International Journal of Engineering Sciences &Research Technology

(A Peer Reviewed Online Journal)
Impact Factor: 5.164

IJESRT

RESEARCHERID
THOMSON REUTERS

[Manaf * *et al.*, 8(4): April, 2019]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

SURVEYON CONTENT BASED IMAGE RETRIEVAL TECHNIQUES

Mumthas Manaf.[*1] **& Baburaj**[2]

[*1] PG Student, Department of Computer Science, Marian Engineering College, APJ Kerala Technological University, Kerala, India

[2] Professor, Department of computer science and Engineering, Marian Engineering College, APJ Kerala Technological University, Kerala, India

DOI: 10.5281/zenodo.2631165

ABSTRACT

Goal of content-based image retrieval is to retrieve relevant images from the large collection of databases on the basis of their own visual content. Content-based image retrieval performs basic function is the feature extraction. Shape alone are not sufficient to recognize the content of the image with high accuracy so we use another information such as color or texture. In this paper we discuss several color feature extraction techniques and shape feature extraction techniques.

KEYWORDS: CBIR, Feature extraction, Color, shape

1. INTRODUCTION

Increasing importance of images in people's daily life, CBIR (content-based image retrieval) is widely used. Text-based image retrieval technique cannot retrieve images efficiently because images consume more storage space than text. To overcome this kind of limitations of texture-based image retrieval, content-based image retrieval techniques have been proposed [1]. CBIR is an active research topic in field of image processing, pattern recognition and computer vision.

2. CONTENT BASED IMAGE RETRIEVAL (CBIR) TECHNOLOGY

Content-based image retrieval system is becoming fast method of information retrieval. The basis of content-based image retrieval is feature extraction. Now a days CBIR techniques are working on combination of low-level features i.e. color, shape and texture, which has become a potential area of research. Image features are classified into two types Low level Features and High-level Features. Color, Texture and Shape are the low-level features of an image while high level features represent the semantic meaning of the image itself. In this paper we study different methods of low level features such as color and shape.

2.1 Color feature extraction

Color histogram

One of the frequently used color feature extraction method in CBIR systems [2], [3]. Color histogram is the spreading of color in an image. It denotes that the joint probability of the intensities of three color channels that is invariant to rotation, translation and scaling. There are two types of color histogram global color histogram and local color histogram. Every statistical color frequency in an image is examined by global color histogram [4]. It is used to find a solution to the problems like change in translation, rotation and angle of view. Local color histogram focusses on the individual parts of an image. Local color histograms give attention to spatial distribution of pixel which is lost in global color histograms [5]. Color histogram is easy to compute and insensitive to small variations in the image so is very important in indexing and retrieval of image database [6]. In [7] HSV color space-based color histogram is used for color feature extraction, texture features of the images are extracted by Grey Level Co-occurrence matrix (GLCM) and Canberra distance is used for similarity measurement.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

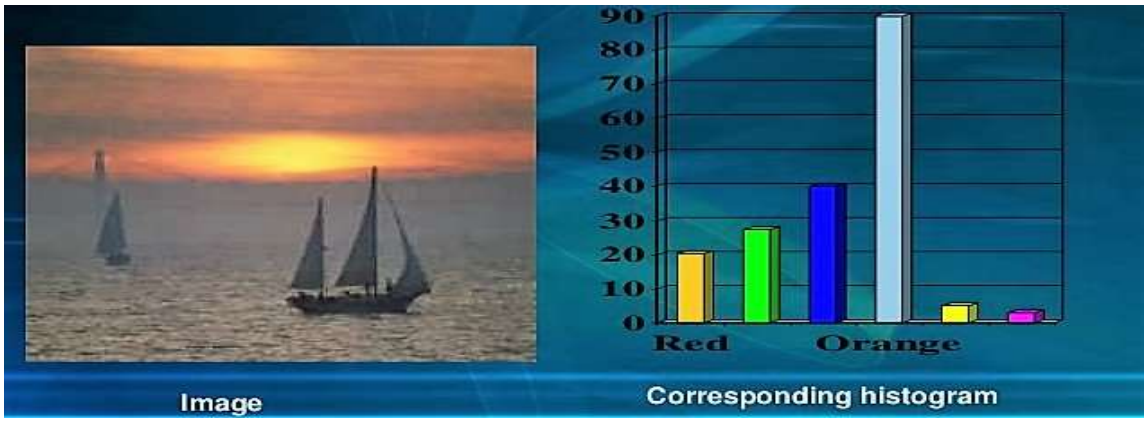

Fig-1: Histogram representation

Histogram intersection

Swain and Ballard had proposed Histogram intersection [8]. In Histogram Intersection (HI) descriptor of the image was proposed which considers global color features using histograms [9]. This feature extraction method has advantage of robustness to the geometrical modification like rotation, scaling, variation in the image resolution etc.

Color moments and color sets

Color features such as color moments and color sets representations are applied for image retrieval to overcome the limitations of color histogram. Stricker and Orengo [10] used the color moments as feature vectors for image retrieval. For fast image retrieval on the large image databases, the Web Seek system [11] proposed the color set.

Color descriptor (CD)

In [12] proposed CD to extract color feature and Canberra distance measure is used for similarity measurement.

Color coherence vector

Color histogram has a drawback that it does not use spatial information, to remove this difficulty Pass and Zabih had proposed color coherence vector method. This method performs much better than color histogram, but it has a drawback about classification of coherence region. In [13] presents modified color coherence vector. In this paper uses both spatial information and additive texture information. The experimental result showed that proposed method is more effective than conventional method.

MPEG-7 content descriptors

The MPEG-7 is a multimedia content descriptor standard proposed four kinds of color descriptors [14]: -scalable color, color layout and color structure, edge histogram. The scalable color descriptor (SCD) is defined in the hue-saturation value (HSV) color space with fixed color space and uses a novel Haar transform encoding that facilitates the scalability for the feature extraction. The color layout descriptor (CLD) can capture information about the spatial color distribution within images. The CLD is efficient only for sketch-based image retrieval. The color structure descriptor (CSD) expresses local color structures in an image using a small structuring window. An edge histogram in the image space points the frequency and the directionality of the brightness changes in the image. It provides the spatial distribution of edges. In [15] feature vectors are extracted by four kinds of color descriptors: -scalable color, color layout and color structure, edge histogram. To increase search efficiency, pre-filter tables are constructed and the feature vectors are protected by the secure kNN algorithm. The dominant color descriptor [16] analyses image using a small number of its prominent color in a given region or in an image. Considering object-based image retrieval this technique is inefficient.

2.2 Shape feature extraction

Shape representation can be divided into two categories:1) Boundary(contour) based which uses only the outer boundary of the shape 2) Region-based which uses the entire shape regions.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

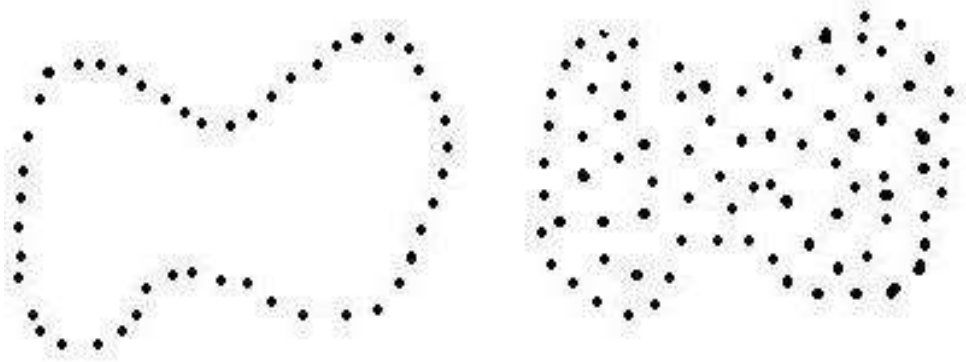

Fig-2: Boundary (contour) based& Region-based

Contour based methods

Fourier descriptor

Some early work can be found in [17] [18[19]. To study the shape retrieval results, Zhang and Lu [20] use FDs (Fourier Descriptors) of different shape signatures, their experimental results show that the FD-based methods capture the general shape of the image without using any local feature.

Wavelet transforms

Wavelet transforms can break down images into elementary building blocks localized both in space and frequency. Hwang and Mallat states that a local maximum of the wavelet transforms (i.e., a strict local maximum of the modulus on either its right or left side) at the finer scales corresponds to a singularity frequency. Wavelet transforms applies especially for recognition of edges, boundaries and important features.

In general, either the complexity of the above algorithms increases exponentially as the number of candidate images increases.

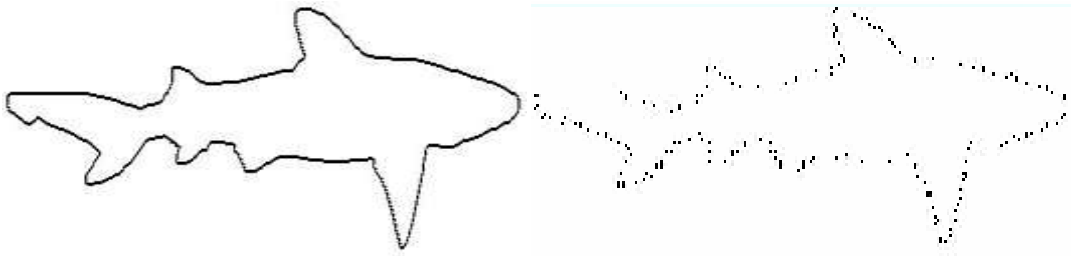

Fig-3: Illustration of the WTMM image (a) Original image (b) Its WTMM image

Curvature scale descriptor

Curvature Scale Space Descriptor (CSSD), computation is given in algorithm forms because of this it more convenient for Implementation. Basically, the CSS method treats shape boundary as a 1D signal, and analyses this 1D signal in scale space.

In 2003 D. Zhang and Guojun Lu compared the two descriptors-Fourier descriptor and CSS descriptor and found that FD performs better than CSSD in terms of robustness, low computation, hierarchical representation, retrieval performance and fit for efficient indexing.

Region based methods

Moment invariants

The main motive of moment invariants is to use region-based moments which are invariant to transformation, as the shape feature. Based on his work [21] Hu identified seven such moments. Yang and Albregtsen proposed a fast method of computing moments in binary images, based on the discrete version of Green's theorem [22]. In [23] texture features such as mean, standard deviation, kurtosis, skewness, energy etc. are calculated directly from a color histogram and invariant moments are used to extracting shape feature. Euclidean distance is used for similarity measurement.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

In [24] proposed a method using the texture and shape feature of an image. In the texture feature we use the statistical feature of color histogram and shape feature we use the Hu moments. Experimental results show that it gives 86% of precision rate and it can be used for any real time application.

In [25] content-based image retrieval is presented HSV color space is used to extract color and moment invariant is used to extract shape. Widely used texture descriptor is Grey Level Co-occurrence Matrix (GLCM). Canberra distance are used to match the query image. Experimental results prove proposed method gives better retrieval results and average precision.

Geometric Moment Descriptor (GMD)
GMD based on moment invariants for shape representation and similarity measure is widely used in shape recognition. Moment invariants are gain from moments of shapes, and are invariant to 2D geometric transformations of shapes.

Generic Fourier descriptor
In general applications generic Fourier descriptor is applied. By using spectral domain generic Fourier - descriptor is extracted.

Fourier or Wavelet Fourier Descriptor is simple to compute, robust and compact for shape representation. When some significant part of the shape is missing, Generic Fourier Descriptors (GFD) is the best choice.

3. CONCLUSION

One of the interesting areas of research is CBIR hence modified methods and algorithms are increased day by day. To improve the image retrieval capability of CBIR systems, various algorithms are proposed. Shape alone are not sufficient to recognize the content of the image with high accuracy so we use another information such as color or texture. This paper provides survey on several color feature extraction techniques and shape feature extraction techniques.

REFERENCES

[1] J. R. Smith and S. F. Chang, "Visual SEEK: A Fully Automated Content-Based Image Query System," ACM Multimedia Conference, Nov. 1996.
[2] A. J. K. Iqbal, M. O. Odetayo, "Content-based image retrieval approach for biometric security using color, texture and shape features controlled by fuzzy heuristics," Journal of Computer and System Sciences, vol. 78, p. 12581277, 2012.
[3] J. A. Q. Iqbal, "A system for content-based retrieval in digital image libraries," in International Conference on Control Automation, Robotics and Vision (ICARCV), 2002.
[4] M. J. Swain, and D. H. Ballard, "Color Indexing", International Journal of Computer Vision, Vol. 7, No. 1, 1991, pp. 11-29.
[5] A. N. Ganar, C. S. Gode, and S. M. Jambhulkar, "Enhancement of Image Retrieval by Using Color, Texture and Shape Features", in International Conference on Electronic Systems, Signal Processing and Computing Technologies, 2014, pp. 251–255.
[6] A. Rao, R. K. Srihari, and Z. Zhang, "Spatial Colour Histogram for Content Based Image Retrieval", in 11th IEEE International Conference on Tools with Artificial Intelligence, 1999, pp. 183-186.
[7] International Advanced Research Journal in Science, Engineering and Technology Vol. 2, Issue 6, June 2015 Content Based Image Retrieval using Color, Shape and Texture Ramesh K Lingadalli Ramesh
[8] M. J. Swain and D. H. Ballard, "Color Indexing," International Journal of Computer Vision, Vol. 7, No.1, 1991.
[9] G. Johnson, X. Song, E. Montag, and M. Fairchild, "Derivation of a color space for image color difference measurement", Color Research and application, Vol. 35, No. 6, 2010, pp. 387-400.
[10] STRICKER, M. and ORENGO, M.: "Similarity of Color Images," in Proc. SPIE Storage and Retrieval for Still Image and Video Databases III, February 1995, San Jose, CA, USA, pp. 381-392
[11] SMITH, J.R. and CHANG, S.F.: "Visually searching the web for content," IEEE Trans. Multimedia, 1997, 4, (3), pp. 12-20

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

[12] International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056Volume: 05 Issue: 03 | Mar-2018CONTENT BASED IMAGE RETRIEVAL (CBIR)S. Rubini1 R. Divya, G. Divyalakshmi, Mr T.M. Senthil Ganesan.
[13] Additive Texture Information Extraction Using Color Coherence Vector Ki-Hyun Kang*, Yong-In Yoon*, Jong-Soo Choi*, Jin-Tae Kim**, Huong Koo**, Jong-Ho Choi
[14] B. S. Manjunath, J.-R. Ohm, V. V. Vasudevan, and A. Yamada, "Color and texture descriptors," IEEE Trans. Circuits Syst. Video Technol., vol. 11, no. 6, pp. 703–715, Jun. 2001.
[15] IEEE TRANSACTIONS ON INFORMATION FORENSICS AND SECURITY, VOL. 11, NO. 11, NOVEMBER 2016 A Privacy-Preserving and Copy-Deterrence Content-Based Image Retrieval Scheme in Cloud Computing Zhihua Xia, Member, IEEE, Xinhui Wang, Liangao Zhang, Zhan Qin, Member, IEEE, Xingming Sun, Senior Member, IEEE, and Kui Ren, Fellow, IEEE
[16] DENG, Y., MANJUNATH, B.S., KENNEY, C., MOORE, M.S., SHIN, H.: "An efficient color representation for image retrieval," IEEE Tran. Image Processing, Jan. 2001, 10, (1), pp. 140-147
[17] Y. Rui, A. C. She, and T. S. Huang, Modified Fourier descriptors for shape representation—a practical approach, in Proc. of First International Workshop on Image Databases and Multi Media Search, 1996.
[18] C. T. Zahn and R. Z. Roskies, Fourier descriptors for plane closed curves, IEEE Trans. On Computers, 1972.
[19] E. Person and K. S. Fu, Shape discrimination using Fourier descriptors. IEEE Trans. Sys. Man.Cyb., 1977.
[20] D. S. Zhang & G. Lu, A comparative study on shape retrieval using Fourier descriptors with different shape signatures, Proc. of Int Conf on Intelligent Multimedia and Distance Education, Fargo, ND, 2001, 1-9.
[21] M. K. Hu, Visual pattern recognition by moment invariants, computer methods in image analysis, IRE Transactions on Information Theory 8, 1962.
[22] L. Yang and F. Algregtsen, Fast computation of invariant geometric moments: A new method giving correct results, in Proc. IEEE Int. Conf. on Image Proc., 1994.
[23] International Journal of Innovative Research in Computer and Communication Engineering Vol. 4, Issue 6, June 2016 Content Based Image Retrieval using Statistical Feature and Shape Extraction Piyush Kothyari and Shriprakash Dwivedi
[24] International Journal of Innovative Research in Computer and Communication Engineering Vol. 4, Issue 6, June 2016 Content Based Image Retrieval using Statistical Feature and Shape Extraction Piyush Kothyari and Shriprakash Dwivedi
[25] International Advanced Research Journal in Science, Engineering and Technology Vol. 2, Issue 6, June 2015 Copyright to IARJSET DOI 10.17148/IARJSET.2015.2610 40 Content Based Image Retrieval using Color, Shape and Texture Ramesh K Lingadalli