RESEARCHERID
THOMSON REUTERS

[Jatar * *et al.*, 6(10): October, 2017]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

IJESRT
INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

SURVEY AND DESIGN OF CONTENT BASED IMAGE RETRIEVAL USING DATA MINING CLUSTERING ALGORITHM

Shivaditya Jatar*1 & Ayush Mittal2

*1&2Computer Engineering, Shri Govindram Seksaria Institute of Technology and Science, Indore (M.P.), India

DOI: 10.5281/zenodo.1002687

ABSTRACT

As processors become increasingly powerful, and memories become increasingly cheaper, the deployment of large image databases for a variety of applications have now become realizable. Databases of art works, satellite and medical imagery have been attracting more and more users in various professional fields for example, geography, medicine, architecture, advertising, design, fashion, and publishing. Effectively accessing desired images from large and varied image databases is now a necessity. Due to development of multimedia technology and increasing vogue of the computer network, the conventional information retrieval systems are not able to overcome the users' current need. There are various areas in which digital images are used such as-crime prevention, commerce, finger print recognition, surveillance, hospitals, engineering, architecture, fashion, graphic design, academics, historical research, and government institutions etc. Because of this widespread demand we need to enhance in retrieval precision and minimized retrieval time. The prior methods were only dependent on text based searching instead of its visual feature. Many times just one keyword is redundantly used with more than one images, therefore it leads to erroneous outcomes. Consequently, Content Based Image Retrieval (CBIR) is evolved to defeat the restriction of text based retrieval. Problems which we are identified in the existing image retrieval systems are as follows- How to retrieve the search image accurately, how we can manage a large database of images, how we can make the searching process efficient. In this paper, we will study different content based image retrieval algorithms and provide a way through which we can provide efficient access to image data

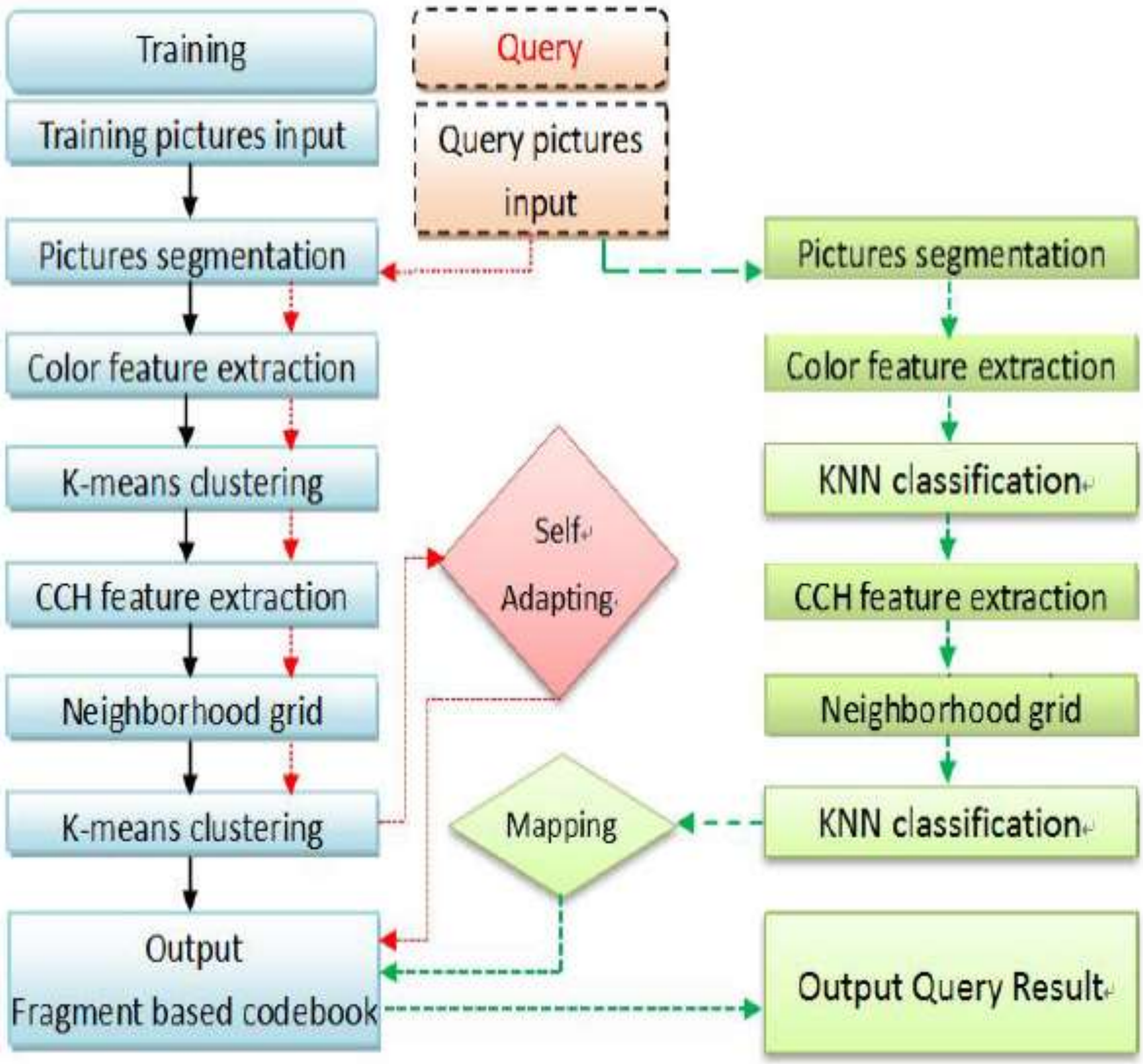
KEYWORDS: Content based Image Retrieval, K-Means Clustering Algorithm, Wave Transform.

I. INTRODUCTION

Image retrieval is the processing of searching and retrieving images from a huge dataset. As the images grow complex and diverse, retrieval the right images becomes a difficult challenge. For centuries, most of the images retrieval is text-based which means searching is based on those keyword and text generated by human's creation.[1] The text-based image retrieval systems only concern about the text described by humans, instead of looking into the content of images. Images become a mere replica of what human has seen since birth, and this limits the images retrieval. This may leads to many drawbacks which will be state in related works. To overcome those drawbacks of text-based image retrieval, content-based images retrieval (CBIR) was introduced [2][3]. With extracting the images features, CBIR perform well than other methods in searching, browsing and content mining etc. The need to extract useful information from the raw data becomes important and widely discussed. Furthermore, clustering technique is usually introduced into CBIR to perform well and easy retrieval. Although many research improve and discuss about those issues, still many difficulties hasn't been solved. The rapid growing images information and complex diversity has build up the bottle neck. To overcome this dilemma, in this paper, we study the CBIR system with an optimized solution combined to K-means and k-nearest neighbor algorithm (KNN). A creative system flow model, image division and neighborhood color topology, is introduced and designed to increase the clustering accuracy.

II. METHODOLOGY

In our CBIR system, it is divided into two parts: learning and querying. The learning step tells about the training process which a huge mount sample images are input in the first step, then the images' features are extracted for the clustering. K-means algorithm is selected to cluster the training data because of it is easy to implement, efficient and well developed in the recent 50 years. Finally the training output the clustering result as a learning code book. The query part describes the images searching process. Inputting the query images and matches to the training result. The output shows the most similar images for user's query. Figure 1 shows the overview of the CBIR system. The main system architecture contains four modules both in learning stage and query stage: Segmentation and grid module, the K-Means clustering module, the feature extraction module and the neighborhood concept module. The flow chart of the system architecture is shown in Figure 2. Each module is described as follow.



1. **Image segmentation and grid module**

The data images input into the system will be first processed in this module. In the images retrieval, larger images usually decrease the retrieval accuracy. Small images grids help in feature extraction and images processing. Therefore, this module first divides the images into F*F grid and every grid will divided again into S*S sub-grids while during the feature extraction module. In this stage, an input images will finally divided into (F*S)2 grids which the F*F grids uses both in feature extraction module and neighborhood module. The inside S*S grids are only used in color feature extraction. Figure 3 shows the sample of images segmentation.

2. **Feature Extraction Module**

The input images, including the training and query stage, are all processed in this module. It is also the most important in image retrieval. Since color is the most popular and intuitive feature based on human visualization,

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

it is applied in the system. In order to get more powerful features, the CCH method is also applied for extracting the important feature point. The two feature extractions are described as below:

Color Feature Extraction

Input images will be divided into F*S grids before this stage. All grids are input to extract the color feature. First, the module compute the average RGB value of the F*F grids. Second, the inside S*S grids in every F*S grids will also be input to calculate the average RGB value. The S*S grids' detail RGB information is append after the F*S grids' color feature information. All those are prepared for first K-means clustering. Figure 3 illustrates the color feature extractions of this stage.

CCH feature extraction

The system utilizes CCH to find out the important feature points. All the points are detected for preparing the input data of the neighborhood module and K-means clustering or KNN classifying. The information of CCH feature points, including the 64 dimensions data, combines with the neighborhood module result. Taking it as the input for the second round K-means clustering, the K-means clustering results in a fragment-based database, call the Code book. As the same implementation in query step, K-means is replaced by KNN algorithm. Query data inputted will be classified to improve the training code book; also correct classified result helps for quickly retrieval. Figure 5 shows the sample for CCH feature extraction.

3. The neighborhood module

In this module, the input data is from the CCH feature points. Feature points of every image will consider as an index to build up the neighborhood table. Also the first K-means clustering result of every F*F grids are imported to denote the value of the neighborhood table. The steps of every detail are described as follow:

- Input the CCH feature point Y of the X picture, represented as PICXY.
- Get the first K-means clustering result based on the CCH feature point's coordinate.
- Get the neighborhoods' first K-means clustering results.
- Appending the results from step3 according with the order left to right then top to bottom. If there is no neighborhood, then the value will be "0", which stands for the side of the pictures.
- Appending the CCH information into the neighborhood table.
- K-means clustering based on the neighborhood table to generate the code book.

4. The K-means/KNN module

K-means clustering is applied twice in our system. The K-means clustering helps generate the code book. In order to keep those input (include the training and query stage) being clustered in the same standard, our architecture keeps the cluster central points in the training stage. The central points are imported into the K-means clustering in the query stage. Finally, the code book can be mapped in the same comparing standard.
K-nearest neighbor algorithm (KNN) is also involved into our CBIR system. Based on the training result, KNN is applied for the query data images. KNN helps to classify the input data; also it fixes the code book which means the training result can be self-adapted.

5. The image retrieval query module

This paper provides a query method based on modules mentioned before. Considering the grid fragment, color feature, and CCH feature points, all images input for query will be divided into pieces. Then KNN is applied to classify those images which maps to the training result (code book). The query grid images are compared with those picture grids in the same cluster, the system then calculates the difference based on the color feature which is introduced in 3.2. All fragments are tagged and linked with one grid in the code book. By calculate the most amount of the grids, the CBIR finally output the query and retrieval result.

III. CONCLUSION

In our knowledge, this paper first combines segmentation and grid module, feature extraction module, K-means clustering and neighborhood module to build the CBIR system. Furthermore, the concept of neighborhood module which recognizes the side of every grids of image is first contributed in this paper. Applying the concept of fragment based code book into the content based image retrieval system also contributes in our system architecture. The experimental results confirm that the proposed CBIR system architecture attains better solution for image retrieval. Our model represents the first time in which combine new modules and techniques proposed in the paper have been integrated with CBIR system. Images can be retrieval correctly through the proposed

CBIR system. For those images which are contained in the code book, all of them can be searched as the most similar result. Also for general images selected randomly, the query results are similar to the input data. Since the CBIR system is based on the color feature, the retrieval results are directly and easy to tell the performances. In the future work, we hope to build a generalized query method which increase the system searching ability and provide more accurate content descriptions of places of interest places by performing color feature analysis and CCH image extraction simultaneously. As a result, the CBIR system will be able to suggest more relevant annotations and descriptions..

IV. REFERENCES

[1] Kato,T.:Database architecture for content-based image retrieval. Image Storage and Retrieval Systems, 112–123. (1999)
[2] Datta, R., Joshi, D., Li, J., Wang, J. Z.: Image Retrieval: Ideas, Influences, and Trends of the New Age. ACM Computing Surveys, Vol. 40, No. 2, Article 5, April. (2008)
[3] Rui, Y., Huang, T.S., Chang, S. F.: Image Retrieval: Current Techniques, Promising Directions and Open Issues. Journal of Visual Communication and Image Representation, Transaction on Systems, Man, and Cybernetics, vol. 8, 460–472. (1999)
[4] Rui, Y., She, A. C., Huang, T. S.: Modified Fourier Descriptors for Shape Representation - A Practical Approach. Proc. of First International Workshop on Image Databases and Multi Media Search. (1996)
[5] Gupta, A., Jain, R.: Visual Information Retrieval. Communications of the ACM, vol. 40, 70–79. (1997)
[6] Gross, M. H., Koch, R., Lippert, L.: A. Dreger, Multiscale image texture analysis in wavelet spaces. Proc. IEEE Int. Conf. on Image Proc. (1994)
[7] Chua, T. S., Tan, K.-L., Ooi, B. C.: Fast signiture-based color-spatial image retrieval. Proc. IEEE Conf. on Multimedia Computing and Systems. (1997)
[8] Chuang, G. C.-H., Kuo, C. -C. J.:Wavelet descriptor of planar curves: Theory and applications. IEEE Trans. Image Proc., vol. 5, 56–70.(1996)
[9] Faloutsos, C., Flickner, M., Niblack, W., Petkovic, D., Equitz, W., Barber , R.: Efficient and Effective Querying by Image Content. (1993)
[10] Rui, Y., Huang, T.S., Mehrotra, S.: Relevance feedback techniques in interactive content-based image retrieval. In Storage and Retrieval for Image and Video Databases VI, 25–36. (1996).

CITE AN ARTICLE

Jatar, S., & Mittal, A. (2017). SURVEY AND DESIGN OF CONTENT BASED IMAGE RETRIEVAL USING DATA MINING CLUSTERING ALGORITHM. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY*, *6*(10), 160-163.