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User Intention Based Image Search Using Clusters With Cross Refernce Reranking Result

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Abstract*: Web-scale image search engines (e.g., Google image search, Bing image search) mostly rely on surrounding text features. It is difficult for them to interpret users' search intention only by query keywords and this leads to ambiguous and noisy search results which are far from satisfactory. It is important to use visual information in order to solve the ambiguity in text-based image retrieval. This research work proposes a new approach for web based image search. It only requires the user to click on one query image with minimum effort. The images from a pool retrieved by text-based search are re-ranked based on both visual and textual content. The key contribution is to capture the users' search intention from this one-click query image in four steps. 1) The query image is categorized into one of the predefined adaptive weight categories which reflect users' search intention at a coarse level. Inside each category, a specific weight schema is used to combine visual features adaptive to this kind of image to better rerank the text-based search result. 2) Based on the visual content of the query image selected by the user and through image clustering, query keywords are expanded to capture user intention. 3) Expanded keywords are used to enlarge the image pool to contain more relevant images. 4) Expanded keywords are also used to expand the query image to multiple positive visual examples from which new query specific visual and textual similarity metrics are learned to further improve content-based image re-ranking. All these steps are automatic, without extra effort from the user. This is critically important for any commercial web-based image search engine, where the user interface has to be extremely simple. Besides this key contribution, a set of visual features which are both effective and efficient in Internet image search are designed. Experimental evaluation shows that the approach significantly improves the precision of top-ranked images and also the user experience.

Keywords: CBIR, SIFT

I. INTRODUCTION

DATA MINING

Data mining is primarily used today by companies with a strong consumer focus - retail, financial, communication, and marketing organizations. It enables these companies to determine relationships among "internal" factors such as price, product positioning, or staff skills, and "external" factors such as economic indicators, competition, and customer demographics. And, it enables them to determine the impact on sales, customer satisfaction, and corporate profits. Finally, it enables them to "drill down" into summary information to view detail transactional data.

With data mining, a retailer could use point-of-sale records of customer purchases to send targeted promotions based on an individual's purchase history. By mining demographic data from comment or warranty cards, the retailer could develop products and promotions to appeal to specific customer segments.

Over the past two decades there has been a huge increase in the amount of data being stored in databases as well as the number of database applications in business and the scientific domain. This explosion in the amount of electronically stored data was accelerated by the success of the relational model for storing data and the development and maturing of data retrieval and manipulation technologies. While technology for storing the data developed fast to keep up with the demand, little stress was paid to developing software for analyzing the data until recently when companies realized that hidden within these masses of data was a

WEB SEARCH ENGINE

A **web search engine** is a software system that is designed to search for information on the World Wide Web. The search results are generally presented in a line which often referred to as Search Engine Results Pages (SERPs). The information may be a important in web pages, images, information and other types of files. Some search engines works as mine data available in databases or open directories. Unlike web directories, which are maintained only by human editors, search engines also maintain real-time information by running an algorithm on a web crawler.A query from a user can be a single word. The index helps find information relating to the query as quickly as possible. Some search engines, such as Google, store all or part of the source page as well as information about the web pages, whereas others, such as AltaVista, store every word of every page they find. This cached page always holds the actual search text since it is the one that was actually indexed, so it can be very useful when the content of the current page has been updated and the search terms are no longer in it.Many commercial Internet scale image search engines use only keywords as queries.

Users type query keywords in the hope of finding a certain type of images. The search engine returns thousands of images ranked by the keywords extracted from the surrounding text. It is well known that text-based image search suffers from the ambiguity of query keywords. The keywords provided by users tend to be short. For example, the average query length of the top 1,000 queries of Picsearch is 1.368 words, and 97 percent of them contain only one or two words.

Top-ranked images returned from Bing image search using "apple" query.

In order to solve the ambiguity, additional information has to be used to capture users' search intention. One way is text-based keyword expansion, making the textual description of the query more detailed. Existing linguistically-related methods find either synonyms or other linguistic-related words from thesaurus, or find words frequently co-occurring with the query keywords. For example, Google image search provides the "Related Searches" feature to suggest likely keyword expansions. A query-specific visual similarity metric is learned from the selected examples and used to rank images. The requirement of more users' effort makes it unsuitable for web-scale commercial systems like Bing image search and Google image search in which users' feedback has to be minimized.

Images of gloomy bear

PATTERN RECOGNITION

The pattern recognition is the assignment of a label to a given input value. An example of pattern recognition is classification, which attempts to assign each input value to one of a given set of classes. Pattern recognition is generally categorized according to the type of learning procedure used to generate the output value. Supervised learning assumes that a set of training data (the training set) has been provided, consisting of a set of instances that have been properly labeled by hand with the correct output. A learning procedure then generates a model that attempts to meet two sometimes conflicting objectives: Perform as well as possible on the training data, and generalize as well as possible to new data.

K-MEANS CLUSTERING

K-means clustering is a method of vector quantization originally from signal processing, that is popular for cluster analysis in data mining. K-means clustering aims to partition n observations into k clusters in which each observation belongs to the cluster with the nearest mean, serving as a prototype of the cluster. This results in a partitioning of the data space into Voronoicells.The problem is computationally difficult (NP-hard); however, there are efficient heuristic algorithms that are commonly employed and converge quickly to a local optimum. These are usually similar to the expectation-maximization algorithm for mixtures of Gaussian distributions via an iterative refinement approach employed by both algorithms.

II. LITERATURE SURVEY

Many Internet scale image search methods [1] are text-based and are limited by the fact that query keywords cannot describe image content accurately. Content-based image retrieval [2] uses visual features to evaluate image similarity. Many visual features [3] were developed for image search in recent years. Some were global features, such as GIST [3] and HOG [4]. Some quantized local features, such as SIFT [5], into visual words, and represented images as Bags-of-visual-words (BoV) [6]. In order to preserve the geometry of visual words, spatial information was encoded into the BoV model in multiple ways.

One of the major challenges of content-based image retrieval is to learn the visual similarities which reflect the semantic relevance of images. The Image similarities can be learned from a large training set where the relevance of pairs of images is known [7]. Deng et al [8] learned visual similarities from a hierarchical structure defined on semantic attributes of training images. Since web images are highly diversified, defining a set of attributes with hierarchical relationships for them is challenging. In general, learning a universal visual similarity metric for generic images is still an open problem to be solved.

GROUP: WEB IMAGE SEARCH RESULTS CLUSTERING

The proposed algorithm first identifies several query-related semantic clusters based on a key phrases extraction algorithm, originally proposed for clustering general Web search results. Then, all the resulting images are separated and assigned to corresponding clusters.

As a result, all the resulting images are organized into a clustering structure with semantic level. To make the best use of the clustering results, a new User Interface (UI) is proposed. It is different from existing Web image search interfaces, which show only a limited number of suggested query terms or representative image thumbnails of some clusters. The proposed interface displays both representative thumbnails and appropriate titles of semantically coherent image clusters. Comprehensive user studies have been completed to evaluate both the clustering algorithm and the new UI.

Image search is a long-standing research problem. Before the 1990s, images were manually labeled with texts based on which they were further indexed and retrieved [10]. Since the early 1990s, because of the emergence of large-scale image collections, manual annotation became more and more impractical due to its tedious and time-consuming nature.

REAL TIME GOOGLE AND LIVE IMAGE SEARCH RE-RANKING

A query image is first categorized into one of several predefined intention categories, and a specific similarity measure is used inside each category to combine image features for re-ranking based on the query image. Extensive experiments demonstrate that using this algorithm to filter output of Google Image Search and Microsoft Live Image Search is a practical and effective way to dramatically improve the user experience. A realtime image search engine is developed for on-line image search with re-ranking. Today's commercial Internet scale image search engines use only text information. Users type keywords in the hope of finding a certain type of images. The search engine returns thousands of images ranked by the text keywords extracted from the surrounding text. However, some of the returned images are noisy, disorganized, or irrelevant. Using visual information to re-rank and improve text based image search results is a natural idea. Most of the existing works assume that there is one dominant cluster of images inside each image set returned by a keyword query, and treat images inside this cluster as "good" ones.

INTENTSEARCH: INTERACTIVE ON-LINE IMAGE SEARCH RE-RANKING

Besides searching in the interface of Microsoft Live Image Search, also design a more flexible interface to let users browse and play with all the images in the current search session, which makes web image search more efficient and interesting. Most of the image search engines nowadays use mainly text-based information. Since "surrounding text" is not always accurate, the returned images are often noisy and disorganized. Content-based image retrieval [24] uses visual feature to evaluate image similarity.However, due to the diversity of images and features, a universal feature set and distance measurement for all the images is hard to find. For example, it is difficult to find a feature to work well for both portrait images and scenery images. Relevance feed-back [25] uses user labeled images to improve image rank.

IMPROVING WEB-BASED IMAGE SEARCH VIA CONTENT BASED CLUSTERING

Due to the fact that web-based image search engines are blind to the actual content of images, the result of querying for a specific object is often cluttered with irrelevant data. Alternatively, much research has been done on Content Based Image Retrieval (CBIR). Nevertheless, most CBIR systems require a user to provide one or more query images. In [27] the user provides an image, and selects the "blob" in that image it represents the object of interest.Although quite flexible, this system is burdensome on the user. Similarly, in the system requires several images from a user, which it uses as a training set to build a classifier using AdaBoost. This again requires the user to be a possession of example images. Other research has focused on the task of learning probability models linking text to image regions ([28]). This task requires a large set of data labeled by a human. Also, it is not clear how these techniques would perform on noisy data sets, with mislabeling, as is the case with the Internet.

A VISUAL CATEGORY FILTER FOR GOOGLE IMAGES

Just, type a few keywords into the Google image search engine and hundreds, sometimes thousands of pictures are suddenly available at your fingertips. As any Google user is aware, not all the images returned are related to the search. Rather, typically more than half look completely unrelated; moreover, the useful instances are not returned first.Theyare evenly mixed with unrelated images. This phenomenon is not difficult to explain: current Internet image search technology is based upon words, rather than image content. The filename of the image and text are near the image.these criteria are effective at gathering quickly related images from the millions on the web, but the final outcome is far from perfect. They conjecture that, even without improving the search engine per se, one might improve the situation by measuring "visual consistency" amongst the images that are returned and re-ranking them on the basis of this consistency, so increasing the fraction of good images presented to the user within the first few web pages.

MAJORITY BASED RAN KING APPROACH IN WEB IMAGE RETRIEVAL

The comprehensive retrieval of the image collections on the web become the important research and industrial issue. The web image retrieval has different characteristics from typical Content-Based Image Retrieval (CBIR) systems.In general, web images have the related text annotations which could be obtained from the web pages where images are contained. So conventional web image retrieval systems utilize the text in-formation of the images, and work as text (keyword) retrieval systems. Some systems use the texts and simple image information and other systems provide the user input interface for relevance feedback. Existing web image search systems allow users to search for images via keywords interface and/or via query by image example. Generally, the system.The user is marks one or more images as relevant to the query. The visual image features for these images are then used in defining a visual query. However, it is often ob-served that there are many wrong results in high rank from the keyword-based image retrieval. Moreover, it is difficult to guarantee that there will be even one expected image shown in the initial page. Sclaro called this the page zero problem.

DESCRIPTOR LEARNING FOR EFFICIENT RETRIEVAL

The problem of efficiently retrieving occurrences of a particular object is selected by an image query, in a large unorganized set of images. Typically, methods in particular object retrieval take a text-retrieval approach to the problem in order to achieve fast retrieval at run time. Interest points and descriptors are found in every dataset image and the descriptors are then clustered (usually by k-means or some variant) and quantized to give a visual word representation for each image in the corpus.

III. METHODOLOGY

The proposed a novel Internet image search approach requires the user to give only one click on a query image and images from a pool retrieved by text-based search are re-ranked based on their visual and textual similarities to the query image. To believe that users will tolerate one-click interaction, this has been used by many popular text-based search engines. For example, Google requires a user to select a suggested textual query expansion by one-click to get additional results.

ONE-CLICK QUERY IMAGE

The key problem to be solved in this work is how to capture user intention from this one-click query image. Four steps are proposed as follows,

- Adaptive similarity
- Keyword expansion
- Image pool expansion
- Visual query expansion

ADAPTIVE SIMILARITY

The adaptive similarity designs a set of visual features to describe different aspects of images. How to integrate various visual features to compute the similarities between the query image and other images is an important problem. In this work, an Adaptive Similarity is proposed, motivated by the idea that a user always has specific intention when submitting a query image. For example, if the user submits a picture with a big face in the middle, most probably he/she wants such images with similar faces and using face-related features with more appropriate.

KEYWORD EXPANSION

Query keywords input by users tend to be short and some important keywords may be missed because of users' lack of knowledge and on the textual description of target images. In this approach, query keywords are expanded to capture users' search intention, inferred from the visual content of query images, which are not considered in traditional keyword expansion approaches.

IMAGE POOL EXPANSION

The image pool retrieved by text-based search accommodates images with a large variety of semantic meanings and the number of images related to the query image is small. In this case, re-ranking images in the pool is not very effective. Thus, more accurate query by keywords is needed to narrow the intention and retrieve more relevant images.

VISUAL QUERY EXPANSION

One query image is not diverse enough to capture the user's intention. In step 2, a cluster of images all containing the same expanded keywords and visually similar to the query image are found. They are selected as expanded positive examples to learn visual and textual similarity metrics, which are more robust and more specific to the query, for image re-ranking.

VISUAL FEATURE DESIGN

Visual Feature Design is used to design and adopt a set of features that are both effective in describing the visual content of images from different aspects, and efficient in their computational and storage complexity. Some of them are existing features proposed in recent years. Some new features are first proposed by us or extensions of existing features.It takes an average of 0.01 ms to compute the similarity between two features on a machine of 3.0 GHz CPU. The total space to store all features for an image is 12 KB. More advanced visual features developed in recent years or in the future can also be incorporated into this framework.

IMAGE SEARCH RE-RANKING

Search engine results are often biased towards a certain aspect of a query or towards a certain meaning for ambiguous query terms. Diversification of search results offers a way to supply the user with a better balanced result set increasing the probability that a user finds at least one document suiting her information need. In this distertation, to present a re-ranking approach based on minimizing variance of Web search results to improve topic coverage in the top-k results

IV. ALGORITHM

THE ALGORITHM IS COMPOSED AS FOLLOWING STEPS,

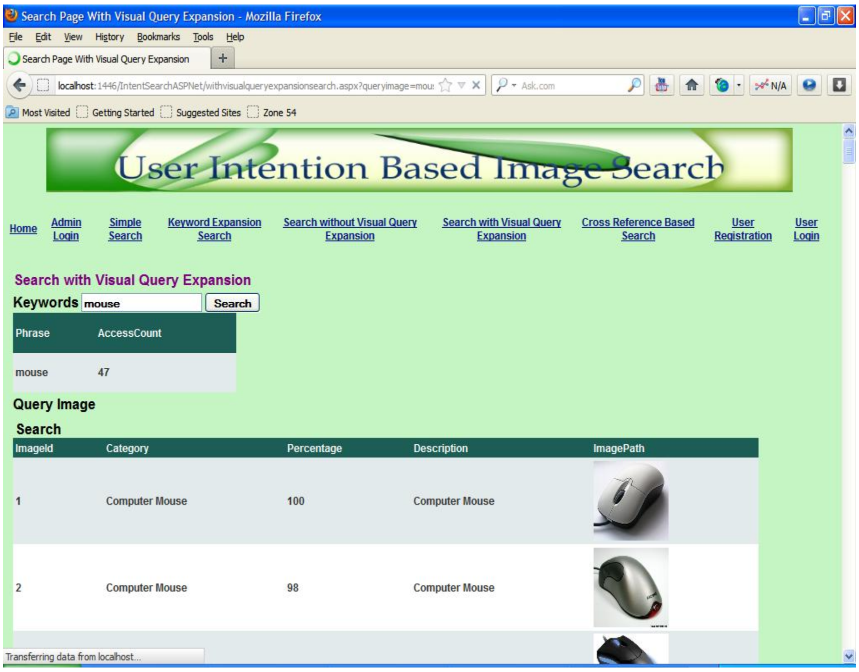
1. Place K points into the space represented by the objects that are being clustered. These points represent initial group centroids.
2. Assign each object to the group that has the closest centroid.
3. When all objects have been assigned, recalculate the positions of the K centroids.
4. Repeat Steps 2 and 3 until the centroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated.

THE K-MEANS ALGORITHM PROCESS

- The dataset is partitioned into K clusters and the data points are randomly assigned to the clusters resulting in clusters that have roughly the same number of data points.
- For each data point:
- Calculate the distance from the data point to each cluster.
- If the data point is closest to its own cluster, leave it where it is. If the data point is not closest to its own cluster, move it into the closest cluster.
- Repeat the above step until a complete pass through all the data points results in no data point moving from one cluster to another. At this point the clusters are stable and the clustering process ends.
- The choice of initial partition can greatly affect the final clusters that result, in terms of inter-cluster and intracluster distances and cohesion.

V. RESULTS AND DISCUSSION

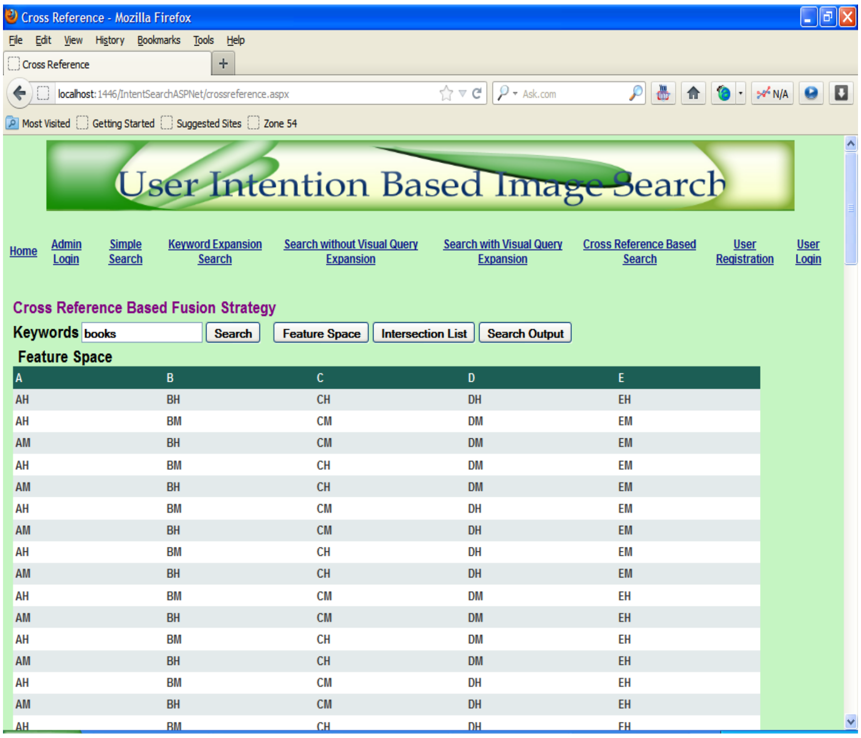
1. SEARCH WITH VISUAL QUERY EXPANSION



Visual Feature Design is used to design and adopt a set of features that are both effective in describing the visual content of images from different aspects, and efficient in their computational and storage complexity. Some of them are existing features proposed in recent years. Some new features are first proposed by us or extensions of existing features. It takes an average of 0.01 ms to compute the similarity between two features on a machine of 3.0 GHz CPU. The total space to store all features for an image is 12 KB. More advanced visual features developed in recent years or in the future can also be incorporated into this framework.

2. FEATURE SPACE

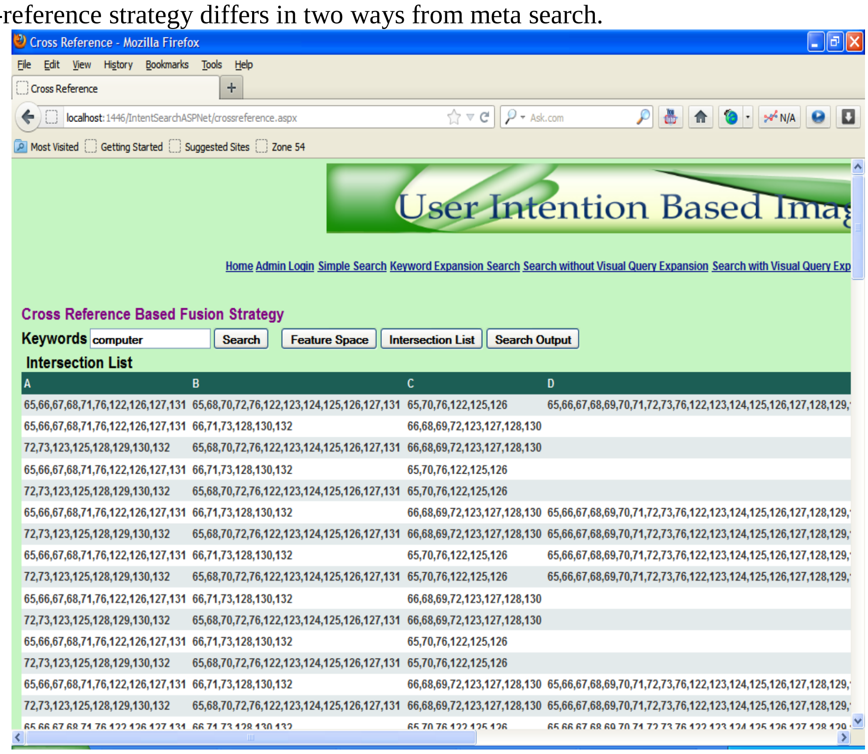
The three key contributions are made to the image search re-ranking. The first contribution is that multiple modalities are considered individually during clustering and cluster ranking processes. It means that re-ranking at the cluster level is conducted separately in distinct feature spaces, which provides a possibility for offering higher accuracy on the top-ranked documents.



The multimodal features are first concatenated into a unique feature, and the subsequent clustering and cluster ranking are then implemented once in the above unique feature space. The second contribution is defining a strategy for selecting some query-relevant shots to convey users' query intent. Instead of directly treating the top-ranked results as relevant examples like PRF, it further filter out some irrelevant shots using some properties existing in the initial rankings.

3. INTERSECTION LIST

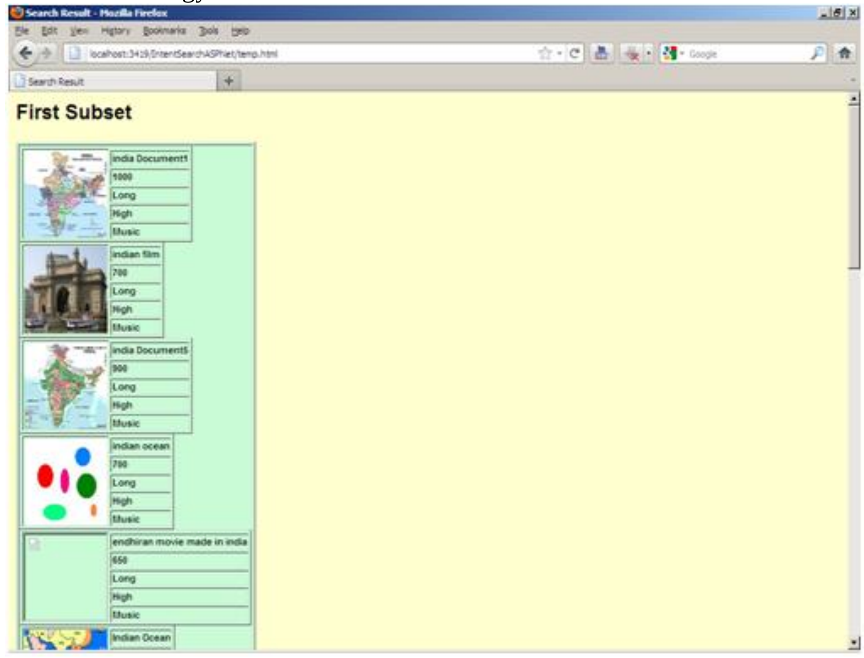
As a result, the accuracy on the top-ranked documents is given more consideration. Because the "unequal overlap property" is employed implicitly, this fusion strategy is similar to the meta search methods to a certain extent. However, our cross-reference strategy differs in two ways from meta search.



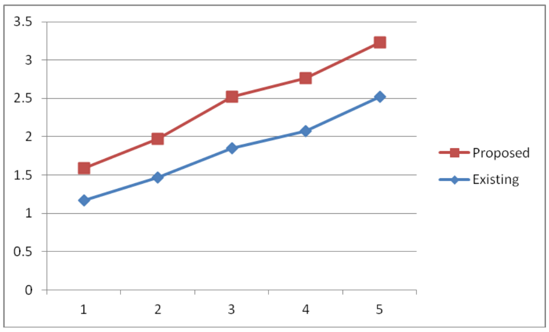
The first difference is that, instead of combining multiple ranked lists from different search engines, they integrate multiple reordered variants of the same result list obtained from only one text-based video search engine. The second one is that, instead of fusing multiple lists at the shot level, to first coarsely rank each list at the cluster level, and then integrate all the resulting clusters hierarchically.

4. CROSS REFERENCE RESULT

The CR ranking is utilized for inferring the most relevant shots in the initial search results, which is different from its original role. CR-Re-ranking method contains three main stages: clustering the initial search results separately in diverse feature spaces, ranking the clusters by their relevance to the query, and hierarchically fusing all the ranked clusters using a cross-reference strategy.



5. RESULT OF THE VISUAL QUERY EXPANSION



The purpose of the user study is to evaluate the effectiveness of visual expansions (expanding both the image pool and positive visual examples) to capture user intention. Forty users are invited. For each query keyword, the user is asked to browse the images and to randomly select an image of interest as a query example. To show them the initial image re-ranking results of using adaptive weight schema and the results of extending both the image pool and positive example images.

Each user is assigned five query keywords from all 10 keywords. Given each query keyword, the user is asked to choose 18 different query images and compare their re-ranking results.

VI. CONCLUSION

The new system eliminates the difficulties in the existing system. It is developed in a user-friendly manner. The system is very fast and any transaction can be viewed or retaken at any level. Error messages are given at each level of input of individual stages. This research work is very particular in reducing the work and achieving the accuracy. It will reduce time be avoids redundancy of data. The user can easily understand the details available from the report. This work will support for the future development.The research work is menu driven. Image can be uploaded and processed very easily.

- Speed and accuracy is maintained in image processing.
- Data is entered in formatted manner.
- The related images can be searched with additional input.
- Modification and maintenance can be made to web site very easily.

VII. SCOPE FOR FUTURE ENHANCEMENTS

The research work has covered almost all the requirement. Further requirements and improvements can easily be done since the coding in mainly structured or modular in nature. Improvements can be appended by changing the existing modules or adding new modules. Several areas to be developed in future, so the application must be upgraded for the new ones required and it is possible to modifications according to new requirements and specifications.

The Future Analysis of this research work as follows:

- The research work only developed for the purpose of only image editing. In future, they will plan to add another process of video concept.
- Facilities fast data backup and restoration facility in case of data loss situations.
- The images search details can be cached in server memory so that they can be used in future searches within the near time interval of previous search.

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