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"Image Search Engine Based on Intension of User"

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Abstract: *Image retrieval is widely used area for the number of applications like journalism, medicine, art collections, scientific database .Most of the existing image search engines are text query based where retrieval result is ambiguous due to multiple meanings of provided textual query. So proposed system targets at the retrieving relevant images based on user's search intention.*

A novel image retrieval approach uses Text query and Visual information of the image for retrieval .Main objective of this system is to capture the user's search intention in just 'One Click' query image and to display most similar images to this clicked image based on its content. Firstly user's intention is captured by asking user to click one image from the result of text based image retrieval. After that clusters of images are formed based on their visual content and visual query hence text query is expanded. Finally,expanded keyword and Visual query expansion are used to retrieve more relevant images from given database.

In this paper best combination techniques for important features like Color, Texture, and shape are used to measure visual similarity between images

Keywords: *Image Reranking, Image pool & query expansion, precision, visual features, visual query.*

1. INTRODUCTION

Image retrieval systems are used to browse, search and retrieve images from a large database of images. The use of digitally produced images in areas like journalism, medicine, art collections,and scientific database is increasing.For example,medical doctors have to access large amounts of images daily inorder to recognize disorders in the human body, home-users often have image databases of thousands of images and journalists also need to search images by various criteria. Text based image retrieval (TBIR) and Content-based image retrieval (CBIR) are two mostly used approaches to search relevant images from the image database.Computational complexity and retrieval efficiency are the key objectives in the design of Image Retrieval system. However, designing a system with these objectives becomes difficult as the size of image database increases.In this project, we are retrieving relevant images reflecting users search intention in just "One Click" query image.We are using both text based and content based approaches to retrieve relevant images.

Query keyword ambiguity may occur because sometimes meaning of the query keyword may be beyond user's expectations. For example, word apple has different meanings like red apple, green apple, apple computer, and apple iPod. Also sometimes the user may not know how to write a textual description of target imagesinaccuratewords.

Fig 1.1 *Top-ranked images returned from Bing image search using apple as query.*

For example, if users do not know bat as the thing related to cricket (shown in Fig1.2) then they have to input bat as query keyword to search images of cricket bat. Sometimes user may get difficulty in describing the visual content of target images using accurate keywords.

To solve ambiguity in image, additional information has to be used to capture users

search intention. One solution to this is a text based keyword expansion, making the textual description of the query more detailed. Existing methods use either synonyms or other linguistic-related words from thesaurus, or words frequently co-occurring with the query keywords for keyword expansion. For example, Google image search provides an option of related search that suggests likely keyword expansions.Sometimes; the intention of the user can be different and cannot be accurately captured by these expansions. As shown in Fig.1.2, cricket bat is not in the keyword expansions suggested by Google related searches.

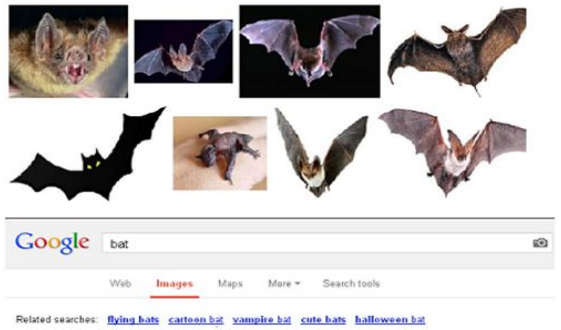

Fig 1.2 *(a) Images ofbat. (B)Google related searches of query bat.*

Content-based image retrieval by relevance feedback can also be used to get relevant images reflecting user's intention.In CBIR with relevance feedback users has to label multiple positive and negative image examples. A visual similarity metric is calculated from the selected positive, negative image examples and used to rank images.But these systems require more user effort as they have to select multiple positive and negative image examples .This makes it unsuitable for image search systems in which user feedback has to be minimized.

So to search images visual information should be used.The interaction of the user to system should be simple and minimum.An Internet image search approach which captures the user search intention in just One Click is proposed in this paper.The system gives most relevant images by first applying text based image search and after that it applies content based image search.

2. RELATED WORK

2.1. Image Search

2.1.1. Text Based Image Retrieval (TBIR):

Text based image search engines use only keywords as queries. Users type query keyword and the search engine returns number of images having filenames similar to query keyword or images in which query keyword appear as surrounding text. Text based image search engines rely on text for indexing of images. As a consequence of this, the quality of an image search engine result depends on the quality of the textual information that surrounds or associated with the images (e.g. filename, nearby text, page title, or picture tags within the HTML code).

Advantages: Text based image search is easy to implement.TBIR doesn't require user to have a similar image to search.TBIR is easy to conceptualize as everything is done manually.

Limitation: Text-based image search suffers from the ambiguity of query keywords. The keywords provided by users tend to be short. Also sometimes user gets difficulty in describing the visual content of target images using accurate keywords.

2.1.2. Content Based Image Retrieval (CBIR)[4]:

In Content-based image retrieval (CBIR), user has to provide query image as input to search engine instead of providing text query as in the case of text based image retrieval.The user can either browse query image from the hard disk, or he can also select the example images provided by us to search the image of that kind.

Content-based image retrieval (CBIR) retrieves images based on features like color, texture and shape. Features of query image and images in the database are extracted and are stored in feature vector.Therefore, images will be indexed according to visual content for features like color, texture, shape or any other feature or a combination of a set of visual features.

Advantages:

CBIR retrieves relevant images fast and doesn't need manual annotation of images.

Limitation: High features similarity may not always correspond to semantic similarity .For the same image, different users may have different interpretations.

2.1.3. CBIR Relevance Feedback [5]:

CBIR system doesn't retrieves relevant images that the user wants in first response to user.The relevance feedback approach has been applied also to content-based image retrieval (Rui et al. 1997b, Thatcher et al. 1997, Minka 1996).In

CBIR with relevance feedback user has to select multiple positive and negative image examples from image pool.

Advantages: In CBIR with relevant feedback, user is allowed to interact with the system to refine the results of query until he/she is satisfied.

Limitation: The CBIR with relevance feedback requires more user effort which makes it unsuitable for web-scale commercial systems (Bing image search, Google image search in which user's feedback has to be minimized.

2.1.4. Pseudo Relevance Feedback [6, 7]:

Pseudorelevance feedback takes the top N images visually similar to the query image as positive examples in order to reduce user's burden. However, due to the well-known semanticgap, the top N images may not be all semanticallyconsistent with the query image which may reduce the performance of pseudo relevance feedback.

Limitation: Top images retrieved by Pseudo Relevance Feedback may not be semantically consistent with the query image.

2.2. Keyword Expansion

For document retrieval, Keyword expansion is mainly used. Keyword expansion is used to expand text query entered by user. It can also be used to expand retrieved image pool and to expand positive examples of the query image.

2.2.1. Annotation [13]:

Some image search engines provide expanded keywords suggestion. They mostly use surrounding text. Some algorithms [13] generated tag suggestions or annotations based on visual content of input images. The performance of image Reranking is not improved by this annotation.

Limitation: For annotation fixed keyword sets is considered, which are difficult to obtain for image reranking in the web environment which is open and dynamic.

3. METHOD

Intention based Image Search Engine is implemented using Java with four different interconnected modules: Text based Image Search, Rerank result based on similarity with the query image, Keyword Expansion and Visual Query Expansion, Image Pool Expansion and Reranking final result.

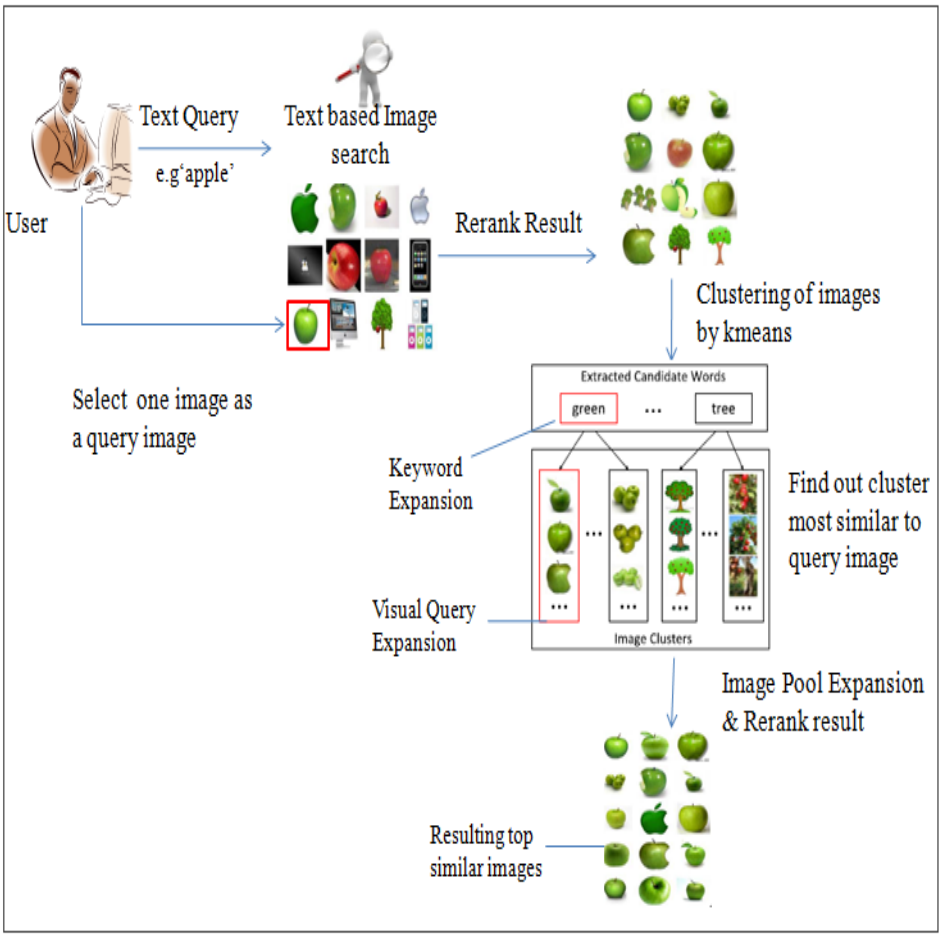

Fig 3.1 *System Architecture*

3.1. Text based Image Search:

For this step, user has to enter text query keyword this module retrieves images based on textual information that surrounds or associated with the images thanthe user is asked to select a query image from this image pool.

3.2. Rank Result based on similarity with query image:

In this step, Images retrieved by text based search are ranked based on their visual similarities to the query image.The visual similarities are computed by extracting visual features like color, texture, shape of images. We are extracting color, texture and shape feature for every image.

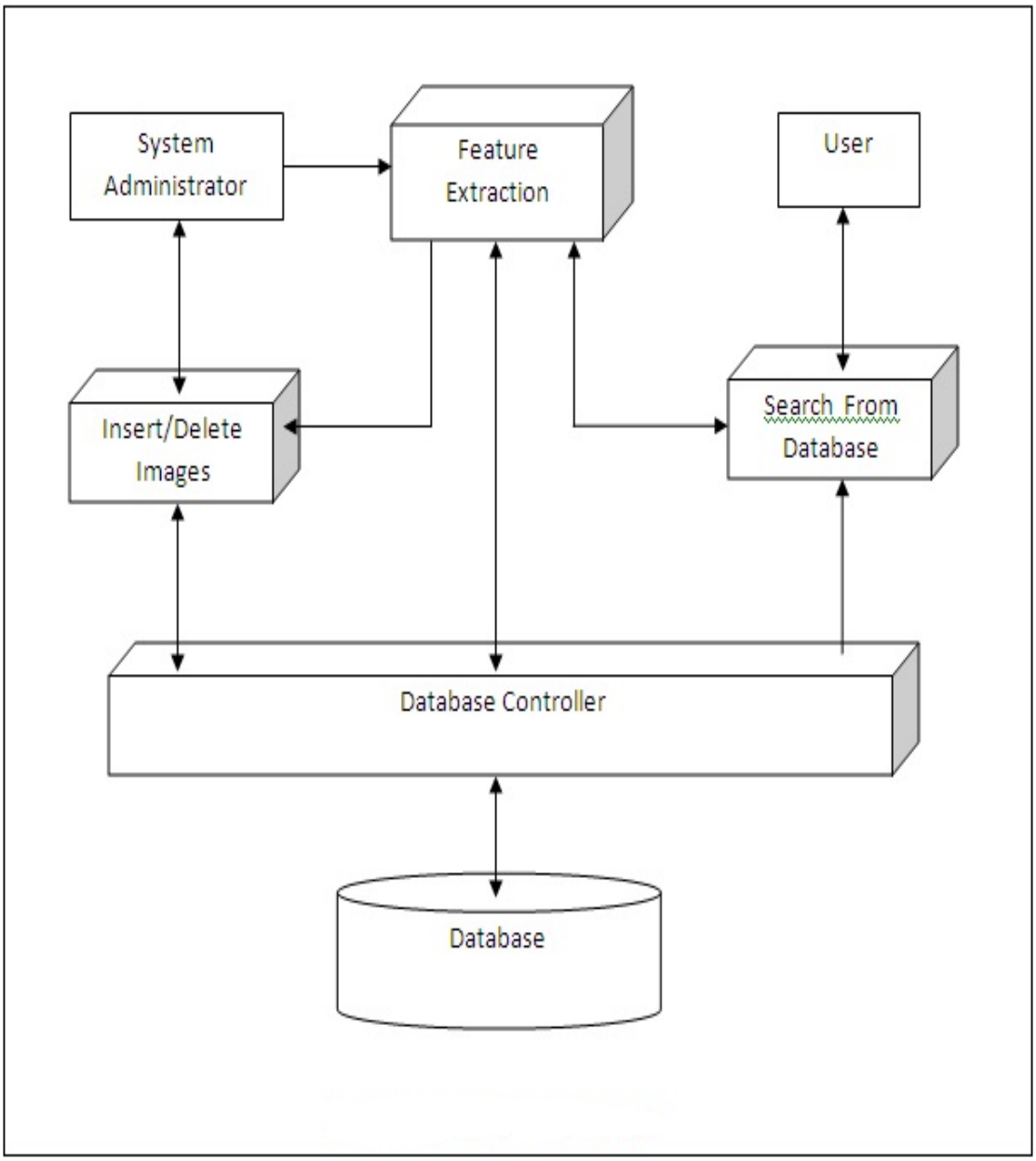

Fig 3.1. *Feature Extraction*

3.2.1. Color Feature Extraction [14]: Color Histogram

The histogram of an image is a plot of the gray level values to the number of pixels at that value.Simply the histogram of the image is graph of intensity values of the color channel and the number of pixels at that value. From the shape of the histogram, we can get the nature of the image or subimage. The features based on the first order histogram probability are the mean, standard deviation, skew, energy, and entropy.

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Mean: The mean is the average value; it gives general brightness of the image.

Color Moment: Color moment of image is used in many image retrieval systems especially when the image contains just the object.

Mathematically, the first three moments are defined as

$$\mu_i = \frac{1}{N}\sum_{j=1}^{N} f_{ij} \; \sigma_i = \left(\frac{1}{N}\sum_{j=1}^{N}(f_{ij}-\mu_i)^2\right)^{\frac{1}{2}}$$

$$s_i = \left(\frac{1}{N}\sum_{j=1}^{N}(f_{ij}-\mu_i)^3\right)^{\frac{1}{3}}$$

Where, N is the number of pixels in the image and fij is the value of thei-th color component of the image pixel j.

Color Entropy:

The entropy is the number of bits we need to code the image data.

3.2.2. Shape Feature Extraction:

Edge detection is mostly used for finding the boundaries of objects within an image. Any abrupt change in frequency of image over the small area within an image is called as an edge. This operation is used to improve an image by showing the directional information only for those pixels that have a strong magnitude for the brightness gradient.

3.3. Keyword Expansion and Visual Query Expansion:

In the keyword expansion step, from the textual descriptions (such as image filenames, surrounding texts in the html pages) of the top n images most similar to the query image, words are extracted. These words are then ranked using tf-idf.The word having highest tf-idf score computed from the top n images is not the correct word to be chosen for keyword expansion. The method proposed in this paper do keyword expansion by image clustering. For each candidate word wi, all the images containing wi are found and they are grouped into different clusters ci,1 , ci,2 . . . , ci,ti based on their visual content. Images with the same candidate word may have a large diversity in visual content.The visual distance between query image and cluster c is calculated as mean of the distance between the query image and images in cluster c.

3.4. Image Pool Expansion and Reranking final result:

From the query image and the visual query expansion, a query specific visual similarity metric and a query specific textual similarity metric are computed.The original image pool retrieved by the query keywords q provided by the user plus the image pool retrieved by the expanded keywords q1 forms the new enlarged image pool.Images in the enlarged pool are re-ranked using the query-specific visual and textual similarity metrics.

3.5. System Modules

List of Modules:

1. Text based Image Search.
2. Rank Result based on similarity with the query image.
3. Keyword Expansion and Visual Query Expansion.
4. Image Pool Expansion and Reranking final result.

Output of system:

Most relevant images.

4. PRACTICAL RESULTS AND ENVIRONMENT

In this section, we represent the practical results and environment.

4.1. Hardware and software Used

Hardware Requirements:-

1. Operating System: windows XP/ Win7
2. Processor: Pentium IV or advanced
3. RAM: 256 MB (min)
4. HDD: 20 GB (min)

Software Requirements:-

1. Programming Language: Java
2. Framework: Net beans 6.8 or more

3. Development Kit: JDK 1.6 or more

4.2. Result of Partial Completed practical work

The performance of Intention Based Image Search Enginecan be evaluated using two terms namely precisionand recall.

1. Precision: Ratio of number of relevant images retrievedto the total number of retrieved images is calledas precision.
2. Recall: Ratio of number of relevant images retrievedto the total number of relevant images presentin database is called as recall.

Text Query	Query Image	DB images	Retrieved images	Relevant	Precision	Recall
Apple	Red Color	20	30	15	0.5	0.75
Apple	ipad	20	15	12	0.8	0.60
Apple	Green Color	20	15	11	0.73	0.55
Palm	reading	20	33	20	0.69	1
Palm	leaf	20	30	18	0.6	0.9

5. CONCLUSION

In this paper, we propose an approach that targets at the retrieving relevant images based on user's search intention.

The approach proposed in this paper uses Text query and Visual information in the image for retrieval .Visual information in image is measured by extracting color, texture, and shape features of image.

From the values of precision and recall obtained for sample user queries, when we combining text based (TBIR) and content based (CBIR) approach helps users to easily find relevant images to clicked query image.

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