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Privacy Based Image Retrieval Using Visual and Textual Features

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***Abstract*—**

The number of internet users is increasing day by day. As the quantum of data to be accessed is increasing, the demand for fast response is increasing. To address this issue, most of the researchers are working in this field of relevant information retrieval. This work focuses on image retrieval based on visual and textual features. In this process, the first search is done on the basis of textual content and then the visual features values obtain from the query image are compared with the dataset filtered image. Images with similar visual feature values is consider as relevant and the most similar images is ranked as first and next as second and so on. Results show that combination of both types of features gives more effective results as compare to single type.

Keywords*— *Digital Image Processing, Information Extraction, feature extraction, Re-ranking.

I. INTRODUCTION

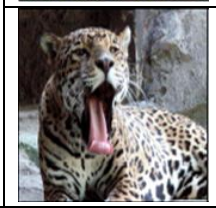
The number of internet users is increasing day by day. The time for surfing is also increasing. Lots of work has been done by the researcher out of which image retrieval is become an important field for providing only the relevant images on the user system from the collection of images.

Image retrieval is performed first on text base [14] that uses text data attached with the image. This is done by using name of the image or some information present with the image, depends on the type of collection. Most of the search engine like Google, Yahoo, Bing, etc. uses this concept of searching the image for user text query but the ranking is totally base on the textual data attached with the image.

Another way of searching the image is by passing the image as a query, in above user query in form of text [3, 13]. Here the query image visual features are read and similar type of visual feature images are retrieved from the dataset, and then those images are shown to the user as relevant images for the passed query.

Fig.1 Image retrival by text query.

One more approach for this is by using textual feature which is name or any other content, with the visual feature of the image [4]. So a combination of both is used here and results are much better as compare to the single feature query algorithm. But here the execution time is comparatively large, so time complexity is more. Because of this, although results are much effective but time duration make it impractical for common use.

Dataset	Query By Example	Relevant images
		
		

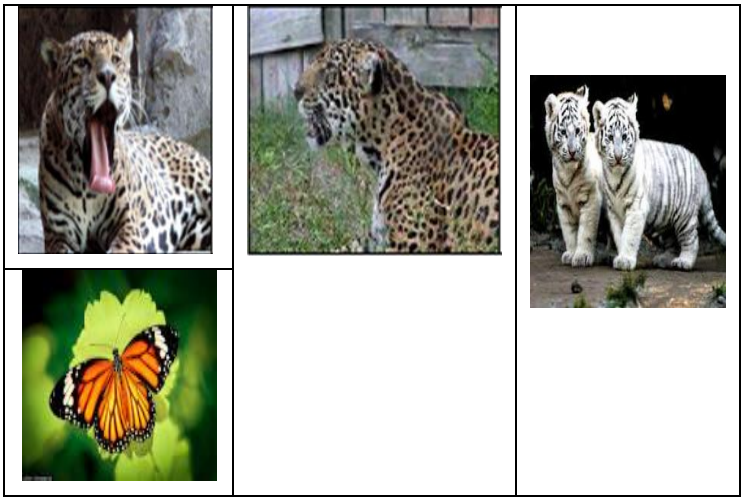


Fig. 2 Image retrival by visual query.

This paper focuses on visual as well as textual feature of the image and reranked images on the basis of the query passed by the user. Some of the important feature of the image which is used in the images are color, CCM, GLCM. This paper give a detailed study of the different feature and there combination for the result.

II. RELATED WORK

The objective of the work [1] is to form categorized image databases harvested from the web. The re-ranking operation is performed for separating relevant and irrelevant results by the usage of a combination of textual and visual features.
In [7] a method that uses user intervention to re-rank the results is proposed. In their approach, a small subset of correct images is manually constructed and this subset is then used to filter the noise in the data. There have been some works exploiting multiple modalities for image search applications. In [8] perform joint clustering in a space built from visual and tag descriptors to find iconic summaries of abstract concepts.
In [10] fetching of image are done from the web by reading the surrounding image. Similarly In [9], tached textual data is utilized from the web page for ranking befor the support vector training which utilize visual effects.
Few of the image reranking algorithm utilize the web page ranking method as in [11] where important pages are ranked first base on their importance. It builds a graph representing the link structure of the web. As the web page get impotant depend on the number of hyperlink present in it.
As [2, 12] shows the approach for page reranking by the multi-modal where it utilize both the visual as well as textual feature. Here it jointly fetch both the feature and implement it in the many applications. One more approach is use here that include autoannotation where text data is automatically updated.

III. BACKGROUND

As Image is collection of pixel and each pixel is treat as single value which is a kind cell in a matrices. In order to identify an object in that image some features need to be maintained as different object have different feature to identify them which are explain as follows:
Colure feature: By storing the pixel value in an image is nothing accept an representation of the color intensity at that point in an image. Because of the various image format pixel values are different for the same image. This can be understand as in RGB three matrix of same image are prepare for Red, Green, Blue matrix range of any pixel value is between 0-1. While in the case of the gray format it is of single matrix range of any pixel value is between 0-255.

IV. PROPOSED WORK

Pre-Processing: Text pre-processing is consisting of words which are responsible for lowering the performance of learning models. Data pre-processing reduces the size of the input text query significantly. Stop-words are functional words which occur frequently in the language of the text (for example a, the, an, of etc. in English language), so that they are not useful for classification. Now read the file which contains stop words then remove similar words from the vector. Once the data is pre-process then it will be the collection of the words that may be in the vector. For example let one query is taken and its text vector is Rd[] ={a1, f1, s1, a2, s2, a3, a4, f2……..an} and let the stop words collection is S[] = {a1,a2,a3,…….am}. Then the vector obtain after the Pre-Processing is D[] = {f1, s1, s2, f2,…….fx}.
D[] = Rd[] – D[]
For Example: Rd[] = {‘Every’,’ morning’, ‘Ram’,’ study’,’ for’,’ two’,’ hour’,’ and’,’ during’,’ this’,’ time’,’ his’,’ mother’,’ give’,’ him’,’ one’,’ glass’,’ milk’,’ with’,’bread’,’jam’,’in ‘,’breakfast’}
After pre-processing
Now D[] = {‘Ram’,’ hour’,’ time’,’ glass’,’ milk’,’bread’,’jam’,’breakfast’}
Now assign number to each text of the query. So that a dictionary of words with there number is created where each text is identified by separate number. Such as

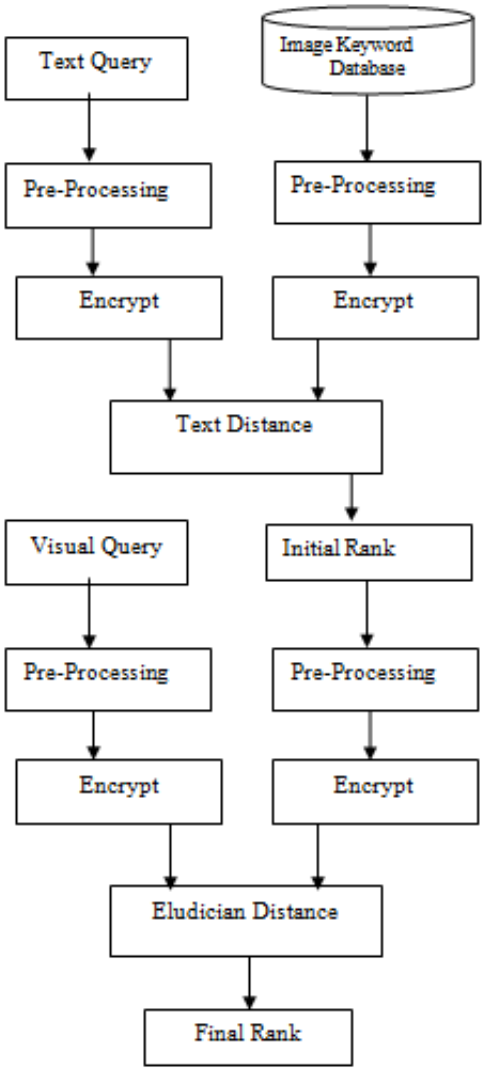


Fig. 3 Represent Block diagram of proposed work.

D[] = [1, 2, 3, 4, 6, 7, 8, 9]
So for n document has its own vector sequence D[n].
Pailler cryptosystem: This cryptosystem is base on the public and private key concept. Here input vector D[n], will be encrypt by this algorithm.

1. Choose two large prime numbers p and q randomly and independently of each other such that gcd(pq,(p−1)(q−1))=1.
2. Compute RSA modulus $n = pq$ and
   Carmichael's function $\lambda\lambda=lllll(pp-1,qq-1)$
3. Select generator g, Select α and β randomly from a set $\mathbb{Z}n*n$ then calculate $g=(\alpha n+1)\beta*\beta \bmod(n*n)$
4. Calculate the following modular multiplicative inverse
   μ=mod(n) / ($L(g\lambda \mod(n*n)-1$
   Where the function L is defined as $(u)=(u-1)/n$.

So The public key is (n, g), private key is (λ, μ).

Query Distance:
Here input query after encryption is transform in other numeric value. So conversion of same text has same value for comparison. This can be understand as let "College" word have numeric value 28 after encryption its transform value is 2456. So if "college" present at server for image keyword then its transform value is also 2456 only for same set of encryption key.
In this step count of similar query words found in image keywords is use for ranking. This can be understand as let query be {2456, 1324, 2783} and I1 content is {2456, 1324, 2711}, while I2 content is {1256, 1114, 2783} then distance of query from I1 and I2 is [2, 1]. Base on distance vector I1 image has high rank as compare to I2.
Visual Pre-Processing: In this step image is resize in fix dimension. As different image have different dimension. So conversion of each is done in this step. One more work is to convert all image in gray format. AS different image has RGB, HSV, etc. format so working on single format is required.

Eludician Distance:
This can be understand as Let X be a query image matrix and Y be the dataset image matrix. Then distance between them is calculate by:

$$D = \sqrt{sum((X - Y)^2)}$$

Base on the minimum distance value between query and dataset image rank is assigned to the image. This is consider as final rank of the work.

V. EXPERIMENT AND RESULT

In this section, first introduce experimental settings, and then present the experimental results that validate the effectiveness of the approach. The experiments actually contain two parts. This work is compare with other several existing methods.
We adopt NDCG [6, 12] as the performance evaluation measure.
The NDCG measure is computed as

$$NDCG@P = Z_P \sum_{i=1}^{P} \frac{2^{l(i)} - 1}{\log(i+1)} \quad (9)$$

where *P* is the considered depth, *l(i)* is the relevance level of the *i* -th image and *ZP* is a normalization constant that is chosen to let the optimal ranking's NDCG score to be 1.

Data Sets and Preprocessing

In order to conduct the experiment an artificial dataset which is a collection of images from different category are utilize. As images are of different format so first it is necessary to make it in readable format for experiment tool MATLAB. Now this collection of images of different category are shown in table 1 for which one can make some important keyword collection for different images. In this way each image have one more feature to identify that is the keys of the images.

TABLE 1 DATASET OF DIFFERENT CATEGORY.

Category	**Examples**
Objects	Ipod, map
animal	Butterfly, Gorrila
scene	Taj Mahal, Hotel Taj
Person	Barack Obama, Lena

By entering the query and search the desired image it was obtained that they can be categorize into few levels such as relevant or not. It can be further categorize into most relevant, relevant, less relevant, irrelevant.

Fig. 4 Above image are generate from two category relevant and irrelevant for two query 'Taj Mahal', 'Barack Obama'.

Fig. 5 Results obtained by visual,

Fig.6 Results obtained by Textual,

Fig.7 Results obtained by Visual +Textual.

TABLE 2. AVERAGE VALUES OF NDCG@10 BY DIFFERENT FEATURES AND THERE COMBINATION.

Method		**NDCG Values**		
		Person	**Animal**	**Scene**
1	Visual	0.2201	0.3629	0.2201
2	Textual	0.5329	0.4959	0.4636
3	Textual + Visual	0.6333	0.5767	0.767

TABLE 3. EXECUTION TIME FOR DIFFERENT METHODS.

Method		Execution Time in Second		
		Person	Animal	Scene
1	Visual	2.26357	4.40215	2.23632
2	Textual	0.833855	0.814015	0.814271
3	Textual + Visual	.080068	0.788313	0.778547

TABLE 4. AVERAGE VALUES OF NDCG@7 BY DIFFERENT FEATURES AND THERE COMBINATION.

Method		**NDCG Values**		
		Person	**Animal**	**Scene**
1	Visual	0.2749	0.3665	0.2749
2	Textual	0.4961	0.5399	0.4996
3	Textual + Visual	0.7082	0.7202	0.7958

From the above table it is find that the including of the new feature for query has increase the efficiency of image re-ranking. In different categories of the images one can find that results are improved.

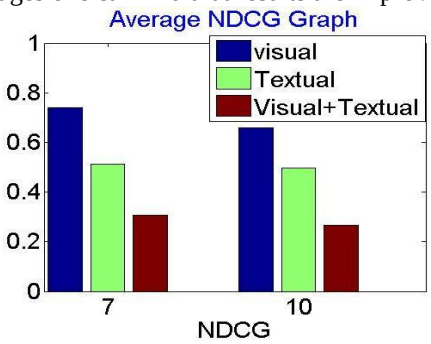


Fig. 8 Average NDCG values for different environment.

It is clear from the above bar graph that the values at different NDCG levels is better then the individual feature method. So the utilization of the visual features has increase the efficiency of the work then the single features.

VI. CONCLUSIONS

World Wide Web has necessitated the users to make use of automated tools to locate desired information resources and to follow. Web image re-ranking has been widely used to reduce the user searching time on the internet; its success mainly depend on the accuracy of image features similarities. This paper present utilizing of the new text as well as visual features for ranking the image as both make the re-ranking process more powerful, which is shown in results. In future in order to improve the efficiency more features of images will be include. As to reduce the server time of making graph and re-ranking one filter need to be inserted into this so that it will filter relevant and irrelevent images at the initial stage.

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