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Exploring Different Techniques on Content Based Image Retrieval

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Abstract- Content-based image retrieval, a technique that uses visual content to search database images according to user demand. Research in image-based image retrieval is expanding today. Content-based image retrieval is a method of computer vision for the problem of retrieving images from the search of digital images in large databases. In this document, proximity measures effectively measure the similarity between images to improve the search for similarities in CBIR. However, according to this study, there is a limitation regarding the level of accuracy of the recovered images. To overshadow these limitations, the study proposes an improved technique for the control of similarity in CBIR. The general purpose of this study is to develop an improved method for the search of similarity in CBIR.

Index Terms-*Content-Based Image Retrieval (CBIR), Proximity Measurements.*

1. INTRODUCTION

The tremendous increase in digital data such as videos, audios and images has increased the demand for content-based image retrieval. Content-based image retrieval techniques are essential in multimedia applications through the use of the Internet. For the search and retrieval of images, there are basically two approaches. The first approach is done manually by humans, it is called indexing of images based on concepts or text. A human specifies and evaluates the images according to the characteristics of the image. Although this approach requires significant efforts and can be expensive, it takes a lot of time. To minimize the limitations of the text-based approach, the second approach known as content-based image retrieval (CBIR) techniques is used.

An image recovery system offers an efficient way to access, explore and recover similar images in the application in real time. This system returns a set of images from a collection of images in the database to satisfy the users' demand with similarity evaluations, such as the similarity of the content of the image, the similarity of the border pattern, the similarity of color, etc. [eleven]. In the retrieval of images based on content, the contents of visual images are represented as image entities that are extracted using the feature extraction method performed automatically. The retrieval of images based on content involves two steps, the first step involves the processing of the image of the database. The extraction of the characteristics of the image is normally done in the low-level characteristics of the image such as color, shape and texture. The next step involves measures of similarity. This is an essential step since the results are retrieved after verification of the measure of similarity. Several approaches have been developed to capture image information.

2. RELATED WORK

This section explores the various techniques for content-based image retrieval (CBIR).

Yinghui Zhang et al. [1] proposed a technique to identify the disease using the Gray Level Co-occurrence Matrix along with the histogram. The correlation coefficient is used to create a CBIR system. According to this technique, the images of the area of interest of a patient present with the complete series of the image of a previous patient can be compared to diagnose the disease. The CBIR is very efficient, even if the symptoms are not shown by the body, the disease can be diagnosed from the sample images. This system can be very useful for doctors and doctors. By matching the images of the current patient with the previous patient, a diagnosis can be implemented and this system can prescribe the most effective medicine. This technique implements the sequential matching of each image one by one, and in future work, you can use other programming languages that support multiple threads so that parallel matching can be started at the same time and time can be reduced of execution. Efficient caching algorithms can be used for faster execution.

S. Rubini et al. [2] addressed a technique to establish color characteristics using the Color Design Descriptor and the use of these feature vectors for similar images are retrieved for greater efficiency. According to the observations, the color characteristics gave approximately similar results with a much lower

execution time compared to an individual approach. The system will first read the user's query image to extract similar images from the database and then convert the RGB color space into HSV color space. Then, the system will quantify each pixel in the HSV space to 256 histograms. The system will calculate the similarity measure of a query image and the image present in the database using the Canberra Distance. The main components of a content-based image retrieval system, including the representation of image attributes, indexing, image processing, query comparison and user interaction. , while highlighting the current state of the art and the key challenges. However, there is still the possibility of a potential improvement in the development of the content-based image retrieval system due to the semantic gap between the result of image similarity and the user's perception. Therefore, this method is not very efficient.

Chintamani Chavan et al. [3] discussed a technique that provided Gabor's Magnitude Fusion and Modified Block Truncation Coding using cloud computing by retrieving content-based images (CBIR). It is an open source cloud-based computer system. Here, the SaaS architecture of CBIR has been proposed because the services are made available dynamically and result in an increase in the scalability, flexibility and availability of the applications. The main reason for this CBIR system is to provide the best matches and find images in large databases using their content as low-level descriptors. According to this system, the cloud services provided by the cloud architecture will handle all the unexpected traffic, and at the same time, they will benefit from a minimized cost. This open source project can be improved upon request and integrated into other existing systems.

Shailesh Kumar and others [4] declared particle swarm optimization (PSO) for image retrieval by K-means clustering. The PSO is a very effective solution and when combined with another computational intelligence technique, shows a truly effective approach. This technique helps to group the contents of similar images in a group, in addition to the proposed technique. This system works in the basic technique of image consultation, which makes the results of the recovery more promising. The precision value of the query image is calculated. Accuracy is a fraction of the search results that are most relevant to the input query. According to the results obtained, the performance of this system increased as the amount of data in the database increases. In the data retrieval application, retrieval values are measured in terms of the relevant retrieved document or the relevant data obtained in accordance with the input query for precision measurement. Then, by combining precision and recall values, the results obtained are adaptable and efficient for image retrieval applications. But the presented work only works for the image-based query for the similarity calculation that can also be implemented for the processing of text-based queries.

In the review article, StanisławDeniziak et al. [5] addressed a new method for image retrieval that is based on two ideas: an object representation and a matching algorithm. Here, the new CBIR algorithm that uses the query by approximate form was presented. A method was proposed that is based on the decomposition of forms into smaller, primitive segments, which are described by their attributes. Based on the primitives detected, a graphic representation of the form is constructed, then compared with the graphs stored in the database. The main advantage of this approach is that it can be applied to transformed covered objects or partially covered objects. This algorithm is suitable for queries that use the input image, as well as for queries drawn by man. The direction of future research is the efficient storage of graphics of objects in the database.

R.K. Gupta et al. [6] has presented a novel CBIR system with adaptive K means using the color space Tone, Saturation and Intensity and the SVM multi-kernel method with an efficient combination of contrast enhancement, color momentum, DWT functions are proposed. In this system, the kinds of images used to provide a very good image retrieval accuracy. The system in terms of performance has good accuracy value and recall value. While, the accuracy is uniform for all classes, which makes SVM a better choice. Different types of distances have been used here, such as Canberra, L1, L2, Correlation and relative standard derivation to calculate the similarity between two images. Performance is measured by the precision, recall and accuracy of the system. In this system, the overall accuracy has reached up to 99 percent. This approach focuses only on the retrieval of image files. But it can be improved to retrieve the audio and video file.

V Ramya et al. [7] He noted that among all the clustering techniques, K-Means is the clustering method most commonly used in the process of recovering content-based images. K-Means performs effectively and reduces the execution time. The authors declared a content-based image retrieval system (CBIR) for images of multiple objects and also a novel framework for combining the three, namely color, texture and shape information, and achieving a greater recovery efficiency. In this system, the color moments and Gabor filter moments responses of these tiles serve as local descriptors of color and texture respectively. This approach is flexible, easy and simple to adopt. In this

study, different grouping techniques are discussed, which are used in existing CBIR systems. Among all the grouping techniques, K-Means is the grouping technique most used in the process of image recovery based on content. K-Means performs efficiently and reduces the execution time.

Aasia Ali in the. [8] proposed a technique, the feature extraction algorithm Scale-invariant feature transformation(SIFT) characteristics for feature extraction, which basically gives them the key point in an image. The SIFT image feature algorithm provides a set of image features that are not valuable, so the BFOA optimization technique (bacteria foraging optimization algorithm) is used to reduce complexity, cost, energy and consumptions of time. Then, for a similarity check, a deep neural network is trained and then the validation and text message phases are performed accordingly, which leads to better performance. The future scope of this system includes the implementation of the CBIR system considering more low-level descriptors and a highly effective deep neural network of learning that can possibly verify that it is faster and more accurate.

Authors	Techniques/ Methods	Pros	Cons
Yinghui Zhang	Grey level co-occurrence matrix	Works efficiently even when symptoms are not shown by the body, disease can be diagnosed	Using sequential matching for images retrieval, multithreading not possible
S.Rubini	Color Layout Descriptor	Less execution time	Difference between user's perception and retrieved image
Shailesh Kumar	Particle Swarm Optimization and K- means clustering	Scalable and efficient when amount of data in database is increased	Text based queries cannot be processed
Aasia Ali	Scale invariant Feature Transformation and BFOA	Simpler, Expensive and less energy consumption	Not précised and more time complexity

Lei Zhu and others [9] discussed a new unsupervised visual hash approach called semantically assisted visual hashing (SAVH). According to the authors, the central idea of this method is to efficiently extract the rich embedded semantics latent in the auxiliary texts of the images to increase the effectiveness of visual hashing without explicit semantic labels differentiated from semi-supervised and supervised visual hashing. In addition, the authors concluded that SAVH has a fruitful advantage that takes advantage of the semantics involved in the text, while online hashing only requires visual input.

Rehan Ashraf et al. [10] Introduced a mechanism for automatic image retrieval. The characteristics of the images such as color, histogram analysis and the discrete cosine transform are used because they are robust and require less computing power. In the technique, the border is derived from the YCbCr matrix using the Canny edge detection method and the RGB histogram is calculated as a global statistical illustration of the color distribution that the image represents. To further enhance

image rendering capabilities, color characteristics are also incorporated with the histogram and the Haar wavelet transform applied to effectively reduce computational steps and help improve search speed. The Manhattan distance is applied to retrieve similar images from the data set. The semantic association is made through artificial neural networks, and an inverted index mechanism is used to return the images against queries to ensure rapid recovery. Comparisons with other standard CBIR systems show that the system performs better in terms of average accuracy and recovery values.

3. DISCUSSION

The framework of the color design descriptor proposed by S. Rubini et al. [2] is used to indicate color characteristics and retrieve similar images. However, due to the semantic gap between the image similarity result and the user's perception, this method is not very effective. Experiments carried out in the framework proposed by Shailesh Kumar et al. [4] showed that the PSO is a very effective technique and when combined with another computational intelligence technique, results in a truly effective approach.

In the SIFT framework proposed by Aasia Ali et al. [8], the algorithm provides a set of image features that are not valuable, so the BOFA optimization technique (bacteria foraging optimization algorithm) is used.
Image recovery framework proposed by Rehan Ashraf et al. [10] has considered the characteristics of the image as the color, the analysis of the histogram since they are robust. Therefore, this system is better than all existing systems in terms of average accuracy and recovery values.

4. CONCLUSION

Much research has been done on CBIR systems. Most systems use color and texture features, few systems use shape features and some use design features. The discrete wavelet has been used effectively in several areas to improve system performance and achieve better results in applications.

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