SURVEY ON CONTENT BASED IMAGE RETRIEVAL

S.R.Surya *

M.Phil Research Scholar
PSGR Krishnammal College for women
Coimbatore-641004 .
sukas14@gmail.com

G.Sasikala

Assistant Professor
PSGR Krishnammal College for women
GR Govindarajalu School of Applied Computer Technology
Coimbatore-641004
sasivivek@gmail.com

Abtract

The digital image data is rapidly expanding in quantity and heterogeneity. The traditional information retrieval techniques does not meet the user's demand, so there is need to develop an efficient system for content based image retrieval. The content based image retrieval are becoming a source of exact and fast retrieval. In this paper the techniques of content based image retrieval are discussed, analysed and compared. Here, to compared features as color correlogram, texture, shape, edge density, JPEG compression domain and clustering algorithm such as K-Means, C-Means for effective retrieval of an image.

Keywords: *Feature Vector, BPN Networks, K-Means and C-Means Clustering Algorithm, Color Collelogram, JPEG Compression Domain.*

1.Introduction

Content Based Image Retrieval (CBIR) is a technique which uses visual contents, normally called as features, such as shape, color, texture, edge. etc…to search images from large scale image databases according to users' requests in the form of a query image. Content based retrieval of visual data requires a paradigm that differs significantly from both traditional databases and text based image understanding systems. The challenge in CBIR is to develop the methods that will increase the retrieval accuracy and reduce the retrieval time.

Among them, Color feature is often broadly used to describe the images which are difficult to be segmented and needn't to consider space information.Texture is one of the most important ones, due to its presence in most real and synthetic world images, which makes it under high attention not only for CBIR but also for many other applications in computer vision, medical imaging, remote sensing, and so on .Finally the edge features that include five categories vertical, horizontal, 45 degree diagonal, 135 degree diagonal, and isotropic are added.

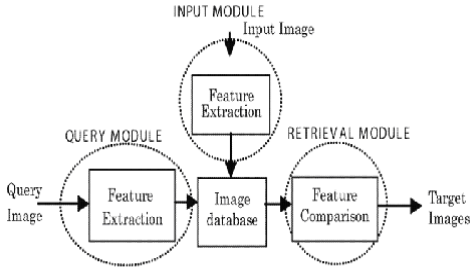

Fig 1: Block diagram of the content-based image retrieval system

The remainder of this paper is organized as follows. Section 2 discusses some of the earlier proposed research work on content based image retrieval. Section 3 provides conclusion and some basic ideas on future research work.

2.Related Works

Jing Huang ed al[1,2] discussed new feature callede color correlogram for image indexing and comparison.this new feature computed efficiently and show that performance very well. Sim, D. G., H. K. Kim and R. H. Park [3,4,5]" the image retrieval scheme for JPEG formatted image is presented. content based image retrieval for JPEG images has attracted many people's attention and a series of algorithms directly based on the discrete cosine transform domain. And to take full advantage of DCT coefficients and consider the color and texture information for the retrieval of JPEG formatted images. Here decompressing the images and then performing in the spatial domain. The feature vectors are computed from several DCT coefficients. And this operation is performed in the partial decoded domain. It can greatly decrease the retrieval complexity**.**

M. Flickner et.al [6,7,8] proposed Color histograms are computationally efficient, and generally insensitive to small changes in camera position. However, a color histogram provides only a very coarse characterization of an image, An images with similar histograms can have dramatically different appearances. Here , to describe a method which imposes additional constraints on histogram based matching. In histogram refinement, the pixels within a given bucket are split into classes based upon some local property. Split histograms are compared on a bucket by bucket basis, similar to standard histogram matching. Within a given bucket, only pixels with the same property are compared. Two images with identical color histograms can have different split histograms, split histograms create a finer distinction than color histograms. This is particularly important for large image databases, in which many images can have similar color histograms.To describe a split histogram called a color coherence vector (CCV), which partitions each histogram bucket based on spatial coherence. A database with 15,000 images can be queried using CCV's in under 2 seconds. And to demonstrate that histogram refinement can be used to distinguish images

A. P. Berman et.al [9,10] found that technique fairly integrates a diverse and expandable set of image properties (color, texture, and location) in a retrieval framework, and allows end users substantial control over their use. We propose a novel set of evaluation methods in addition to applying established tests for image retrieval; our technique proves competitive with state of art methods in these tests and does better on certain tasks. The Stairs algorithm can operate in a regional query mode with only a moderate increase in computational overhead. For certain queries this capability significantly increases the relevance of the images retrieved. Furthermore, it improves on many standard image retrieval algorithms by supporting queries based on subsections of images. The merits of drawing on different types of image features for Image retrieval are firmly established. Our work capitalizes on this trend, providing a framework for fairly and consistently integrating diverse image properties into a description amenable to fast, reliable retrieval.

J. Zhang et.al[11,12,13] suggest the image retrieval based on the textural information of an image, such as orientation, directionality, and regularity. Here ,utilize texture orientation to construct the rotated Gabor transform for extraction of the rotation-invariant texture feature. The rotation-invariant texture feature, directionality, and regularity are the main features used in the proposed approach for similarity assessment. Using these features, we finally propose an efficient mechanism for CBIR and examine it through some applications. the system can now compare features of the query with features of images in the collection based on some matching criterions. Because three features are used in this work, three matching scores need to be computed. A weighted average of the matching scores is then calculated to get a final score for each image. Finally, rank images based on these final scores and top-ranked images are displayed to the user as the result of retrieval.

Haralick RM et.al[14,15]discussed the four image features are extracted by this system, which are color feature (HSV color histogram), texture feature (co-occurrence matrix), shape feature (moment invariant based-on threshold optimization), spatial relationship feature (based-on the Markov chains). According to the statistical analysis of the experiment results discover that the four visual features describe image characters variously. The retrieval precision based on color feature is better than based on texture feature. An image retrieval method combined color and texture features. According to image texture characteristic, a kind of image feature statistic is defined. By using feature weight assignment operators designed here, the method can assign weight to color and texture features according to image content adaptively and realize image retrieval based on combined image features. The retrieval results are more exact and efficient than other methods based on single feature and simple

linear combined features of fixed weight, the retrieval results are more suitable to the human visual characteristic. The error matching is decreased and weight assignment is logical.

P.S.Hiremath ed al," [16,17,18,19] discussed four approaches such as multispectral Approach, HSV color space, YCbCr color space,and uses gray scale texture features for color texture analysis. the wavelet decomposed coefficient of image and its complements by using texture feature. Their experiments are carried out on Wang's dataset using JSEG for segmentation and compare the four different color space.finally haar wavelet is more effective in texture feature compare with other wavelet so, The results are encouraging.

P. S. Hiremath and Jagadeesh Pujari [20]discussed An integrated matching scheme based on higher priority of similar image and the adjacency matrix of a bipartite graph by using tiles of query.shape information is computed by Gradient Vector Flow fields. this demonstration is efficiency compare with wavelet method. K.P. Ajitha Gladis and K.Ramar [21,22,23,24] discussed mainly as the image can be represented on statistical properties, morphological features and fuzzy cluster features of the image in order to get more accurate results. He distance is measured through a back propagation network.

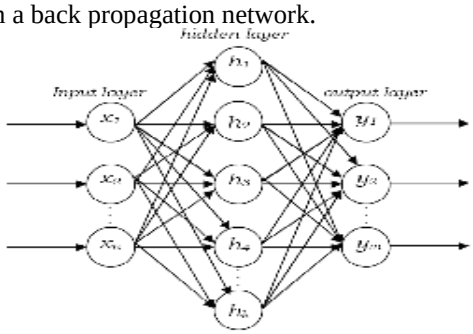

Fig 2: Back Propagation Network

So, Experimental results is quite effective in both performance and retrieval rate.

Son Lam Phung and A. Bouzerdoum [25] proposed new feature called edge density. it differentiates objects from non-objects using image edge characteristics. this approach is based on a fast object detection method. The edge density, which measures the specific region of the object, that can be computed more efficiently.

Fig 3:Left: an image window.
Middle: the edge magnitude.
Right: three edge density features

where each feature is the average edge magnitude in a specific subregion. The new feature capability compared to the Harr-like features[30].finally new feature show good discriminative capability.S. Nandagopalan ed al [26,27,28]discussed texture for texture co -occurrence matrix based entropy, energy, etc, and for edge density , Edge Histogram Descriptor (EHD).For retrieval of images, finally to reduce the computational complexity based on greedy stategy. so, its achieved better results for both local and global feature. Mamta Juneja and Parvinder Singh Sandhu[29,30,31] proposed candy method for edge detection.here,to compare canny method with laplacian of Gaussian method .

Operator	Canny	Lap of Gaussian
Canny	1	0.62386301
Lap of Gaussian	1.602916	1
Prewitt	3.72341244	2.32289929

So,the result shows canny's edge detection algorithms is performs better then laplacian method. Michele Saad [32.33] discussed to compare four color feature extraction algorithms such as 1) the conventional color histogram, 2) the fuzzy color histogram, 3) the color correlogram, and 4) a color/shape-based method. and four texture feature extraction techniques such as 1) the steerable pyramid, 2) the contour let transform, 3) the Gabor wavelet transform, and 4) the complex directional filter bank . finally, the fuzzy color histogram and the Gabor wavelet transform were shows the highest color and texture retrieval results. In "J.Huang et.al" [34,35]proposed two stages for retrieving an image such as hierarchical clustering and then apply the clustered images to RBFN network.

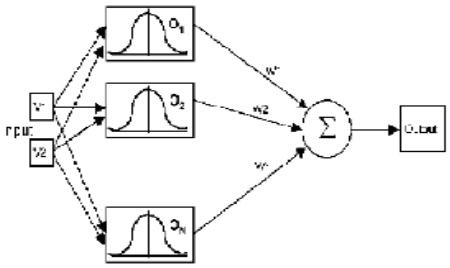

Fig 4: RBFN Network model

Hierarchical Algorithm is used to group similar images into clusters and RBFN Network which uses K-Means clustering and Gaussian function to retrieve the similar images. so that its get the better favored image results.N Gnaneswara Rao ed al [36,37,38] discussed the texture of an image is computed by using wavelet transformation .because its quite efficiently and also using clustering algorithm, to construct indexed image database based on the texture feature. Finally,clustering is to give the good matching and reduce the undesirable noice. P.AnandhaKumar and V.Balamurugan proposed two indexing technique such as Spatial assess method (SAM) and metric access method (MAM)

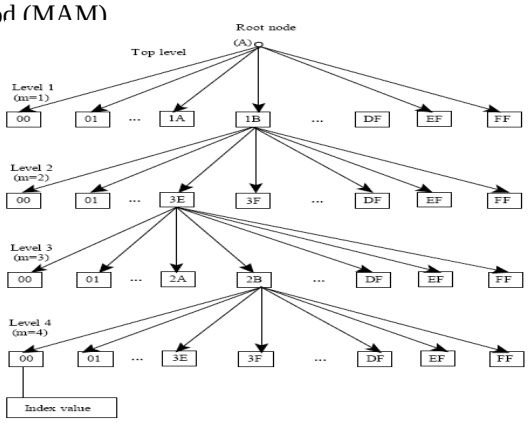

Fig 5:General structure of the FATT(*N=256, m=4*)

SAM providing good result on low dimensional feature. MAM-based balanced and dynamic indexing technique called feature based adaptive tolerance tree. Feature Based Adaptive Tolerance Tree (FATT), which brings effective solution and to increase efficiency of image retrieval .

Rajshree S. Dubey et. al[39]discussed four techniques as Color Histogram, Color moment, Texture ,edge histogram and it involves pattern recognition. because its most important tool for machine vision. Therefore, the combination of four technique gives better result.

Kondekar V. H. et. al [40] discussed Image color quadratic distance for image histogram, Image Euclidian distance for image wavelet transform; image Hamming Distance for retrieval of an image. From these distance formulae is to increase the retrieval efficiency of an image. Ritu Shrivastava et. al [41,42] discussed to compare two clustering techniques such as K- mean and C-mean clustering for distance metric concept. Finally, K- mean algorithm is easy and fast to compute. C- mean algorithm takes long computational time. Both converges but suffers from the problem of local minimum.

3.Conclusion And Future Work

In this survey paper candy method is easy and fast to compute the process .Image splitting and image compaction is to reduce the computation complexity by reducing feature vector size and Haar wavelets are used, since they are more effective compared to other wavelets. In each of the paper they provide several methods ,in that each method fulfill their works. The results are quite good for most of the query images and it is possible to further improve, to use genetic algorithm, cluster algorithm such as hierarchical clustering, Cure data Clustering, fusion algorithm and any other technique will including in CBIR ,it will give the better and effective retrieval of an image.

References

[1] Content-based image retrieval systems. IEEE Computer, 28(9), 1995.
[2] M. Flickner et al. Query by image and video content: The QBIC system. IEEE Computer, 28(9):23–32, 1995.
[3] V. Ogle and M. Stonebraker. Chabot: Retrieval from a relational database of images. IEEE Computer, 28(9):40–48, 1995.
[4] Pentland, R. Picard, and S. Sclaroff. Photobook: Content based manipulation of image databases. International Journal of Computer Vision, 18(3):233–254, 1996.
[5] Jiang, J., A. Armstrong and G. C. Feng, Direct content access and extraction from JPEG compressed images, Patten Recognition, pp.1-9, 2001.
[6] Lay, J. A. and L. Guang, Image retrieval based on energy histograms of the low frequency DCT coefficients, Proc. of the IEEE International Conference on Acoustics, Speech, and Signal Processing, vol.6, 3009-3012, 1999.
[7] Sim, D. G., H. K. Kim and R. H. Park, Fast texture description and retrieval of DCT-based compressed images, Electronic Letters, vol.37, no.1, pp.18-19, 2001.
[8] Huang, Y. L. and R. F. Chang, Texture features for DCT-coded image retrieval and classification, Proc. of the IEEE International Conference on Acoustics, Speech, and Signal Processing, vol.6, pp.3013-3016, 1999.
[9] M. Flickner et al. Query by image and video content: The QBIC system. IEEE Computer, 28(9):23-32, September 1995.
[10] Wynne Hsu, T. S. Chua, and H. K. Pung. An integrated color-spatial approach to content-based image retrieval. In ACM Multimedia Conference, pages 305-313, 1995.
[11] Virginia Ogle and Michael Stonebraker. Chabot: Retrieval from a relational database of images.IEEE Computer, 28(9):40-48, September 1995.
[12] P. Berman and L. G. Shapiro. Efficient content based retrieval: Experimental results. In IEEE Workshop on Content Based Access of Image and Video Libraries, 1999.
[13] C.Carson, M. Thomas, S.Belongie, J.Hellerstein, and J. Malik. Blobworld: A system for region based image indexing and retrieval. In Third International Conference on Visual Information Systems. SpringerVerlag, June 1999.
[14] J. S. De Bonet and P. Viola. Structure driven image database retrieval. Advances in Neural Information Processing, 10,1997.
[15] M. Flickner, H. Sawhney, W. Niblack, J. Ashley, Q. Huang, B. Dom, M. Gorkani, J. Hafner, D. Lee, D. Petkovic, D. Steele, and P. Yanker. Query by image and video content :TheQBIC system. IEEE Computer, 28(9):23–32, September1995.
[16] J. Zhang and T. Tan, Brief review of invariant texture analysis methods, Pattern Recognit 35 (2002), 735–747.
[17] G.M. Haley and B.S. Manjunath, Rotation invariant texture classification using a complete space frequency model, IEEE Trans Image Process 8 (1999), 255–269.
[18] K. Jafari-Khouzani and H. Soltanianzadeh, Radon transform orientation estimation for rotation invariant texture analysis, IEEE Trans Pattern Anal Machine Intell 27 (2005), 1004–1008.
[19] Haralick RM. Statistical and Structural Approaches to Texture[J].Proceeding of the IEEE,1979,67(5):786-804.
[20] S. Arivazhagan, and L. Ganeshan, “Texture classification using wavelet transform” Pattern Recognition Letters, Vol.24, pp. 1513-1521, 2003.
[21] R. M. Haralick, “statistical and structural approaches to texture”, Proceedings of IEEE 67:786-804, 1979.
[22] Ritendra Datta, Dhiraj Joshi, Jia Li and James Wang, “Image Retrieval: Ideas, Influences, and Trends of the New Age”, Proceedings of the 7th ACM SIGMM international workshop on Multimedia information retrieval, November 10-11, 2005, Hilton, Singapore.
[23] C. Carson, S. Belongie, H. Greenspan, and J. Malik, “Blobworld: Image Segmentation Using Expectation-Maximization and Its Application to Image Querying,” in IEEE Trans. On PAMI, vol. 24, No.8, pp. 1026-1038, 2002.
[24] V. E. Ogle and M. Stonebraker, “Chabot: Retrieval from a relational database of images,” IEEL: Computer, vol. 28, no. 9, pp. 40-48, Sept. 1995
[25] R. K. Srihari, “Automatic indexing and content-based retrieval of captioned images,” IEEE: Computer, vol. 28, no.9, pp. 49-56, Sept. 1995.
[26] J.R. Bach, C. Fuller, A. Gupta, A. Hampapur, B. Horowitz, R. Humphrey, R.C. Jain, and C. Shu. “Virage image search engine: an open framework for image management,” In Symposium on Electronic Imaging: Science and Technology – Storage and Retrieval for Image and Video Database IV, vol.2670, pp. 76-87, IS& T/SPIE, 1996.
[27] R.T. Collins, A.J. Lipton, H. Fujiyoshi, and T. Kanade,“Algorithms for cooperative multisensor surveillance,” Proceedings of the IEEE, vol. 89, no. 10, pp. 1456–1477, 2001.

[28] Y. Rachlin, J. Dolan, and P. Khosla, “Learning to detect, partially labeled people,” in IEEE/RSJ Int. Conf. on Intelligent Robots and Systems, 2003, vol. 2, pp. 1536–1541
[29] Tristan Glatard, John Montagnat, “Texture based Medical image indexing and retrieval: application to cardiac images".
[30] B. S. Manjunath, Jens-Rainer Ohm, Vinod V. Vasudevan, and Akio Yamada, "Color and Texture Descriptors". In: IEEE Transactions on Circuits and Systems for Video Technology, Vol. 11, No. 6, June 2001,pp. 70-715
[31] Alberto Amato, Vincenzo Di Lecce, "Edge Detection Techniques in Image Retrieval: The Semantic Meaning of Edge", 4th EURASIP Conference on Video/Image Processing and Multimedia Communications, Zagreb, Croatia. pp. 143-148.
[32] E. Argyle. “Techniques for edge detection,” Proc. IEEE, vol. 59, pp. 285-286, 1971.
[33] F. Bergholm. “Edge focusing,” in Proc. 8th Int. Conf. Pattern Recognition, Paris, France, pp. 597- 600, 1986.
[34] A.Bovik, Hand book of Image and Video Processing,2nd Eidition, Elsevier Academic Press,ISBN 0-12-119792-1, pp.993-1013,2005 .
[35] Y.Rui, T.S. Huang and S.Chang, ”Image Retrieval: Current Technique, Promising Directions and Open Issues”, Journal of Visual communication and Image Representation,vol.10,pp.39-62.
[36] J.Huang, S.R.Kumar, M.Mitra, W.J.Zhu and R.Zabih, ”Image Indexing using color corrologrames”,Proc. IEEE conf. on Computer vision and Patternn REcongnition,PP 762-768, June 1997.
[37] Gupta, R. Jain, Visual information retrieval, Communications of the ACM 40 (5) (1997) 70-79.
[38] Y. Rui, T.S.Huang, S.-F.Chang, Image retrieval Past, present and future, in: M. Liao(Ed.),Proceedings of the International Symposiumon Multimedia Information Processing Taipei,Taiwan,1997.
[39] Sameer Antani, Rangachar Kasturi, and Ramesh Jain. A Survey on the Use of Pattern Recognition Methods for Abstraction, Indexing and Retrieval of Images and Video. Pattern Recognition,35:945–965, 2002.
[40] Faloutsos, R. Barber, M. Flickner, J. Hafner,W. Niblack, D. Petkovic, W. Equitz, “Efficient and effective querying by image content,” Journal of Intelligent Information Systems: Integrating Artificial Intelligence and Database Technologies, vol. 3, no. 3-4, pp. 231-62, July 1994
[41] Gupta, R. Jain, ``Visual information retrieval,"Comm.Assoc. Comp. Mach., vol. 40, no. 5, pp. 70-79, May 1997.
[42] P.Ciacca,M.Patella,and P.Zezula, “M-tree:An efficient access method for similarity search in metric spaces,”In Proceedings of the 23th VLDB International Conference. Athens,Greece, pp.426-435,August 1997.