Image Mining

P. Srividya Sarvani[1], Y, Madhavi Latha[2]

[1]Department of Electronics and Computer Engineering, Koneru Lakshmiah University,
Green Fields, Vaddeswaram , Guntur Dt, 522502, Andhra Pradesh, India
spisupati92@gmail.com

[2]Assistant Professor, Department of Electronics and Computer Engineering, Koneru Lakshmiah University,
Green Fields, Vaddeswaram , Guntur Dt, 522502, Andhra Pradesh, India
madhavilatha@kluniversity.in

Abstract: ***In this paper I would like to explain image mining- introduction, history, advantages over data mining, 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 I would like to explain why it is most widely used and what technique is followed duly in this process .In simple words image mining is the process of retrieving requisite data based on user's query form the data warehouses of the search engines. Based on the specifications made by the user in his query the required image will be retrieved and displayed to the user.***

Keywords: Image Mining, Extraction Mechanism, **S**emantic features

1. 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' ad developers and 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 [1]. Image mining deals with the extraction of implicit knowledge, image relationships or other patterns not explicitly stored in the image.

Image mining early systems, such as QBIC, VisualSEEK and MARS, facilitate classification, indexing and retrieval of images, such as color, texture and shape. [2]Though these systems are fully automatic yet it's hard for non expert users because of the semantic gap prevalent between the user's needs and low-level system requirements. Hence to overcome this drawback image mining has come into more practice in data mining.

2. Brief History on Mining

Data mining was into existence since a long period of time but image mining took over since the recent years as it was found to be simpler even for non technical users to retrieve their requirements in the form of images. Images are usually easily understood and identified by people especially those with no expertise in technology.

Earlier data was described in words which had to be imagined or visualized by mind but due to image mining any kind of data could be viewed and hence simplified the user's work. Almost all the existing search engines have a separate and specific option to retrieve images only that too the images related to the data query. One of the best examples is GOOGLE.

Let us say for instance a person wants to know about 'Broccoli' which is actually a vegetable. The query 'Broccoli' would lead to the description of the word or various links that contain that word but only the image of the word can make the person understand that it is a kind of vegetable which is similar lo cauliflower and even at times the user might have seen that vegetable earlier but had no idea about its name. So, this way image mining makes many things simpler to non expert users in understanding their queries than having detailed explanations in the form of words.

3. 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.

3.1. 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 [3]. Yellow, Red, Blue, Orange, Green, Purple are six main colors used along with six others obtained by linear combination 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 [4]. Later this step each image is divided into N regions each presented in extended chromaticity space.

3.2. Texture Characteristics

The Quasi-Gabor filter [5] 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.

3.3. Shape Characteristics

To represent shapes a technique based on [6] 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.

4. Retrieval based on high level semantic features

Here we will discuss retrieving images on the basis of color, texture, shape and semantic features which are classified as high level.

4.1. Retrieval by high level color properties

Based on the theory formulated by Johannes Ittenn 1960[7], the spatial arrangement of chromatic contents in the image is obtained. This theory explains seven types of contrasts. These seven types of contrast are defined:

1. Contrast of hue
2. Light-dark contract
3. Cold warm contrast (Yellow through red–purple give the filing of ‘‘warm’’, yellow–green through purple is find as ‘‘cold’’)
4. Complementary contrast
5. Simultaneous contrast
6. Contrast of saturation
7. Contrast of extension

Harmony is defined as a combination of colors resulting in a gray mix that generates stability effect onto the human eyes.

Non-harmonic combinations are called expressive.

Itten's model is adopted for defining fuzzy production rules that are used to translate the low level semantic features into sentences qualifying warmth degree, and contrasts among colors.

4.2. Retrieval by high level texture properties

Changing low level texture characteristics to high level semantic features such as texture of wood, rock, wall-paper, etc. is made by calculating the low level texture characteristic of a typical set of corresponding textures and finding the "cluster center" values which is used in the fuzzy production rules.

4.3. Retrieval by high level shape properties

A set of typical shapes characterizing the domain specific objects are defined. To calculate the similarity between the search shape and given object shape, fuzzy production rules are used.. They are obtained after image mining.

4.4. Retrieval by high level semantic features

A set of high level semantic features which are defined in the image mining process are used. They combine high level color, texture and shape properties and high level semantic features defined by the expert during the image mining.

5. The Experiments

This proposed method is in process of realization in a system named "Flint". After low level image properties extraction image mining was made for obtaining associate rules, describing the high level image semantic features.

6. Conclusions

The main advantage of the proposed method is the possibility of retrieval using high level image semantic features. After the full system realization we will be able to obtain statistic characteristics about the usefulness of the suggested method.

References

[1] Peter Stanchev, "Using Image Mining for Image Retrieval," . www.kettering.edu/~pstanche.
[2] Zaher Al Aghbari, "Effective Image Mining By Representing Color Histograms as Time Series".
[3] Carter,R.,Carter,E.,CIELUV color difference equations for self-luminous displays, color Res. & Appl.,8(4),1983,252-553.
[4] Jain , A. ,Algorithms for clustering data. Englewood cliffs,NJ,Princeton Hall,1991.
[5] Mira p., Jesse j., Laurence W., Fast Content-Based Image Retrieval Using Quasi-Gabor Filter and Reduction of Image Feature Dimension.
[6] Mori K., Wada K., Toraichi K., Function Approximated Shape Representation using Dynamic Programing with Multi-Resolution analysis ,ICSPAT'99,1999
[7] Itten, J., Kunst der Farbe Ravensburg, Otto Maier Verlag. 1961.

Author Profile

P.Srividya Sarvani pursuing B. Tech final year in Electronics and Computers Engineering from Koneru Lakshmiah University, India