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A STUDY ON IMAGE MINING TECHNIQUES, FRAMEWORK AND APPLICATIONS

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ABSTRACT

Image mining refers to a data mining technique where images are used as data. It supports a large field of applications like medical diagnosis, agriculture, industrial work, space research and obviously the educational field. In this paper I would like to explain image mining- introduction, history, image mining process, image mining framework, application, techniques, various extraction mechanisms used in image mining and image retrieval based on semantics. Since image mining is now the most popular technique of retrieving information related to user query. These concepts are used to developing the research process and it gives the best image mining results.

KEYWORDS:

I. INTRODUCTION

Data mining means mining information and knowledge from large databases and information repositories. This has become a highly demanding task which has attracted lots of researchers' and developers has made good progress in the past years. One of the major forms of data mining used in today's scenario is image mining. The process of retrieving images form repositories is called image mining.

There have been many advances in technologies like image digitization, storage and transmission. These have caused a number of digital images to increase tremendously. Thus, content based image classification and retrieval systems have been the subject of many multimedia data mining research works in the recent years. The most used features for image description are: color, texture, shape and spatial features. Many of the existing image databases allow users to formulate queries by submitting an example image. The system then identifies those stored images whose feature values match those of the query most closely, and displays. Image mining deals with the extraction of implicit knowledge, image relationships or other patterns not explicitly stored in the image.

A. Image Mining Process

The researches in image mining can be classified into two kinds. The image processing is one in which, it involves a domain specific application where the focus is in the process of extracting the most relevant image features into a suitable form [2,3,4] and the image mining is one in which, it involves general application where the focus is on the process of generating image patterns that may be helpful in the understanding of the interaction between high-level human perception of images and low-level features [5,6]. So, the latter may be the best one to lead the improvement in the accuracy of images.

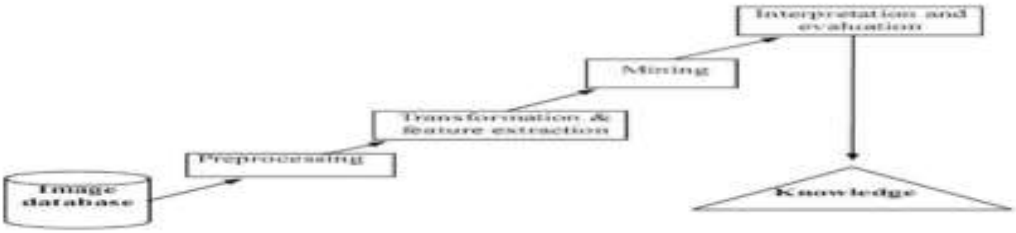

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Image mining normally deals with the extraction of implicit knowledge, image data relationship, or other patters not explicitly stored from the low-level computer vision and image processing techniques. i.e.) the focus of image mining is the in the extraction of patterns from a large collection of images, the focus of computer vision and image processing techniques is in understanding or extracting specific features from a single image.

The images from an image database are first preprocessed to improve their quality. These images then undergo various transformations and feature extraction to generate the important features from the images. With the generated features, mining can be carried out using data mining techniques to discover significant patterns. The resulting patterns are evaluated and interpreted to obtain the final knowledge, which can be applied to applications.

Current techniques in image retrieval and classification (two of the dominant tasks in Image Mining) concentrate on content-based techniques [RHC99]. Various systems like the QBIC [NB94], Retrieval Ware [D93] and Photo Book [PPS96] etc have a variety of features, but are still used in particular domains. Jain et al [JV96] use color features combined with shape for classification. Ma et al [MDM97] use color and texture for retrieval. Smith and Chang [SC96] use color and the spatial arrangements of these color regions. Since perception is subjective, there is no single feature which is sufficient [RHC99, ZHL001]; and, moreover, a single representation of a feature is also not sufficient. Hence multiple representations and a combination of features are necessary.

B. Current State of Image Mining Research

Real-world application of image mining involving satellite images. Satellite images are an important source of information and one useful application of satellite images is to examine the paths and trends of forest fires over the years, thereby enabling firefighters to have a better understanding of the behavior of such forest fires in order to combat these fires effectively. In order to achieve thus, the following steps had been followed by them.

1. An efficient and effective spatial clustering technique for large-scale multi-resolution incremental clustering that are adaptable in dynamic environment
2. An image indexing scheme is based on cluster-related semantic concepts to achieve high level image retrieval in the satellite image database
3. Fire cluster information to discover any spatial and temporal trends and patterns of fire development in terms of scale, area, duration and location.

The mining of fire patterns from satellite images involves the following 6 steps which correspond to the information-driven framework level:

1. Image processing. In the lowest pixel level, image processing technique is used to extract the spatial location information of fire spots. The spatial location of a fire spotis represented by its altitude and longitude in the map. Such spatial information is stored in the Hotspot database.
2. Database integration. The commercial satellite typically generates 2 to 3 images of a specified location every day and the extracted fire locations of each image i.e., the latitude and longitude are stored in an individual table of the Hotspot database.
3. Spatial clustering. FASTCiD is an efficient clustering method that has been developed the large dynamic spatial databases. The cluster label of each fire spot is obtained after applying the clustering process.
4. Semantic cluster concept generation. FASTCiD allows to obtain the information regarding the spatial layout, the area and the density of a specific cluster automatically. Based on this information, one can define a few semantic cluster concepts such as center cluster, left cluster, dense cluster, sparse cluster, big cluster and small cluster.

II. IMAGE MINING TECHNIQUES

The techniques which were used by early image miners prior to the invention of suitable framework include pattern recognition, image indexing and retrieval, image classification, image clustering, association rule mining, and neural network. In the following, is a survey on these techniques? The techniques are classified on five levels of information and the associated image or data mining operations.

These levels (from top to bottom) are: knowledge extraction level b patterns and inter-image relations level c semantic concept level d region, objects, or visual patterns level e pixel level.

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A. Object Recognition

Using object models which might be known a priori, an object recognition technique finds objects in actuality from an image. Machine learning and purposeful information extraction can simply be realized when some objects have been identified and recognized through machine.

The object recognition problem might be refer to as any supervised labelling problem according to models of known items i. e. given a target image containing a number interesting objects and a collection of labels corresponding to a collection of models known to technique, what is object recognition to assign correct product labels to regions, or a collection of regions, in the image.

B. Image Retrieval

Image mining requires that images be retrieved according to some requirement specifications. The requirement specifications can be classified into three levels of increasing complexity:

- Comprises low level features of such as color, texture, shape or the spatial location of image elements.
- Comprises image retrieval by derived or logical features like objects of a given type or individual objects or persons.
- Comprises high level features of image.

C. Image Indexing

To further improve image retrieval rate, there is require of image data base using a fast and useful indexing scheme. A couple of main approaches are usually: reducing dimensionality or indexing high dimensional info. Other proposed indexing schemes concentrate on specific image features including color, shape and texture features.

D. Image Classification

In supervised classification technique, as input a collection of labelled (Pre-classified) images are given, and here the problem is to label a newly Encountered, yet unlabeled images. Typically, the given Labelled (training) images are used to do the machine learning of the class description which in turn is use to label a new Image.

E. Image Clustering

In unsupervised classification (or image clustering), the problem is always to group a given assortment of unlabeled images straight into Meaningful clusters based on the image content with not a priori knowledge. Clustering is often more advantage for minimizing the searching time period of images inside database. There are a variety of clustering methods: hierarchal, partitioning, density-based, grid based and fuzzy clustering methods.

F. Association Rules Mining

Association rule mining generates rules who have support and confidence greater than some user specific minimum support in addition to minimum confidence thresholds. A normal association rule mining algorithm works within two steps. The 1st step finds all substantial item sets that match the minimum support constraint. The second move generates rules from each of the large item sets that match the minimum confidence constraint.

G. Neural network

Neural Networks are computational systems made up of simple processing units called neurons which are usually organized into layers with fully or partially connections. The main task associated with a neuron is to receive the activation values from its neighbours (the output of other neurons), compute an output based on its weighted input parameters and send that output to its neighbours.

III. EXTRACTION MECHANISMS FOR IMAGE MINING:

All the images have certain features-color, shape, size (pixels), and texture features. Using Dempster-Shafer theory of evidence the proposed mechanism transfers low level image characteristics into high level semantic features. This is done by using fuzzy production rules.

A. Color characteristics

This feature includes color image segmentation. Initially the regular RGB image is converted into L*U*V* image where L* is luminance, u* is redness–greenness, and v* is approximately blueness–yellowness. Yellow, Red, Blue, Orange, Green, Purple are six main colors used along with six others obtained by linear combination

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of the above mentioned colors. These twelve colors are the fundamental colors used. Five levels of luminance and three levels of saturation are identified. This results that every color is transferred into one of 180 references colors. After that clustering in the 3-dimensional feature space is performed using the K-means algorithm. Later this step each image is divided into N regions each presented in extended chromaticity space.

B. Texture Characteristics

The Quasi-Gabor filter is explored to present the image texture features. The image is characterized with 42 values by calculation of the energy for each block defined by a combination of one of 6 frequencies (f = 1, 2, 4, 8, 16 and 32) and one of 7 orientations (q = 0°, 36°, 72°, 108°, 144°, 45° and 135°). We take the average value of the magnitude of the filtered image in each block.

C. Shape Characteristics

To represent shapes a technique based on is used. The image is changed into binary. Polygonal approximation that uses straight-line, Bézier curve and BSpline are applied. Thus the resulting image is presented as a set of straight lines, arcs and curves.

D. Retrieval Based on High Level Semantic Features

In this section we discuss image retrieval based on high level color, texture, shape and semantic features.

IV. CONCLUSION

The main intent of the image mining is to remove the data loss and obtain the meaningful information which is expected need of human. In this paper most of image mining techniques have been discussed. Here the selecting an appropriate image mining technique among all the available techniques are discussed. Future work may include discussion about new image mining methods and the updated frameworks, also comparing them with previously discussed methods.

V. REFERENCES

[1] Carter,R.,Carter,E.,CIELUV color difference equations for self-luminous displays, color Res. & Appl.,8(4),1983,252-553.
[2] Datcu, M. and Seidel, K. (2000) 'Image information mining: exploration of image content in large archives', IEEE Conference on Aerospace, Vol. 3, pp.253–264.
[3] Deepika Kishor Nagthane, "Image Mining Techniques and Applications", in International Journal Of Engineering Sciences & Research Technology July, 2013.
[4] D.S. Zhang and G.Lu, "Content Based Image Retrieval Using Texture Features", In Proc. of First IEEE Pacific-Rim Conference on Multimedia (PCM'00) pp.392-395, Sydney, Australia, December2000
[5] Gibson, S., Kreinovich, V., Longpre, L., Penn, B. and Starks, S.A. (2001) Intelligent Mining in Image Databases, with Applications to Satellite Imaging and Web Search, Data Mining and Computational Intelligence, pp.1–20, Springer-Verlag, Berlin.
[6] Hewayda M.Lofty, Adel S.Elmaghraby "CoIRS: Cluster Oriented Image Retrieval System" IEEE conference on tools with Artificial Intelligence, 2004.
[7] Image Mining: Trends and Developments, Ji Zhang Wynne Hsu Mong Li Lee.
[8] Jeremy, S. and Bonet, D. (2000) 'Image preprocessing for rapid selection in pay attention mode', MIT Press.
[9] Jain , A. ,Algorithms for clustering data. Englewood cliffs,NJ,Princeton Hall,1991.
[10] K. R. Yasodha, K.S. Yuvaraj, "A Study on Image Mining Techniques", In International Journal of Applied, December 2013.
[11] Itten, J., Kunst der Farbe. Ravensburg, Otto Maier Verlag. 1961.
[12] Mira p., Jesse j., Laurence W., Fast Content-Based Image Retrieval Using Quasi-Gabor Filter and Reduction of Image Feature Dimension.
[13] Mori K., Wada K., Toraichi K., Function Approximated Shape Representation using Dynamic Programing with Multi-Resolution analysis ,ICSPAT'99,1999.
[14] Peter Stanchev, "Using Image Mining for Image Retrieval," . www.kettering.edu/~pstanche.
[15] Tan, K.L., Ooi, B.C. and Thiang, L.F. (2001) Retrieving Similar Shapes Effectively and Efficiently, Multimedia Tools and Applications, Kluwer Academic Publishers, The Netherlands..

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