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An Integrated Approach for Image Retrieval through Similarity Measures

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Abstract: *In the recent years, use of Social multimedia websites, like Facebook, YouTube, Flickr, and Picasa has increased tremendously. Use of e-commerce websites such as Flipkart, Amazon, Snapdeal and eBay are increased a lot around in today's world and becomes an integral part of our life. Such network contains lots of images which are accompanied by information such as comments, annotations and thus forms heterogeneous image rich information network. In this paper, link plus content based similarity approach is presented to perform image retrieval in heterogeneous image rich information network. Also personalized image search approach is presented in this paper which is based on annotations of the image. Presented image retrieval system will help user to get better results in the terms of relevance.*

Keywords: *Personalized image search, Search Engine, Image network, Image Retrieval.*

1. INTRODUCTION

Social multimedia websites such as Flickr, Picasa, Facebook and YouTube are very popular around the world. Social multimedia websites of such types contains lots of images uploaded by users. E-commerce websites such as Flipkart, Amazon, Snapdeal and eBay are also furnished with enormous amount of product related images. Such type of network contains lots of images which are accompanied by information such as comments, annotations, owner, customer, groups and image features thus forms heterogeneous image rich information network. Retrieval of relevant images in such networks is very important in order to satisfy user's need.

Most commercial image search engines use textual similarity to return semantically relevant images. These search engines fails to retrieve relevant images sometimes because annotations are not accurate or not describe the image properly. In content based image retrieval (CBIR), image content features like edge histogram [1], color histogram, Shape [2], [3] and texture features are used to perform image retrieval. Content based similarity also provides unsatisfying results sometimes.

In Link based similarity, similar images are likely to link to similar groups and tags [5]. In link based semantic similarity between images is defined as combination of similarity of group and similarity of tags. Similarity between image pairs is calculated as similarity between group pairs of images and similarity between tag pairs of image until the convergence is reached.

In this paper, integration of link and content based similarity approach is proposed to provide relevant image search efficiently and effectively. MokSimRank approach to significantly improve the speed of SimRank which considers both link and content information by integrating reinforcement learning with feature learning. In an image-rich information network, similar images are likely to link to similar groups and tags, so the link-based semantic similarity between images is considered [7]. The group similarity is computed via the similarity of the images and tags they link to, and the tag similarity is calculated via the similarity of the images and groups they link to.

Keyword/text based search is most popular search in today's search engines. In spite of keyword based/text based approach are simple and efficient, but performance of this approach is far from satisfying and provides poor user experience due to the reasons like, queries are short, not descriptive and nonspecific and different users have different intensions for same query [4]. These problems are avoided by using personalized image search approach. In proposed approach, user specific information is considered to distinguish the exact intension of query entered by the user and perform re-ranking of the results. In personalized search, ranks of images are decided by user's query as well as by user preference [6]. For user preferences, tagging of images are considered. In proposed approach, link and content based similarity approach is considered along with personalized image search approach in which user's query and user preference are simultaneously considered.

2. SYSTEM ARCHITECTURE

Figure. 1 describes the system architecture for proposed image retrieval system. This system architecture has four layer architecture. The bottom layer contains an image data warehouse which includes images and related image information.

The second layer performs information extraction and image feature extraction.

The third layer builds an image information network.

The next layer performs analysis of image information which is available in the database and finds relevant image results for a query and query image given by the user using ranking algorithm.

The top most layer provides interface to user. Through this interface, user can interact with the system and system can responds to user's requests.

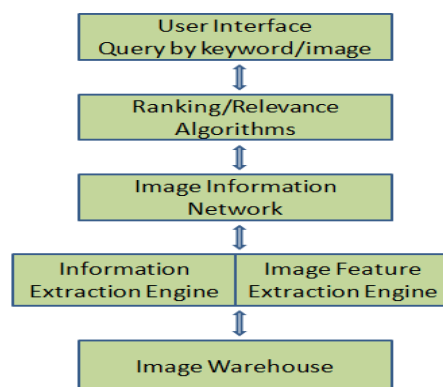


Fig 1: Proposed System Architecture

3. ALGORITHMS

In proposed image retrieval approach, both link based and content based similarities are considered to find most relevant images as per user's query search criteria and user's preference.

The Algorithm for proposed image retrieval system is defined as below:

Algorithm I : Integration Algorithm using Link based and Content based similarity measures

Input: I, the image network.

1. Construct kd-tree over the image features;
2. Initialize similarity scores;
3. Iterate {
4. Calculate the link similarity for image pairs via HMok-SimRank;
5. Perform feature learning using either global or local feature learning;
6. Update the new image similarities
7. Compute link-based similarity for all group and tag pairs via HMok-SimRank;
8. Add to result list

9.} until converge or stop criteria satisfied.
10. Return result list

Output: R = Result Image List

Algorithm II: Personalised Search

Input : I = Images, C = Category, A = Annotations, Q = Search query

1. Initialize I image Loader
2. I = Load i(1...n)
3. Where n is number of Images
4. Initialize C category Loader
5. C= Load i(1...n)
6. Where n is number of category
7. Initialize A annotations Loader
8. A = Load i(1...n)
9. Where n is number of annotations
10. Get input query
11. Generate user interest profile
12. Q = Input Load Query
13. Divide input
14. While for each I
15. Feature of I =E
16. If(query . contains I && query . contains user's link interest profile)
17. Add to result list
18. Return result list

Output: R = Result List

4. EXPERIMENTS

A. Dataset

In this experiment, images from flickr dataset are used to perform image retrieval.

B. Results

1. Results for "Link Based "search option is presented in Fig 2. Here search query is provided as "Apple".

Query: Apple

Time :0.0176ms








ID	CATEGORY	ANNOTATION	IMAGE	UPLOADER
11	company	apple logo		admin
12	company	apple company logo		admin
15	tree	apple		admin
13	company	apple company logo		admin
14	tree	apple fruit		admin
16	tree	apple		admin
17	tree	apple		admin

Fig 2: Result for "Link Based "search

- Results for “Content Based “search is presented below in Fig 3. Here search image is provided as image of “Apple logo”.

Query Image: Apple logo



Time :0.0445ms

ID	CATEGORY	ANNOTATION	IMAGE
10	company	apple company logo	
17	tree	apple	
24	Insect	bettle wild insect	
13	company	apple company logo	
31	flower	yellow rose	
34	flower	beautiful yellow rose	
14	tree	apple fruit	

Fig 3: Image Search Result for “Content Based “Search

- Results for “Link based+ Content based” Search is presented in Fig 4. Here search query is provided as “Apple” and query image as “Apple logo”.

Query: Apple and Query Image: Apple logo



Time :0.0206ms







ID	CATEGORY	ANNOTATION	IMAGE	UPLOADER
10	company	apple company logo		admin
11	company	apple logo		admin
12	company	apple company logo		admin
13	company	apple company logo		admin
14	tree	apple fruit		admin
15	tree	apple		admin

Fig 4: Result for “Link + Content based” Search.

4. Result for “Personalised Search” is presented in Fig 5. Here query is given as “Apple”.

User’s interest profile is in searching apple fruit. So shown apple fruit images are shown at top.

Query: Apple

Time : 0.0166ms








ID	CATEGORY	ANNOTATION	IMAGE
14	tree	apple fruit	
15	tree	apple	
16	tree	apple	
17	tree	apple	
10	company	apple company logo	
11	company	apple logo	
12	company	apple company logo	

Fig 5: Result for “Personalised Search”.

C. Speed Performance

Figure 6 shows the time performance of proposed algorithm. X axis presents the number of images and Y axis presents the running time.

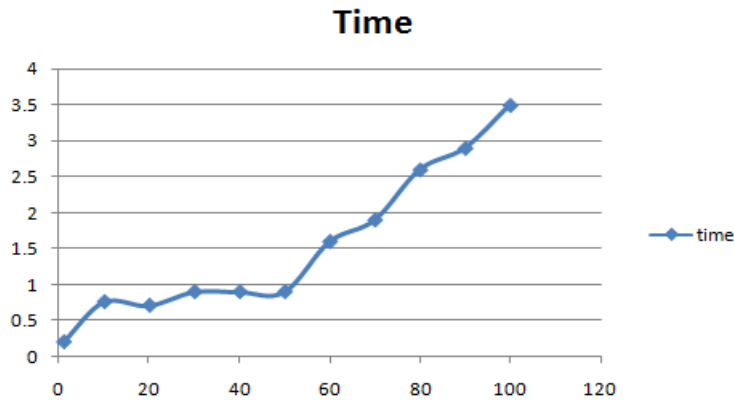


Fig 6: Result for Speed Performance

5. CONCLUSION

In this paper, a novel image retrieval approach is proposed which combines link and content based retrieval. Retrieved results accuracy is superior as compared to using the techniques separately/alone. The proposed integrated image retrieval system allows the users to retrieve their desired images based on the link and/or sample image query. Also proposed personalized image search approach helps to improve image searching experience in the terms of query relevance and user preference by considering annotations of the images. The experiments conducted on the sample data sets prove the effectiveness of the system.

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