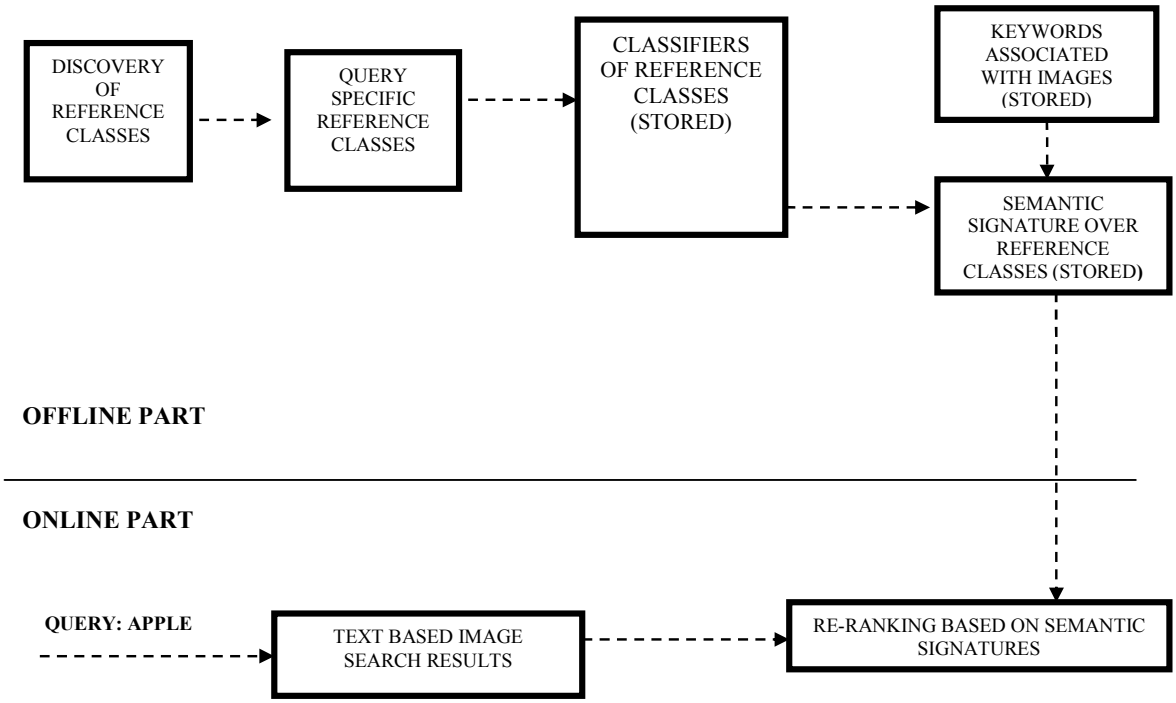

Fig. 2 System Architecture

IV. Experimental Results

The project experiment is carried out with the image dataset containing of 1000 images. The images in the dataset include the images of animals, fruits, humans, vehicles, flowers, scenery. The user intended image is found from the click made by the user from the list of available images. Fig. 3 shows the user intended image.

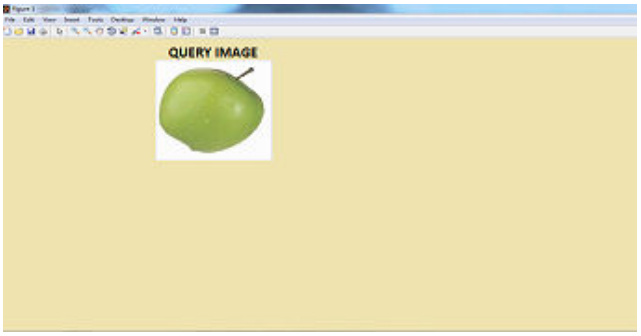

Fig. 3 User Desired Image

Figs. 4 and 5 show the searching image database to find the similar image that is related to the user's desired image.

Fig. 6 shows the final list of images after re-ranking, which is similar to the user desired image.

Fig. 4 Searching Image Database for Similar Image

Fig. 5 Searching Image Database for Similar Image Retrieval

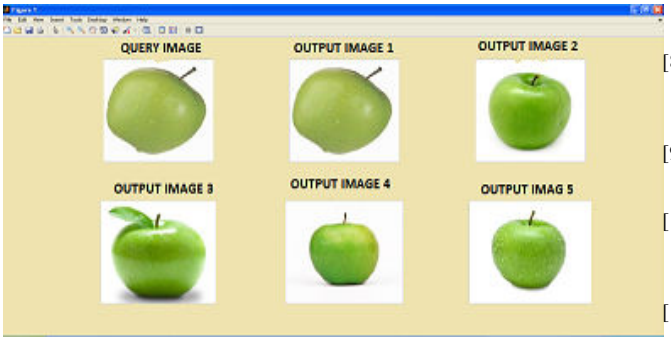

Fig. 6 Final Results

V. Evaluation Measure

A. Precision

The Precision measures the retrieval efficiency of images from the Image Database.

Precision is the ratio of the number of retrieved relevant images to the total number of retrieved images. Table I shows the precision value in %.

TABLE I
PRECISION VALUES IN %

Query Image	Precision
Image 1	56
Image 2	50
Image 3	53

VI. Conclusion and Future Work

To conclude, the implemented scheme of image re-ranking framework improves the precision of the retrieved images about 15%, when compared to the existing methodologies. In future, the framework can be enhanced in the database images with the duplicate image detection. The duplicate image detection for the database images can be done with the help of generation of hash code.

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