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Content Based Image Retrieval Systems: A Review.

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ABSTRACT

This paper aims to review the various content based retrieval techniques that are used to retrieve the desired image. The various content based retrieval system techniques and features are analysed. The desired image can be fetched from an existing large database using Content-Based Image Retrieval systems. The desired images are usually fetched based on their metadata. This process has so many limitations. In order to overcome the limitations of traditional methods, here similar images are retrieved based on their contents such as color, shape, and texture from the large database. The achievements using various content based image retrieval methods are discussed in this paper.

Keywords: Color, DWT, GIRA, Histogram, KNNSVM, Shape, Texture.

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INTRODUCTION

In order to retrieve the images using their content from the large database, one of the computer vision techniques CBIR is used. In CBIR, images are searched based on their content rather than its metadata. The colour of the searched image, shape of it, texture of it, etc., are termed as content. QBIC (query by image content) and CBVIR (content-based visual information retrieval) are the different names for the Content-based image retrieval (CBIR). Figure 1 shows the basic steps in CBIR systems.

Techniques Involved in CBIR

Graphical Image Retrieval Algorithm (GIRA)

In for retrieving images based on a query image. The image segmentation is for extracting different features of the image. The feature vectors of query image and images in the database is compared each other. In order to find local manifold structure, this algorithm was designed. In GIRA, nearest neighbour search was used and it is suitable for retrieving images. Hence the images are projected into a lower dimensional subspace, the fetched relevant images get closer to the input image. So the performance of image retrieval can be enhanced. In[1] the author proposed an image retrieval algorithm namely GIR (novel manifold learning algorithm). In this merging of features like textual and image for image retrieval were used. [1]

Using Colour and Texture Features with and without DWT

In it, the features are extracted based on texture and colour using wavelet transformation and colour histogram.

Colour histogram without DWT

The RGB colour query image is converted into HSV colour space. Using this HSV, quantize each pixel and divide the total pixels to normalize it and then calculate the statistical features such as mean, skewness, and variance for normalized histogram. Finally these features are stored in colour feature vector.

Discrete Wavelet based colour histogram

The MRA (multi-resolution analysis) is one of the main properties in DWT which is used for texture analysis and classification.

Recall and Precision are used for performance measures in an image based retrieval system. The authors concluded that the DWT based colour histogram performed well than the other. In the authors proven that the DWT performs well when compared to traditional CBIR by combining colour and texture features. [2]

Using Nearest Neighbour and Hybrid KNNSVM

In the CBIR is used to retrieve the required similar and dissimilar conditioned Magnetic Resonance (MR) Images from the large database according to the input query image. The authors used Hybrid K-Nearest Neighbour Support Vector Machine (HKNNSVM) and Nearest Neighbour (NN) algorithms to analyse the condition of brain tumour of a patient. It results in high classification accuracy with low computational cost. In[3] the authors used hybrid KNNSVM+NN which results in high classification accuracy and low computation because of feature reduction and the hybrid concept. [3]

Using Combination of Texture and Shape Features

In this approach combination of texture and shape feature is taken into consideration. By using median filtering, the noise is removed from the query image. Segmentation is performed using K-means clustering and Fuzzy C-means Clustering to segregate the similar images. These methods are compared by means of performance measurements namely MSE, NCC (Normalised Correlation coefficient), PSNR and SC (Structural Content). The authors proved that FCM clustering provides better results than that of K-means clustering. They extracted the Tamura texture features, Hara lick features, and shape moment invariant

features. The feature are combined and used for the retrieval. The Euclidean distance and Hausdroff distance are also used to find the similarity measurements. They have shown that the Euclidean distance provides better results than the Hausdroff distance. They concluded that by integrating the features like colour and texture for retrieval produces better and accurate results when compared retrieval using single feature. [4]

Using Colour and Texture Features of the Image Sub-blocks

In Image is represented in the form of certain features. The texture and colour are the two important visual features. An image is partitioned into sub-blocks of same size. The cumulative histogram is obtained from colour features. The gray level co-occurrence matrix is used to obtain the texture of each sub-block. The Euclidean distance is also used to retrieve similar images. The authors proved that the combined features i.e., the proposed method based on colour and texture features of image sub-blocks provide better performance in retrieval than that of the traditional CBIR methods. [5]

Using Dominant Colour, Shape & Texture

An image retrieval technique is efficient when it is based on dynamic dominant features such as colour, shape and texture of the image. In the image is uniformly partitioned into 8 coarse parts. In the first step, image is uniformly divided into 8 coarse partitions. After this, the dominant colour is selected as the centred of each partition. By using Gray Level Co-occurrence Matrix, texture feature of an image is extracted. The features like texture and colour are normalized. The edge of the image is computed using Gradient Vector Flow fields, from which the shape features are extracted. In order to record the shape features of an image, invariant moments are then used. To retrieve similar images, Euclidean distance of the feature set (colour, texture and shape features) is used. This method shows good performance in image retrieval. [6]

Features Involved in CONTENT BASED IMAGE RETRIEVAL:

Colour Based Image Retrieval:

Colour is the most important feature of an image. There are different methods to retrieve the colour feature. They are colour histogram, colour correlogram, colour moments etc. Colour is not dependent of the size of the digital image and orientation of the digital image. The colours of an image is distributed in a histogram is called colour histogram. To extract colour features of an image, the colour moments such as mean, variance and skewness are used. A colour correlogram is used as an image feature which is scalable.

Texture Based Image Retrieval:

The visual pattern in an image is represented as texture. Based on the texture found in an image, the pixels are grouped and placed into different number of sets. The texture extraction techniques fall into different groups:

Model-based approach:

In order to describe and synthesize the texture; the structure based models such as Markov model and Fractal model are used.

Statistical approach:

Based on the non-deterministic properties, it characterizes the texture of an image.

Structural approach:

In it, well defined primitives are used to denote texture. It follows the spatial arrangements of well defined primitives.

Transform information:

Fourier transform, Gabor transform and wavelet transform are the transform methods used to extract the co-ordinate system of an image which has close relationship to the characteristics of a texture.

Shape Based Image Retrieval:

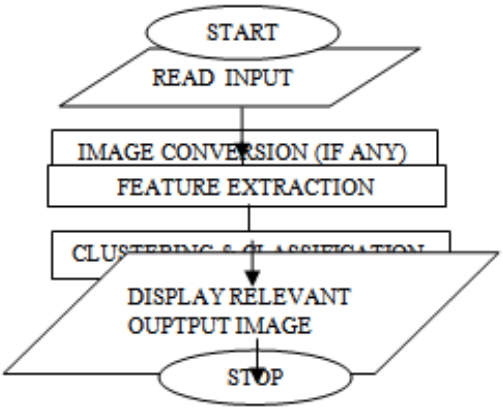
One of the low-level features in image retrieval system is shape. Using segmentation techniques the shapes are extracted from the image. The shapes are having their own representation and they can be classified. The accuracy of shape features mainly depends on the segmentation technique. The shape parameters are Centre of gravity, Hole Area Ratio, Digital bending, Solidity, Euler Number etc. The Boundary based descriptor and Region based descriptor are the two groups of shape descriptors.

RESULTS AND DISCUSSION

In the authors proposed a new learning techniques namely long term learning such as semantic clustering and short term learning by means of fuzzy support vector machine pseudo labelling. They proved that the content-based image retrieval using long term learning is worked well for large databases. In the authors searched the input image using CBIR based on clusters and they also reduced the searching time. In the authors proposed a technique and achieved better results using spatial and colour features for retrieving images from the database. In the authors discussed the study of CBIR using various techniques. [7-18]

In the authors used the features like colour, shape and texture for extracting the desire image [19-33]. In the authors achieved better results for retrieving the images using regression model, SVD decomposition approach, SOM and DWT, hybrid technique, RGB colour histogram, GMM and relevance feedback Polar Raster Edge Sampling signature, HOG of Wavelet Sub Bands, Coupled Binary Embedding and Perceptual Hashing [34-44]. In the authors achieved the gain of average retrieval time in performance. In [45-47] the authors discussed the techniques to retrieve the medical images using CBIR. In [48, 49] the authors discussed the techniques and mining using CBIR. In [50-54] the authors used classification algorithms and transform with CBIR to retrieve the desired image.

Figure: 1 CBIR SYSTEMS



CONCLUSION

The objective of CBIR is to retrieve the related images in an efficient manner. In order to retrieve the image, the CBIR system involves the following steps namely reading a query image, extracting the features, selecting optimal features and retrieving the similar images from the database. In this paper, the various concepts of CBIR have been reviewed. Every technique has its own merits and demerits.

REFERENCES

[1] Jayaprabha P, Somasundaram RM. Content Based Image Retrieval Methods Using Graphical Image Retrieval Algorithm (GIRA), International Journal of Information and Communication Technology Research, 2012 Jan, 1(1),pp. 9-14.

[2] Valli Madhavi K, Tamilkodi R, Bala Dinakar R, JayaSudha K. An Innovative Technique for Content Based Image Retrieval Using Color and Texture Features,International Journal of Innovative Research in Computer and Communication Engineering, 2013 Jul, 1(5),pp.1-5.

[3] Kannan A. Content Based Image Retrieval Using Nearest Neighbour and Hybrid KNNSVM Methods to Diagnose MR Images, International Journal of Innovative Research in Science, Engineering and Technology,2014 Mar,3(3),pp.1-6.

[4] Puviarasan N, Bhavani R, Vasanthi A. Image Retrieval Using Combination of Texture and Shape Features, International Journal of Advanced Research in Computer and Communication Engineering 2014 Mar, 3(3),pp.5873-77.

[5] Khandave V, Mishra N. CBIR By Integration of Color and Texture Features, International Journal of Recent Development in Engineering and Technology, 2014 Jan,2(1),pp.1121-27.

[6] Rao MB, Rao BP, Govardhan A. Content Based Image Retrieval Using Dominant Color, Texture And Shape, International Journal of Enggineering, Science and Technology, 2011 Apr,3(4),pp.2887-96.

[7] Barrett S. Content-Based Image Retrieval: A Short-Term and Long-Term Learning Approach. http://digital.cs.usu.edu/ ~xqi/Teaching/ REU07/ Website/ Samuel/ SamFinalPaper.pdf; 2007.

[8] Kannan A, Mohan V , Anbazhagan N. An Effective Method of Image Retrieval using Image Mining Techniques,The International journal of Multimedia & Its Applications, 2010 November, 2(4),pp.17-26.

[9] Huu QN, Thu HNT, Quoc TN. An Efficient Content Based Image Retrieval Method For Retrieving Images, International Journal of Innovative Computing, Information and Control, 2012 April, 8(4),pp.2823-36..

[10] Rui Y , Huang TS, Chang SF. Image Retrieval: Current Techniques, Promising Directions, and Open Issues, Journal, of Visual Communication and Image Representation, 1999, 10,pp. 39–62.

[11] Hirwane R. Fundamental of Content Based Image Retrieval, International Journal of Computer Science and Information Technologies, 2012, 3 (1) ,pp. 3260 - 63.

[12] Koskela M, Laaksonen J, Oja E. Comparison Of Techniques For Content-Based Image Retrieval,Proceedings of the 12th Scandinavian Conference on Image Analysis (SCIA 2001),Bergen, Norway, 2001,pp. 579-86.

[13] Ritendra Datta Jia Li James Z. Wang. Content-Based Image Retrieval - Approaches and Trends of the New Age, *MIR'05,* Singapore,*2005,*November,pp. 11-12.

[14] Ahmed GF, Barskar R. A Study on Different Image Retrieval Techniques in Image Processing, International Journal of Soft Computing and Engineering (IJSCE) , 2011 Sep,1(4).

[15] Velmurugan K. A Survey of Content-Based Image Retrieval Systems using Scale-Invariant Feature Transform (SIFT), International Journal of Advanced Research in Computer Science and Software Engineering, 2014 January, 4(1).

[16] Zinzuvadia KM, Tanawala BA, Brahmbhatt KN. A Survey on Feature Based Image Retrieval Using Classification and Relevance Feedback Techniques, International Journal of Innovative Research in Computer and Communication Engineering, 2015 January, 3(1).

[17] Kaur G, Singh EA. A Review Paper on Content Based Image Retrieval, International Journal of Advanced Research in Computer Science and Software Engineering, 2015 Apr, 5(4).

[18] Fendarkar DJ, Gulve AK. Utilizing Effective Way of Sketches for Content-based Image Retrieval System, International Journal of Computer Applications , 2015 Apr, 116(15),pp.0975 – 8887.

[19] Tiwari A, Bansal V. PATSEEK: Content Based Image Retrieval System for Patent Database,The Fourth International Conference on Electronic Business (*ICEB),2004 ,pp.1167-71.*

[20] Sharma S.Visual Feature Based Image Retrieval Using Color and Texture, International Journal of Innovations & Advancement in Computer Science, 2015 May,4(5),pp.1121-27.

[21] Bhuravarjula HHPK, Kumar VNSV. A NOVEL CONTENT BASED IMAGE RETRIEVAL USING VARIANCE COLOR MOMENT, International Journal of Computer and Electronics Research 2012 Oct, 1(3),pp.93-99.

[22] Gowri S. Color and Texture Based Image Retrieval, ARPN Journal of Systems and Software, 2012 Jan, 2(1),pp.1-5.

[23] Jenni K, Mandala S, Sunar MS. Content Based Image Retrieval Using Colour Strings Comparison, 2nd International Symposium on Big Data and Cloud Computing, Procedia Computer Science ,2015 , 50,pp. 374 – 79.

[24] Chaudhari R, Patil AM. Content Based Image Retrieval Using Color and Shape Features, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Enggineering 2012 Nov,1(5),pp.386-92.
[25] Patil SM. Content Based Image Retrieval Using Color, Texture & Shape, International Journal of Computer Science & Engineering Technology,2012 Sept,4(2),pp.242-45.
[26] Singh SM, Hemachandran K. Content-Based Image Retrieval using Color Moment and Gabor Texture Feature, International Journal of Computer Science Issues, 2012 September, 9(5,1),pp.299-309.
[27] Kavitha C, Rao DBP, Govardhan DA. Image Retrieval Based On Color and Texture Features of the Image Sub-blocks, International Journal of Computer Applications ,2011 Feb, 15(7),pp. 0975 – 8887.
[28] Reddy PVN, Prasad KS. Color and Texture Features for Content Based Image Retrieval, International Journal of Comp, Technology Application, 2011 July-August,2 (4),pp. 1016-20.
[29] Sharma S, Swaminathan R. Visual Feature Based Image Retrieval Using Color and Texture, International Journal of Innovations & Advancement in Computer Science, 2015 May,4(5),pp.1124-27.
[30] Rajlaxmi N, Lokhande M. Content Based Image Retrieval Using Spectral Feature Extraction Methods, International Journal of Electronics and Communication Engg. 2015 April,2(4),pp.74-79.
[31] Mhatre GS, Zalte MB. Remote Sensing Image Retrieval using High Level Colour and Texture Features, International Journal of Engineering and Technical Research, 2015 July,3(7),pp.124-28.
[32] Nimi PU, Tripti C , Binu A. Agent approach to Feature Based Image Retrieval in a Network, Int. Journal of Emerging Trends & Technology in Computer Science, 2015 May-June, 4 (3),pp.1-9.
[33] Su CH, Lin C. Content Based Image Retrieval Based On Features Of Texture And Color String, Proceedings of Int. Conference on Networking and Computer Application, 2015 July, pp.15-16.
[34] Singh S. A Study of Color Image content Retrieval using Regression Model, International Journal of Scientific Research Engineering & Technology (IJSRET),2015 Apr, 4(4),pp.1-4.
[35] Sushma A, Kumar NS. Analytical Image Retrieval Approach Based On SVD Decomposition Approach, International Journal Of Professional Engineering Studies, 2015 Sep,(5),pp.101-104.
[36] Huneiti A, Daoud M. Content-Based Image Retrieval Using SOM and DWT, Journal of Software Engineering and Applications, 2015 8, pp.51-61.
[37] Abood ZI, Muhsin IJ, Tawfiq NJ. Content-based Image Retrieval using Hybrid Technique, International Journal of Computer Applications, 2013 Dec, 83(12),pp.0975 – 8887.
[38] Haridas K, Thanamani AS. Well-Organized Content based Image Retrieval System in RGB Color Histogram, Tamura Texture and Gabor Feature, International Journal of Advanced Research in Computer and Communication Engineering,2014 Oct, 3(10),pp.8243-48.
[39] Shanmugapriya N,Nallusamy NR. A New Content Based Image Retrieval System Using GMM and Relevance Feedback, Journal of Computer Science, 2014, 10 (2),pp.330-40.
[40] Narayanan M, Dhanalakshmi R, Jayalakshmi R. Content Based Image Retrieval Systems, International Journal of Computer Science and Information Technology Research, 2014 Apr-Jun, 2(2),pp.158-166.
[41] Mathew SP, Balas VE, Zachariah K P, Samuel P. A Content-based Image Retrieval System Based on Polar Raster Edge Sampling Signature, 2014, 11(3),pp.25-36.
[42] Vijendran AS, Kumar SV. A New Content Based Image Retrieval System by HOG of Wavelet Sub Bands, International Journal of Signal Processing, Image Processing and Pattern Recognition, 2015, 8(4), pp.297-306
[43] Puviarasan N, Bhavani R, Aruna P, Sindhiya M. Content Based Image Retrieval Using Perceptual Hashing, Advances in Natural and Applied Sciences, 2015, 9(6) , pp.282-87.
[44] Himabindu K, Raveendra K. Content Based Image Retrieval by Coupled Binary Embedding, International Journal of Recent Trends in VLSI, Embedded Systems and Signal Processing, 2015 Jul-Aug ,1(2),pp.3368-80.
[45] Silva PD, Bhuvaneswari P. Content Based Medical Image Retrieval using Artificial Neural Network, International Journal of Science Technology & Engineering , 2015 May,1(11).
[46] Lavanya M, Kumar RND, Manoj SO, Hari KS. Multi Disease Analysis System Using Content Based Image Retrieval, African Journal of Computing & ICT, 2015 Sep,8(3),pp.1-6.
[47] Sahu T, Patil S. Content-Based Retrieval Of Medical Images, International Journal of Science, Engineering and Technology,2015, 3(2),pp.435-37.
[48] Chidambaranathan S. Image Mining with CBIR. International Journal of Computer Science and Mobile Computing, 2015 Mar, 4(3), pp.12 – 15.
[49] Hole AW, Ramteke PL. Design and Implementation of Content Based Image Retrieval Using Data Mining and Image Processing Techniques, International Journal of Advance Research in Computer Science and Management Studies, 2015 Mar, 3(3),pp.219-24.

[50] Deole PA, Longadge R. Content Based Image Retrieval using Color Feature Extraction with KNN Classification,Int. Journal of Computer Science and Mobile Computing, 2014 May,3(5),pp. 1274 – 80.
[51] Hussain SJ. A Novel Approach of Content Based Image Retrieval and Classification using Fuzzy Maps, International Journal of Research Studies in Computer Science and Engineering (IJRSCSE), 2015 Mar,2(3), pp.91-94.
[52] Putheti S, Kotha MK, Edara SR. Supervised Content based image Retrieval using Fuzzy Texton and Shearlet Transform, Global Journal of Computer Science and Technology: Graphics & Vision,2015,15(1),pp.1-9.
[53] Kumar MS, Kumaraswamy YS. A Boosting Frame Work for Improved Content Based Image Retrieval, Indian Journal of Science and Technology, 2013 Apr, 6(4),pp.1-5.
[54] Singh H, Verma S, Marwah GK. The New Approach for Medical Enhancement in Texture Classification and Feature Extraction of Lung MRI Images by using Gabor Filter with Wavelet Transform, Indian Journal of Science and Technology.,2015 Dec, 8(35),pp.1-7.