

A REVIEW PAPER ON IMAGE RETRIEVAL TECHNIQUES

Er. Uttamjeet Kaur, Er. Harpreet Kaur

Research Scholar, Assistant Professor

Department of CSE

Sant Baba Bhag Singh University, Jalandhar, India

Abstract: Image retrieval is the latest and the fastest technique for searching images from the large collection of database. To search for images, a user may provide keywords, text input or image itself. This paper describes various image retrieval techniques like TBIR (Text Based Image Retrieval), CBIR (Content Based Image Retrieval), SBIR (Semantic Based Image Retrieval) and focus on the various methods used in SBIR and comparison of these techniques. In TBIR image retrieval is based on matching the user's textual query to the annotation of the image. CBIR uses colors, textures, shapes, or any other information that can be derived from the image itself to retrieve the information. SBIR retrieve the information by combining all the features like texture, color, and shape to identify higher-level concepts which is semantically more similar with the image.

Index Terms- Image retrieval, Retrieval based on text, Retrieval based on content, Retrieval based on semantics, Semantic gap, Object ontology.

INTRODUCTION

Technology had made a tremendous impact on the world. In regard to images and videos its impact is becoming phenomenal which increases the data storage. So it is necessary to handle this large number of data sets. Collection of this data is allowed to be retrieved by many approaches like TBIR, CBIR, SBIR.

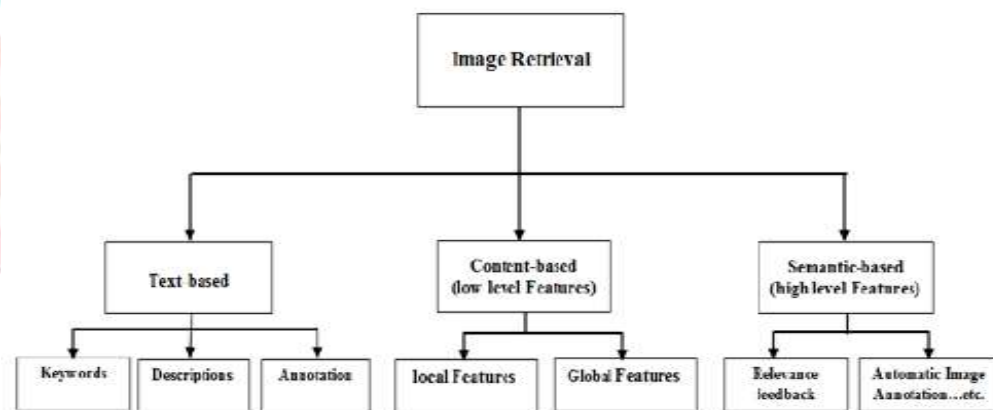
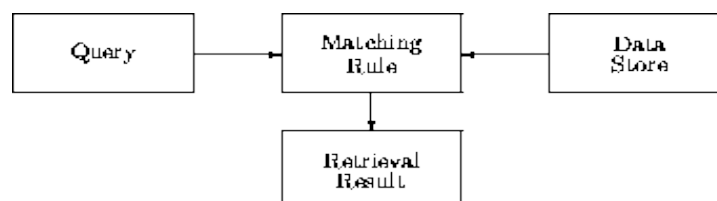


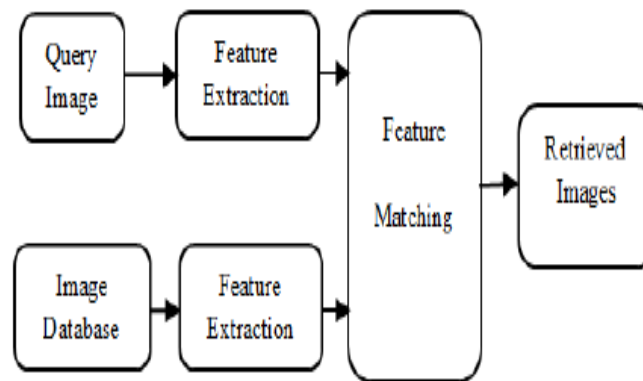
Image Retrieval Techniques

The systems which are used to retrieve images, based on keywords known as text based image retrieval. TBIR is used to retrieve documents containing images based on the textual information. It allows the user to carry information according to the textual query which is given and find the relevant images based on the textual query. It is also necessary to use unique keywords for the description of images to retrieve the right information.



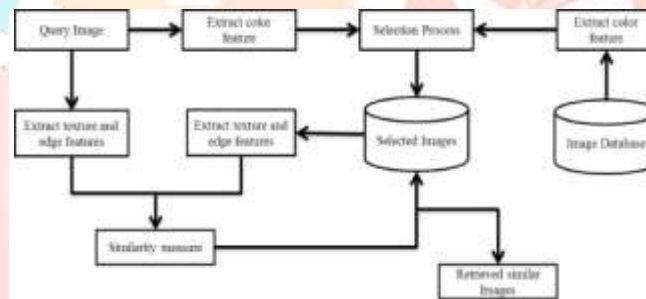
Text Based Image Retrieval

Content based image retrieval is another way to retrieve the information with the help of the visual contents similar to the query image. Images are retrieved not by keywords or annotations but with the help of features which are extracted directly from the image source. CBIR uses the contents and properties of image (i.e. color, texture and shape of the image) and then matches it with different images present in the database. According to the similarity level the system ranks the images and displays it.



Content Based Image Retrieval

SBIR is the combination of CBIR and TBIR. In semantic based image retrieval, retrieval is done with the help of features of images, emotions, abstract attributes, logical implication, shape matching, faces, fingerprints like "find pictures of lily flower". To achieve better results many CBIR systems generally make use of combination of lower-level features like texture, color, and shape with interfaces to identify higher-level concepts which is semantically more similar with the image. This technique is identified as bridging the semantic gap which maps low level concepts to high level concepts and helps to retrieve the meaningful information.



Semantic Based Image Retrieval

II.RELATED WORK

Hollink, L., Little, S., and Hunter, J. (2005) provides the knowledge based on the concepts and relationships among these concepts. Some researchers describe images using the intermediate-level descriptors which are quantized from low-level features, and then high-level semantics are reasoned using the ontology rules. These inference rules capture the domain-expert's understanding of how low level features are related to ontology concepts. [15]

Ying Liu, Dengsheng Zhang, Guojun Lu, Wei-Ying Ma (2006) provides a comprehensive survey of the recent technical achievements in high-level semantic-based image retrieval. Major recent publications are included in this survey covering different aspects of the research in this area, including low-level image feature extraction, similarity measurement, and deriving high-level semantic features. [1]

Gulfishan Firdose Ahmed (2011) et al In essential segments of CBIR system are presented. IR strategies in light of color, texture, shape and semantic image are talked about, broke down and analyzed. The semantic-based IR is a superior approach to fathom the "semantic gap" issue, so the semantic-based IR technique is pushed in this study. Other related strategies, for example, importance criticism and execution assessment additionally examined. [11]

Riad Alaa et al. (2012) discussed the literature review on Image Retrieval based on semantic concepts by which had a great impact on the Image Retrieval field as it was very helpful for improving the semantic image retrieval systems accuracy. In this research various image search techniques are described for reduction of semantic gap. Furthermore, based on existing methods and application requirements author have suggested few future assessments. [10]

Kurtz, Camille, et al (2014) conducted a research on Image Retrieval (IR) on the basis of content similarity. Many techniques have been used to enhance the results of image search. These approaches include hierarchical knowledge-based systems for Image Retrieval. But the semantic gap between the low-level image features and their high level semantics has always ruined the retrieval quality. [4][22]

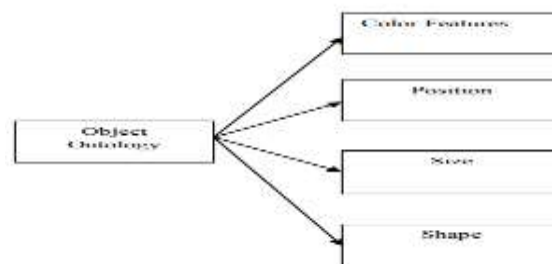
L. Haldurai (2015) et.al This data is spoken to in numerous structures like text, table, image, chart and graph so forth here we focus on data that is put away as images. CBIR strategy investigates different philosophies in separating certain knowledge, examples and connections found in the images from the collection of images. This paper concentrates on different strategies that were proposed in earlier literature. [3]

III. METHODS USED FOR EXTRACTING DIFFERENT FEATURES

Different methods are used for extracting different features of the image which are as follows:-

- i) On the basis of knowledge- It provides the knowledge in advance for extracting the features.
- ii) On the basis of behavioral semantics- It can extract the information by the help of recognizing the image.
- iii) On the basis of object recognition- It is based on the object detection which uses the outline of the computer vision
- iv) On the basis of external information- The information is extracted from other relevant information like file name, URL of the image etc.

Some retrieval systems which depend on low level features mismatch with the human perception which leads to incorrect information and insufficient knowledge known as semantic gap. By the semantic gap, systems are unable to find the relevant image according to the human requirement. To overcome this problem of the semantic gap, the object ontology technique used in SBIR. The word ontology refers to the science of metaphysics which defines the nature with its properties and relations. In Computer Science, ontology is a systematic arrangement of concepts, their properties and relations which exist in domain. Common components of ontology include Individuals, Classes, Attributes, Relations, Function terms, Restrictions and Rules [22]. Object ontology uses semantics of the image which defines the different levels for assigning low level features of the image (i.e. some stones, many stones, big stones). The different algorithms for the object ontology are designed easily for extracting the semantic features of the image. The most common techniques used for image retrieval using object ontology are :- I) Color based techniques II) Position (texture) based technique III) Shape based technique IV) Size based technique



Object Ontology

The color based approach is done by calculating the color histogram of the image and set of images are obtained at the end. The shape based approach identifies the similar images related to it and gave the result. The texture based approach identifies the texture in the image to provide the desired result whereas size based approach looking for the size of the object and identify it.

IV.COMPARISON

Various Image Retrieval Techniques

AREAS	TBIR	CBIR	SBIR
Terminology	Searching done by text or keywords.	Searching done by color, texture or shape.	Combination of TBIR and CBIR.
Results efficiency	Provides effective result	Robust feature set.	Reduced data set, retrieve similar images.
Speed	Less time consuming	Time consuming	Time consuming
Databases	Requires unique keywords for searching.	Handle large databases but missing relevant images.	Handle large databases. Do not miss any relevant image.

V.CONCLUSION

This paper shows the survey on the different image retrieval techniques and also comparison of them. All these techniques have some advantages and disadvantages also .TBIR uses the keywords for searching, manually which is fast and effective but still has some disadvantages like inaccurate entry by user. CBIR uses contents like color, texture and shape but still faces difficulty to identify semantic analysis of the image properly and SBIR uses the combination of both TBIR and CBIR. So we have concluded that SBIR is the most efficient technique for image retrieval as it does not miss any relevant image as the content is provided by the user. Semantic technology like object ontology which reduces semantic gap as it helps to scaling the low level image features to high level ontology concepts which gives the desired result but sometimes there is the problem of extracting semantic features so it is important to design the system which extract the features more efficiently.

REFERENCES

- [1] Ying Liu , Dengsheng Zhang , Guojun Lu, Wei-Ying Ma “A survey of content-based image retrieval with high-level semantics” Gippsland School of Computing and Information Technology, Monash University, Vic 3842, Australia Microsoft Research Asia, No. 49 ZhiChun Road, Beijing 100080, China.
- [2] Dharmendra Pandey and Shivpratap kushwah “A Review on CBIR with its Advantages and Disadvantages For Low-level Features” Volume-4, Issue-7, July 2016.
- [3] L. Haldurai, V. Vinodhini, “A Study on Content Based Image Retrieval Systems” International Journal of Innovative Research in Computer and Communication Engineering -2015.
- [4] Kurtz, Camille, et al. "A hierarchical knowledge-based approach for retrieving similar medical images described with semantic annotations." Journal of biomedical informatics (2014).
- [5] Camille Kurtz, Adrien Depeursinge, Sandy Napel, Christopher F. Beaulieu, Daniel L. Rubin "On combining image-based and ontological semantic dissimilarities for medical image retrieval applications" Medical Image Analysis, Volume 18, Issue 7, October 2014, Pages 1082-1100.
- [6] Hong-Ying Yang, Yong-Wei Li, Wei-Yi Li, Xiang-Yang Wang, FangYu Yang "Content-based image retrieval using local visual attention feature", Journal of Visual Communication and Image Representation, Volume 25, Issue 6, August 2014, Pages 1308-1323.
- [7] K. Haridas, “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 Volume 3, Issue 10, October 2014 .
- [8] Mr. Milind et al, “Efficient Content Based Image Retrieval Using Color and Texture”, International Journal of Scientific & Engineering Research, Volume 4, Issue 6, June- 2013 121 ISSN 2229-5518 8B. Ramamurthy and K.R. Chandran, “Content Based Medical Image Retrieval with Texture.

- [9] K. Nirmala , “Comparative Analysis in Content Based Image Retrieval System Using Color and Texture” International Journal Of Engineering Sciences & Research Technology ,November (2013).
- [10] Riad, Alaa M., Hamdy K. Elminir, and SamehAbd-Elghany. "A Literature Review of Image Retrieval based On Semantic Concept." International Journal of Computer Applications 40.11 (2012): 12-19.
- [11] Gulfishan Firdose Ahmed and Raju Barskar” A Study on Different Image Retrieval Techniques in Image Processing” International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-1, Issue-4, September 2011.
- [12] Fernández, Miriam, et al. "Semantically enhanced Information Retrieval: an ontology-based approach." Web Semantics: Science, Services and Agents on the World Wide Web 9.4 (2011): 434-452.
- [13] Nicolas Eric Maillot, Monique Thonnat "Ontology based complex object recognition" Image and Vision Computing, Volume 26, Issue 1, 1 January 2008, Pages 102-113.
- [14] Park, K.-W., Jeong, J.-W., and Lee, D.-H. 2007. OLYBIA: Ontology-based automatic image annotation system using semantic inference rules, in 12th International Conference on Database Systems for Advanced Application (Bangkok, Thailand, 2007).
- [15] Hollink, L., Little, S., and Hunter, J. 2005. Evaluating the application of semantic inferencing rules to image annotation. In Proceedings of the 3rd international conference on Knowledge Capture(K-CAP) (Banff, Alberta, Canada, 2005).
- [16] Town, C. 2006. Ontological inference for image and video analysis. Machine Vision and Applications 17, 2, 94-115.
- [17] Shamik Sural, “segmentation and histogram generation using the hsv color space for image retrieval” IEEE ICIP.
- [18] W. Niblack et al., "Querying images by content, using color, texture, and shape," SPIE Conference on Storage and Retrieval for Image and Video Database, Vol. 1908, pp.173-18.
- [19] J. G. Daugman, "Complete discrete 2D Gabor transforms by neural networks for image analysis and compression," IEEE Trans. AS SP, vol. 36, pp. 1169-1179, July.
- [20] N. Alajlan, M.S.Kamel, G.H.Freeman, “Geometry-based image retrieval in binary image databases, IEEE Transactions on Pattern Analysis and Machine Intelligence” (2008), Volume 30, Issue 6, Pages 11003–11013.
- [21] B Kaur, A Kaur, J Singh, “Steganographic approach for hiding image in DCT domain” International Journal of Advances in Engineering & Technology, 2011.
- [22] Umar Manzoor, Mohammed A. Balubaid “Semantic Image Retrieval : An Ontology Based Approach” IJARAI vol.4, no.4. King Abdulaziz University, Saudi Arabia.
- [23] Er. Harpreet Kaur, “Local maximum edge coocurrence patterns for image indexing and retrieval” in International Conference on Signal and Information Processing (iconsip) 2016 in IEEE Xplore 16 February 2017.
- [24] Harpreet Kaur, Vijay Dhir “Color and Texture Based Image Retrieval Feature Descriptor using Local Mesh Maximum Edge Co-occurrence Pattern” International Journal of Applied Engineering Research ISSN 0973-4562 Volume 12, Number 19 (2017).
- [25] Harpreet Kaur, Mandeep Kaur “An Empirical Study on Texture Feature Extraction Methods for Image Retrieval” International Journal of Advanced Research in Computer Science, Volume 8, No. 4, May 2017.
- [26] Dr. Vijay Dhir, Sanjeev Kumar “ Review of Various Image Contrast Enhancement Techniques” International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 8, August 2014.
- [27] Gurpreet Rathore , Dr. Vijay Dhir “Image Registration for Dental X-Ray images using Hybrid Technique” , International Journal of Innovative Research in Science, Engineering and Technology Vol. 2, Issue 11, November 2013.
- [28] H Kaur, V Dhir “Local Color Oppugnant Mesh Extrema Patterns: A New Feature Descriptor for image retrieval” Indian Journal of Science and Technology, 2017.
- [29] J Kaur, J Singh, “An Image Segmentation Based Clustering Technique Applied on Dental Images”, Proceedings in International Journal Of emerging Technologies in engineering research, 2015.
- [30] Gurpreet Singh, Prof. (Dr.) Jatinder Singh Bal “AReview of Ant Colony System Algorithm and its models”,International Journal of Advanced Research in Computer science, Volume 8, No. 4, May 2017.