Exploring the Creation of a Non-Image Data Base Employing Slope and Inclination parameters of linear edges of an Image

H S Nagalakshmi *, Dr Sanjay Pande, Dr P Nagabhushan*****

Abstract—this research proposal aims at creating a ***Non-image based retrieval system that has the advantages of efficient matching and retrieval of image, which*** isdue to the usage of only two image parameters such as slope and inclination captured using a histogram based regression line. The proposed system is expected to be experimented with different types of images from the bench mark dataset of CBIR.

Index Terms— Non-image data base, CBIR, Histogram, image data base, similarity matching, virtual image and linear edge image.

1 Introduction

The recent tremendous growth in computer technology has brought a substantial increase in the storage of digital imagery. Examples of applications can be found in everyday life, from museums for archiving images or manuscripts, to medicine where millions of images are generated by radiologists every year. Storage of such image data is relatively straightforward, but accessing and searching image databases is intrinsically harder than their textual counterparts. To overcome this problem traditional systems uses text based manual annotation for retrieval but, as the number of candidate images in database increases, text based system becomes highly inefficient. The main problems being tremendous amount of manual labor required for annotating the images and also, few keywords are not sufficient to describe an image. This limits the usefulness of the system. To overcome this problem Content Based Image Retrieval is used. "Content based" means that the search will analyze the actual contents of the image [1].

*Assistant professor in Computer Science, GWC, Hunsur.Email-hsnss2003@yahoo.co.in

** Principal, Sampoorna Insituteof Technology and Research, SITAR, Belakere, Channapatna, email-rakroop99@gmail.com

***professor, University of Mysore, Mysore Email-pnagabhushan@hotmail.com

The goal of Content-Based Image Retrieval (CBIR) systems is to operate on huge collections of images and, in response to visual queries, extract relevant images. In the conventional CBIR, the image matching takes place between query and database images at pixel level, which limits its application to large databases, subsequently consuming more access time and memory. To overcome the problem of conventional method of CBIR, few researchers have attempted to use CBIR from the database of non-image representation. In this work we have proposed a *Non-image database*, which is effective and fast retrieval of images using some parameters which are derived from the images and which are numerically represented.

Review of Research and Development in the Subject

Research on content-based image retrieval has gained tremendous momentum during the last decade. A lot of research work has been carried out on Image Retrieval by many researchers, expanding in both depth and breadth [2-6]. The term Content Based Image Retrieval (CBIR) seems to have originated with the work of Kato [7] for the automatic retrieval of the images from a database, based on the colour and shape . Since then, the term has widely been used to describe the process of retrieving desired images from a large collection database, on the basis of syntactical image features (colour, texture and shape). The techniques, tools and algorithms that are used, originate from the fields, such as statistics, pattern recognition, signal processing, data mining and computer vision. In the past decade, many image retrieval systems have been successfully developed, such as the IBM QBIC System [9], developed at the IBM Almaden Research Centre, the VIRAGE System [9], developed by the Virage incorporation. Since simply colour, texture and shape features cannot sufficiently represent image semantics, semantic-based image retrieval is still an open problem.

Image retrieval system can be broadly classified into two types (i). Image based ,data based image retrieval systems and (ii). Non-Image representation based image retrieval systems

Image based content retrieval includes the features like colour, shape, texture,. Lot of research work has been done on these features [10]

Colour

Examining images based on the colours they contain is one of the most widely used techniques because it does not depend on image size or orientation. Colour searches will usually involve comparing colour histograms, though this is not the only technique in practice [8,10 19,20].

Texture

Texture measures look for visual patterns in images and how they are spatially defined. Textures are represented by pixels which are then placed into a number of sets, depending on how many textures are detected in the image. These sets not only define the texture, but also where in the image the texture is located [20].

Shape

Shape does not refer to the shape of an image but to the shape of a particular region that is being sought out. Shapes will often be determined first applying segmentation or edge detectionto an image. In some cases accurate shape detection will require humanintervention because methods like segmentation are very difficult to completely automate [10 ,19].

Tamura Features

The Tamura features including *coarseness*, *contrast*, *directionality*, *line likeness*, *regularity*, and *roughness*, are designed in accordance with psychological studies on the human perception of texture. The first three components of Tamura features have been used in some early well-known image retrieval systems, such as *QBIC[8,10]*

Non-image medium for image retrieval

Text based manual annotation are used for image retrieval, but as the number of candidate images in data base increases, text-based system becomes highly inefficient, the main problem being tremendous amount of manual labour required for annotating the images and also, few keywords are not efficient to describe an image [6]. This limits the usefulness of the system. Nevertheless in the literature we could trace out an interesting idea of using histogram based regression line for characterising an image which has only two parameters [17].

From the literature review carried out by us we could observe that there are some efforts in characterising an image with line parameters in different orientation [11,12,13,14,15,16,18] which we roughly group into four category :viz., statistical based[16], gradient based [13], pixel connectivity-edge linking based [14,15] and Hough Transform (HT) based [11,12] models. However, a single and robust solution that consumes less computing time, less memory and also ensures edge pixel connectivity was unexplored for a quite long time. In 2004 a novel and robust approach, which consumes less time and ensures edge pixel connectivity was proposed by Guru et.at [18]. Therefore we are motivated to explore this work for detecting line segments in a CBIR database images, which could be further parameterized to create a non-image database.

Motivation

From CBIR literature review ,we could observe that creating an image data base for image retrieval is ineffective , as it consumes lot of memory and it takes more time to retrieve required image. Most of the proposed features discussed in the literature of CBIR are not suitable for large repository of images, However, algorithm proposed **by *Pradeep &Nagabhushan*** *[17]* on regression based feature has proved to be superior in capturing image characteristics. However location of the line is also one the important feature, to extract the location of the line, we may consider the spatial relationship of the line by fixing the image in quadrants. Therefore we feel that this proposed method for creating a non-image based data base could be superior model for image retrieval. .

Objectives

The following objectives are identified

- Transforming an image into linear edge image
- Expressing the linear edges in terms of their lengths, orientations and locations.
- Assimilating linear edge information of an image into line -length histogram and line-orientation histogram
- Exploring the usability of histogram based regression line parameters for creating a non-image base database.
- Demonstrating the superiority of Non-image representation of content based image retrieval over the conventional data base containing actual images.

Description of research work

In the back drop of the image based content retrieval as brought out in the literature review, this research proposal aims at creating a *Non-image based retrieval system, that has the advantages of efficient matching and retrieval of image, which is* due to the usage of only two image parameters such as slope and inclination captured using a histogram based regression line. The proposed system is expected to be experimented with different types of images from the bench mark dataset of CBIR.

Proposed architecture

The proposed architecture for the above problem statement is shown in figure – 1.

We proposes to use database in two levels namely (a) Front-end database and

(b)Back-end database.

Front-end database: is a database of Non-image representation of images base stored in primary memory, which is used for fast image capture. This is also called as virtual data base , which is already available in the primary memory enabling efficacious retrieval computations. Since true images are not stored here, this is also refer to as virtual image base.

Back-end database: Consists of actual images. This is called so the data base is placed in secondary memory. This function as an image archive. The images referenced by the retrieval procedure are finally extracted from the back-end data base.

Overall architecture of the proposal

Figure

Proposed experimental analysis

Initially we plan to create a non-image based data base using the regression line parameter obtained from the line segments for the entire image ,detected using existing algorithm . However it may be possible that regression line parameters may fail to capture the spatial location of the line segments detected. Therefore to alleviate this problem be proposed to quad divide an image to obtain regression line parameters for each quadrant.

Experiments will be carried out on standard image data bases ,which are proven as benchmark data sets in CBIR studies.

Some of the key performance measures which we propose to study in comparing our proposal model with conventional methods are (i) Space complexity of non-image based database model (ii) Query matching time (iii) Retrieval time.

Conclusion

In summary, the proposal is to suggest a computationally economical approach for CBIR in terms of creating a non-image data base, composes of numerical parameters such as slope and inclination of corresponding linear edge image of an image with which computations would happen, in place of carrying out the process directly with the actual image-data base.

ACKNOWLEDGMENT

I would like to thank UGC for Sponsoring this Minor Research Project.2164- MRP-/15-16/KAMY005/UGC-SWRO dated 25/04/2016.

References

[1] Dr.Fuhuri Long, Dr.Hongjiang and Prof.David Dagan Feng, 2003.*Fundamental of content based ImageRetrieval*;Chapter1, R. Datta, D. Joshi, J. Li and J. Z. Wang, "Image retrieval: Ideas, influences, and trends of the new age", ACM computing Survey, vol.40, no.2, pp.1-60, 2008.

[2] J. Eakins and M. Graham, "Content-Based Image Retrieval", Technical report, JISC Technology Applications Programme, 1999.

[3] Y. Rui, T. S. Huang and S.F. Chang, "Image Retrieval: Current Techniques, Promising Directions and Open Issues. Journal of Visual Communication and Image Representation. 10(4): pp. 39-62. 1999.

[4] A. M. Smeulders, M. Worring and S. Santini, A. Gupta and R. Jain, "Content Based Image Retrieval at the End of the Early Years", IEEE Transactions on Pattern Analysis and Machine Intelligence, 22(12): pp. 1349-1380, 2000.

[5] Y. Liu, D. Zang, G. Lu and W. Y. Ma, "A survey of content-based image retrieval with high-level semantics", Pattern Recognition, Vol-40, pp-262-282, 2007.

[6] T. Kato, "Database architecture for content-based image retrieval", In Proceedings of the SPIE – The International Society for Optical Engineering, vol.1662, pp.112-113, 1992.

[7] M. Flickner, H Sawhney, W. Niblack, J. Ashley, Q. Huang, B. Dom, M. Gorkani, J. Hafne, D. Lee, D. Petkovic, D. Steele and P. Yanker, "Query by Image and Video Content The QBIC System" IEEE Computer, pp-23-32, 1995.

[8] A. Gupta and R. Jain. Visual information retrieval, Communications of the ACM 40 (5), 70–79. 1997.

[9] W. Niblacket. al., "The QBIC Project: Querying Images by Content Using Color, Texture and Shape". Proc. Of the Conference Storage and Retrieval forImage and Video Databases, SPIE vol. 1908, 1993, pp. 173-187.

[10] Duda, R.O., Hart, P.E., 1972. Use of Hough transformation to detect lines and curves in pictures. Commun. ACM 15 (1), 11–15.

[11] Galambos, C., Matas, J., Kittler, J., 1999. Progressive probabilistic Hough transform for line detection. In: Conf. on Computer Vision and Pattern Recognition, IEEE Computer Society 1, 554–560.

[12] Burns, J.B., Hanson, A.R., Riseman, E.M., 1986. Extracting straight lines. IEEE Trans. Pattern Anal. Machine Intell. 8

[13] Canny, J.F., 1986. A computational approach to edge detection.IEEE Trans. Pattern Anal. Machine Intell. 8 (6), 679–698. Nevatia, R., Babu, K.R., 1980.

[14] Linear feature extraction and description. Comput. Vision Graphics Image Process. 13, 257- 269.

[15]Mansouri, A., Malowany, S., Levine, M.D., 1987."Line detection in digital pictures: A hypothesis prediction/verification paradigm."Comput. Vision Graphics Image Process.40, 95–114.

[16].P.Nagabhusan, R.Pradeep Kumar "An Approach Based on Regression Line Features for Low Comnplexity Content Based Image Retrieval". Proceedings of the International conference on computing Theory and Applications (ICCTA 2007)

[17] D.S. Guru, B. H. Shekar, P. Nagabhushan, "A simple and robust line detection algorithm based on small eigenvalue analysis", Pattern Recognition Letters, Vol 25, 2004.

[18] T. Bernier, J.A. Landry, "A new method for representing and matching shapes of natural objects". Pattern Recognition 36(2003) 1711-1723.

[19]G.L.Gimel'farb and A.K.Jain."On retrieving textured images from an image data base." *Pattern Recognition*, vol. 29, no. 9, 1996, 1441 - 1483.