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Comparative Results of CBIR and Region Growing for Image Retrieval System

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ABSTRACT: Now in these days search systems are optimized for finding the user targeted (i.e. video, audio, image, web documents) data search. Therefore various different kinds of search systems are developed in recent years. Additionally due to advancement on technology the demand of multimedia data search is also growing rapidly. In order to satisfy the need of the image data search from web data sources new approaches is required to investigate. In this presented work the image data retrieval techniques are investigated and a new model for enhancing the user query relevancy is proposed. The given technique club traditional technique of content based image search and tag based image annotation techniques for optimized performance of content based image retrieval.

The proposed hybrid image retrieval technique is designed using the three different feature extraction techniques and image annotation. Therefore for finding the shape, texture and color features the canny edge detection technique, local binary pattern analysis and the grid color movement analysis techniques are employed.

Finally the performance of proposed classification technique is evaluated in terms of memory consumption, training time, search time, precision and recall.

KEYWORDS: Image Retrieval, Feature Extraction, Precision, and Recall.

I. INTRODUCTION

The data retrieval systems are frequently used by the internet users. These retrieval systems are works on the basis of user guidelines or according to the relevancy analysis. In addition of that there are a number of approaches are recently developed to improve the data extraction quality and improving the relevant contents.

Internet is a rapid growing technology which serves data to all the users of internet. Due to the communication aspects the internet is becomes more effective medium of communication due to its low cost, availability and ease of accessibility. The internet is not limited to send message, communicate using chat systems that is also used for making search for finding text and also for multimedia data (video, audio, image, etc.). Therefore the modifications over the traditional search technique are required for finding the relevant multimedia data from internet sources.

There are a number of data formats are available in multimedia data formats in this presented work the image data is targeted for investigation. In literature a number of image retrieval techniques are available among them content based image retrieval has their own place. In addition of that the content based image retrieval techniques are more accurate as compared to the other techniques. Thus in this presented work the content based image retrieval

techniques are evaluated and a detailed study on image retrieval techniques is performed. In addition of that for improving the image search accuracy and efficiency by considering different techniques of user query a new concept is also proposed. Thus the key aim is to improve the existing system based on improving the search methodology according to the user query. Finally to justify the proposed solution against the traditional methods the proposed technique is implemented and compared with the traditional approach of image retrieval which is based on the given concept in [1] and that is also compared with the tag based image retrieval system as listed in [2].

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II. RELATED WORK

This section provides the different recently made contributions and researches on the content based image retrieval techniques.

Bow (Bag-of-Words) based picture recovery describes, the SIFT ocular express has a small discriminative influence, so fake optimistic competitions arise commonly. Apart from the information defeat through quantization, one more cause is that the SIFT characteristic only explains the restricted incline sharing. To address this difficulty, Liang Zhang et al [3] propos a coupled Multi-Index(c-MI) structure to present characteristic synthesis at indexing stage. Essentially, conflicting characteristics are combined into a multi-dimensional upturned directory. Every measurement of c-MI communicates to one type of characteristic and the recovery procedure votes for pictures like in both SIFT and other characteristic spaces. Specifically, they develop the synthesis of restricted color characteristic into c-MI. While the correctness of optical opposition is really improved, we accept manifold task to recover remember. The combined collaboration of SIFT and color characteristics considerably decreases the collision of false optimistic equals. Wide trials on some benchmark datasets show that c-MI develops the recovery correctness appreciably, while overwhelming only not whole of the question time evaluated to the baseline. Significantly, we demonstrate that c-MI is fine balancing to lots of prior methods. Assemble these techniques; we have attained an MAP of 85.8% and N-S achieve of 3.85 on vacation and UK Bench datasets, correspondingly, which evaluate optimistically with the state-of-the-arts.

CBIR (content-based image retrieval system) describes, the major matter is to remove the picture characteristics that efficiently symbolize the picture satisfied in a record. Such a removal necessitates a thorough assessment of recovery presentation of picture characteristics. Usually worn color features including color moments, color histogram and color correlogram and Gabor surface are compared. Sheena V.B. et al [4] reconsiders the augment in competence of picture recovery when the color and surface characteristics are united. The resemblance calculates based on which equals are completed and pictures are recovered are also argued. For effectual indexing and quick penetrating of pictures based on ocular characteristics, neural network based pattern learning can be used to achieve effective categorization.

III. PROPOSED WORK

The key aim of the proposed work is to investigate the traditional methods of CBIR and providing an accurate and efficient technique for the content based image retrieval. Therefore the following works are included in this study.

1. Study of various image retrieval techniques:
   In this phase of study various methods available for image retrieval is investigated and some essential methods are recovered by which the relevancy of image is improved.

2. Study of performance improvement techniques:
   In this phase various performance improvement techniques (i.e. tag based and content based image retrieval) are investigated by which the search results are improved during image search.

3. Design and implementation of user query relevance technique for image search:
   In this phase the previously recovered techniques are employed on the traditional system and their performance improvement is performed by using both the concepts of image retrieval (i.e. tag based and content based image retrieval).

4. Performance study of the proposed technique:
   In this phase the performance analysis of the proposed technique is provided in terms of space and time complexity. Additionally theaccuracy of query relevancy is measured in terms of precision and recall values. Finally the existing models of the content based and tag based image retrieval is used for comparativeperformance study.

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A. Problem Domain:

In this field of Image Tagging, the problem on how to incorporate both image content and tag information into image retrieval and annotation tasks, to take advantages of both the visual information and user-contributed tags for image retrieval, we need to tackle two main challenges.

1. The First Challenge is how to bridge the semantic gap between image contents and image tags.
2. The Second Challenge is how to create a scalable and effective algorithm.

B. Solution Domain:

After successfully study and implementation of the proposed content based image retrieval concept the following outcomes are expected from the system.

1. A rich collection of literature:
For finding the promising techniques of image retrieval a number of techniques and algorithms are investigated by which a significant literature is prepared.

2. An accurate image retrieval technique:
From the collected literature various techniques are recovered which are more promising and using the previous concept a new data model is prepared for user query relevance image search.

3. A comparative performance study:
After implementation of the proposed concept of image retrieval the performance of the system is evaluated and their performance is compared to justify the proposed work.

IV. PROPOSED ALGORITHM

The entire design of the proposed content based image retrieval technique is demonstrated in two major modules. The detailed understanding about these modules is discussed as:

Training Algorithm:

Step 1: Input training image I
Step 2: I_1= region Growing(I);
Step 3: Compute features of image
- i. I_c=Color_feature(I_1)
- ii. I_E=Edge_feature (I_1)
- iii. I_{LBP}=texture_feature (I_1)

Step 4: $normalize\ image\ features$
- i. ln=normalize features(I_c, I_E, I_{LBP})

Step 5: Input user Tags T
Step 6: Store in database
Step 7: Store(In, T)

Testing Algorithm:

Step 1: Input user query Q
Step 2: If (queries == “text”)
- i. Load list of T
- ii. Find $d = \sum\sqrt{(T-Q)^2}$
- iii. If (d→0)
- iv. Return Tag and image

Step 3: End if
Step 4: If (query == “image”)
- b. Compute features of image
  - i. I_c=Color_feature(I_1)

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ii. I_E=Edge_feature (I_1)
iii. I_{LBP}=texture_feature (I_1)
c. $normalize\ image\ features$
i. In=normalize_features(I_c, I_E, I_{LBP})
d. Find $d = \sum\sqrt{(In - Q)^2}$
e. Return image
Step 5: End if

V. RESULT ANALYSIS

The implemented model of the proposed image retrieval system is discussed in this chapter. Therefore the performance of both the techniques traditional as given in [1] and [2] is compared with the proposed model in this chapter over different performance parameters.

1. Memory Consumption:

The amount of space in main memory required to execute the algorithm is known as the memory consumption of the algorithm. The comparative performances in terms of memory for implemented algorithms are demonstrated using the Figure 4.1.

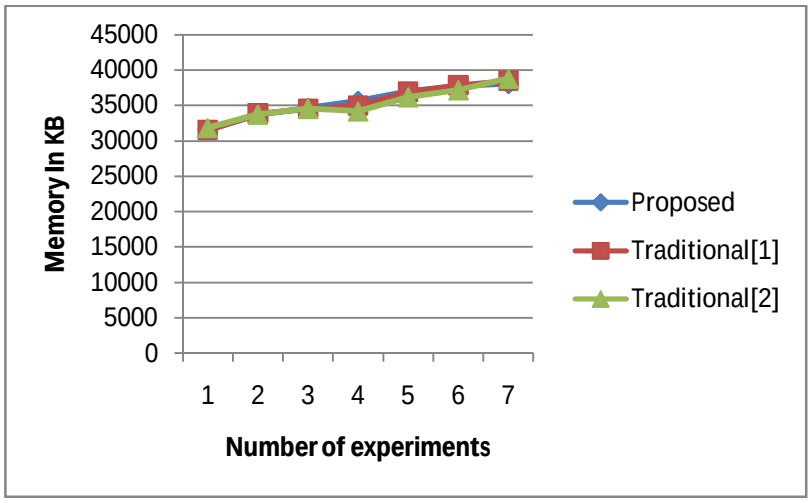

Figure 4.1 Memory Consumption

According to the comparative outcomes as given in Figure 4.1 the performance of implemented algorithms are overlapping each other. But sometimes the memory consumption of the proposed algorithm is higher than the traditional algorithms [1] and [2]. In order to demonstrate the performance of the system the X axis contains the different experiments performance with the system and the Y axis shows the memory consumption of the system in terms of KB (kilobytes). The performance of the proposed method is provided using the blue line and the red line shows the performance of the traditional system as given in [1] and the second techniques as given in [2] is represented using the green line. Therefore the proposed technique consumes higher memory as compared to the classically available techniques in [1] and [2]. For more clarification the mean memory consumption of the algorithms are also computed and demonstrated using the Figure 4.1.

2. Training Time:

The amount of time consumed for training the algorithm is termed here as the training time. The comparative training time of implemented algorithms of the system is given using Figure 4.2. in this diagram the performance of proposed algorithm is given using blue line, and the performance of the technique available in [1] is given using red line similarly the performance of second traditional approach [2] is given using green line. The training time of a

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system shows how much time the system consumes for extracting the image features and the time overhead by which the data preservation is required.

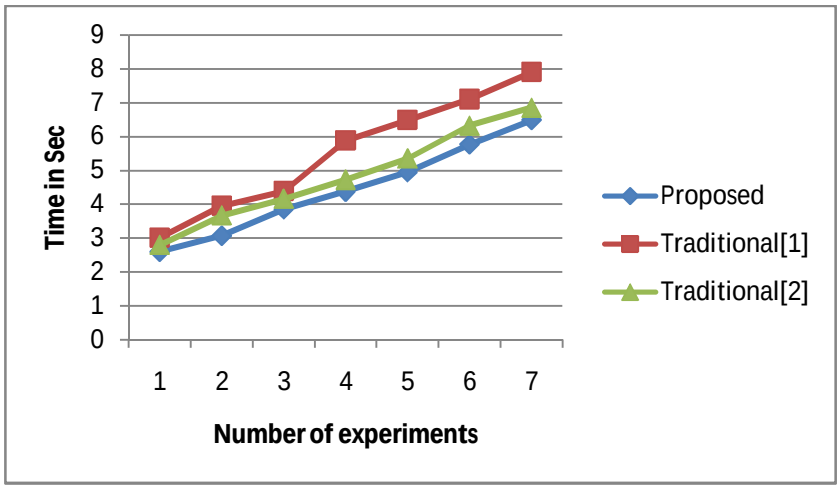

Figure 4.2 Training Time

The performance of the implemented system is estimate the training time separately in terms of seconds. Additionally for representation of the performance the X axis shows the different experiments performed on the system and the Y axis shows the consumed time in second. According to the obtained results the performance of the proposed algorithm is consumes less time as compared to the traditional techniques. Therefore the performance of the proposed technique is much optimum as compared to traditional technique. For clearer results the mean

performance of the system is estimated and the differences in the performance of both are computed the average performance of the system is given using Figure 4.2. According to the mean performance of the algorithms the training time of the proposed system is few as compared to the compared techniques as given [1] and [2]. In the proposed technique consumes less time because the proposed technique usage the feature extraction parallel manner. And only overhead is to preserve them in database system for future use.

3. Search Time:

The search time of the system is termed as the amount of time required to search the images from data base using the input query. That demonstrates the response time of the algorithms to get the results after producing the input to the system. The time consumption of the system is measured in terms of seconds and reported using the Figure 4.3. The given figure contains the performance of the all implemented techniques. In this diagram the X axis shows the number of experiment performed and the Y axis shows the amount of time consumed in terms of seconds. According to the obtained performance the proposed technique (shows using blue line) consumes less time as compared to the traditional technique [1] (shows using red line) and also with the Meta text based technique [2] (shows using the green line). For more clear results and experimental analysis the mean search time of all three algorithms are computed and reported using the Figure 4.3. the given figure demonstrate the proposed algorithm consumes the less time as compared to technique given in [2] and the algorithm [2] consumes less time as compared to the results of technique [1]. Therefore the proposed technique is efficient as adoptable as compared to available text and content based technique for efficient and accurate image retrieval.

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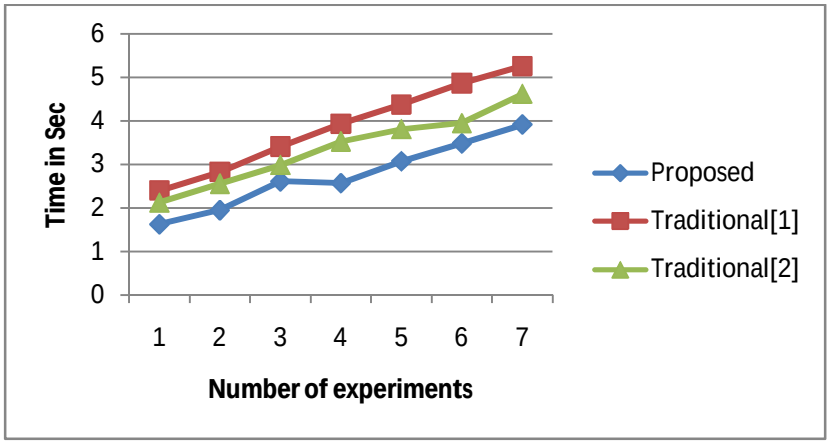

Figure 4.3 Search Time

4. Precision:

In search systems the precision is a fraction of search results which most relevant to the input query. The provided precision of the proposed search system and their filtering options are given using Figure 4.4. That can be evaluated using the user feedback basis. That can be evaluated using the following formula.

$$precision = \frac{relevent\ image\ \cap retrieved\ image}{retrieved\ image}$$

In order to understand the precision if the database contains the 10 documents which contains the area of interest and during search process the total 8 results are retrieved among them 6 documents are relevant to the search query then the precision values is denoted by 6/8.

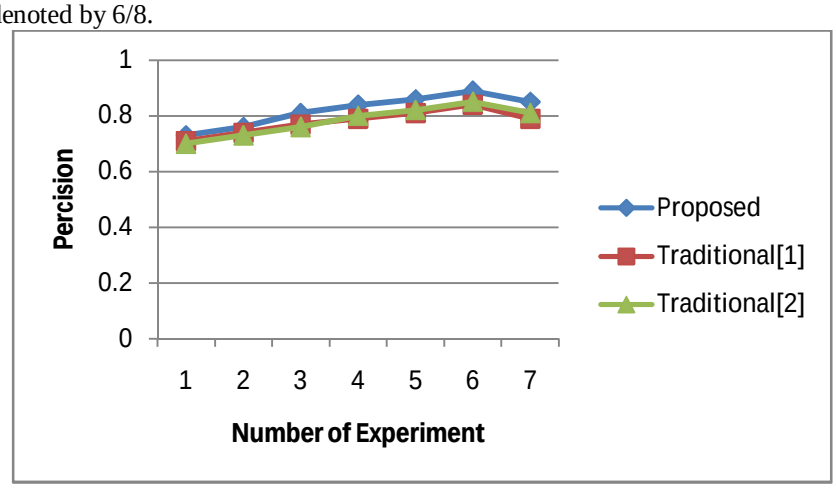

Figure 4.4 Precision

The evaluated performance in terms of precision of the implemented image retrieval systems is given using the Figure 4.4. In this diagram the X axis shows the different experiment and the Y axis shows the corresponding precision values of the search system. For demonstrating the performance individually the blue line is used for proposed algorithm, red line is used for traditional technique [1] and the green line is used for technique [2]. According to the obtained results the performance of the system is optimum as compared to the traditional system [1] and [2]. The results analysis using the mean precision values are also reported for clear outcome demonstration using Figure 4.4. In this diagram the proposed algorithm demonstrate the more accurate results as compared to the other two implemented

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algorithms. Therefore the proposed technique is more adoptable as compared to the similar functional algorithms for image retrieval.

5. Recall:

The search recall values are measured in this section, that is an accuracy measurement in terms of relevant document retrieved according to the input search query. That can be evaluated using the following formula.

$$recall = \frac{relevant\ images \cap retrieved\ images}{relevant\ images}$$

In order to understand the recall of search system an example of recall calculation is given as, for example if the data base contains 10 relevant documents in the database and during search results the 8 documents are retrieved among them 6 documents are relevant to the search query than the recall value can be given by 6/10. The comparative recall values of the proposed system and the traditionally available techniques [1] and [2] is given using Figure 4.5.

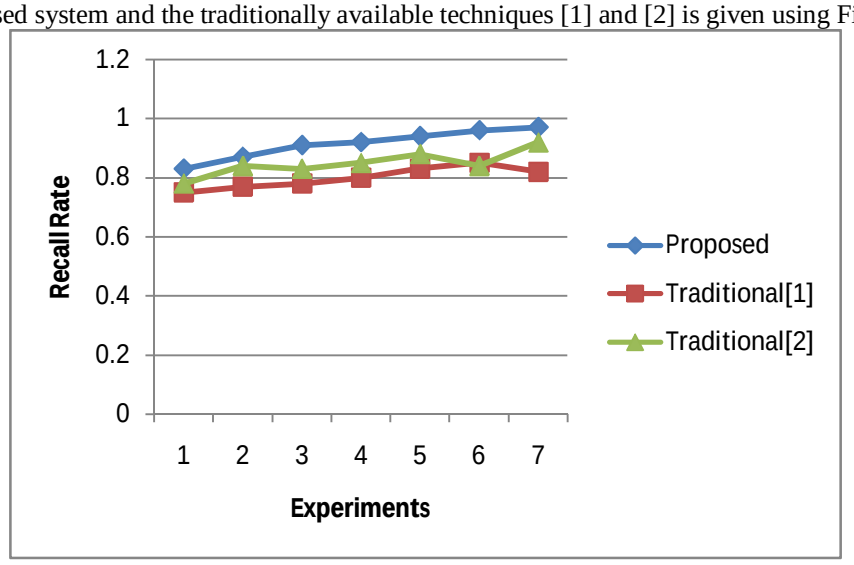

Figure 4.5Recall

VI. CONCLUSION AND FUTURE WORK

Internet is a source of information and data, where different kinds and formats of data are available for use. Internet users can search the specific kind of data from web using the web search engines. The extraction from the data from a given source of data is known as the information retrieval. In this presented work the image retrieval systems are key area of research. During investigation various kinds of image search systems are found some of them are working on the basis of text associated with the images and some of them are works on the basis of image contents. The content based image retrieval systems are much accurate than the text based search systems. But due to annotation concepts,that technique can be more appropriate than content based search.

In this presented work a hybrid model for image retrieval proposed. That technique usage the concept of image annotation and content based image retrieval. Therefore the technique allows a user to search image by their text query as well as the image query. For design aspects the system first utilizes the feature extraction techniques thus for shape feature the canny edge detection technique, for color features the grid color movement analysis and for texture analysis the local binary pattern is investigated and implemented for the feature evaluation of the input images.

The implementation of the proposed content based image retrieval system is given by the JAVA technology. After implementation of the concept the performance of the technique is also investigated in terms of time and space complexity and search results is measured in terms of precision and recall.

In this presented work the key focus is to improve the traditional work for content based image retrieval. Therefore a hybrid approach of image search is presented and implemented using the JAVA technology. The presented technique of

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image retrieval is much efficient and provides more accurate results as compared to the other available technique. In near future the performance of the system in terms of memory consumption is required to optimize.

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