Image Retrieval Analysis of European Art Picture Classification Based on Digital

Shu Zhu

Hubei University of Technology Engineering and Technology College, Wuhan 430068, China

Abstract

In recent years, with the development of network and multimedia technology, various kinds of resources on the network are becoming more and more abundant, and people are more and more interested in the intuitive and vivid multimedia technology. The digital image has more strong, but they have not been comprehensive classification, so to make full use of the useful information, we need to use the technology of image retrieval. At present, cyber source is increasingly rich and image retrieval technology becomes more mature, the expanding application areas of image retrieval, which we need to study and improve the image retrieval technology. At the same time, the transfer rate of the network and computer information processing speed increases, the use of multimedia information is becoming more and more popular page, especially the image information has become an important part of the contents of web pages. In this paper, the European art picture classification of image retrieval analysis, the use of digital image processing technology, discusses the principles of image retrieval technology and digital European art picture classification based image retrieval method.

Keywords: Digital image technology, Image classification, Image retrieval, Feature extraction.

1. INTRODUCTION

With the rapid development of computer technology and information technology, the level of digital image retrieval technology is increasing. At the same time, digital image equipment and large capacity storage technology have been widely popularized, promoted and applied, and the amount of digital image data is increasing (Shinde et al., 2014). The traditional text based image retrieval technology is almost impossible to keep pace with the growth rate of digital image information. It is necessary to adopt more efficient image retrieval technology to improve the quality of image retrieval. For European art pictures, image retrieval technology based on image classification came into being in this context (Anitha and Chilambuchelvan, 2015). Although the image retrieval technology has the characteristics of high efficiency and convenience, but the content based image retrieval technology has some shortcomings and shortcomings in the actual detection and application, which needs to be further improved. Digital image retrieval and analysis of European art picture classification is of great significance.

2. DIGITAL IMAGE TECHNOLOGY

Digital image processing is the method and technology of removing noise, enhancing, segmenting and extracting features by computer. Digital image processing and the rapid development is mainly influenced by three factors: one is the development of the computer; two is the development of mathematics; three is widely used in agriculture and animal husbandry, forestry, environmental, military, industrial and medical aspects of growth (Zhao et al., 2014). Digital image processing refers to the process of transforming the image signal into digital signal and processing it by computer, as shown in figure 1. In 1950s, the computer has developed to a certain level, people began to use computers to deal with graphics and image information, which is the early image processing. Early image processing is to improve the image quality, which is to improve the visual effects (Baldiet al., 2014). Digital image processing, as a discipline, was formed in the early 1960s. In image processing, the input is low quality image, and the output is the improved quality of the image. Commonly used image processing methods include image enhancement, restoration, coding and so on.

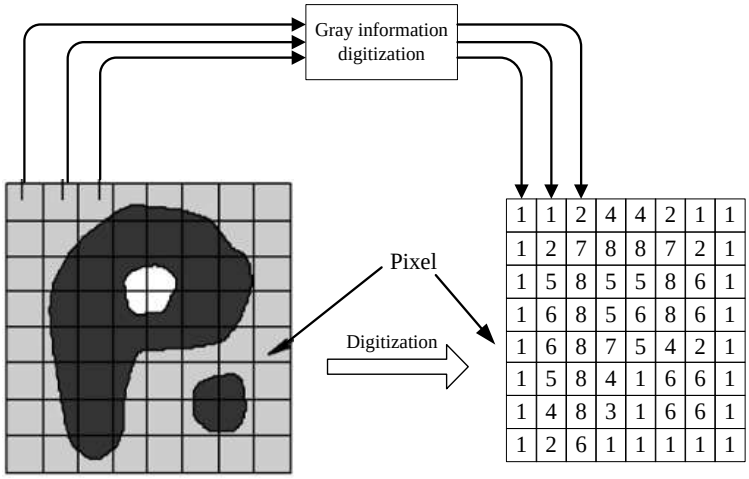

Figure 1. Image pixel digitization

Following the techniques of digital image processing:

(1)Image coding compression: image coding compression technology can reduce the amount of data to describe image, in order to save image transmission, processing time and reduce the capacity of memory. Compression can be obtained under the premise without distortion, the distortion can be allowed under the conditions. Coding is the most important method in compression technology, and it is the earliest and more mature technology in image processing technology.

(2)Image transformation: as a large array of images processed directly in spatial domain, involving much computation. Therefore, various image transformation methods, such as Fourier transform, Walsh transform and discrete cosine transform, which are often used to transform the processing of spatial domain into transform domain processing (Olaode et al., 2014). It can not only reduce the amount of computation, but also can obtain more effective treatment. Wavelet transform has good localization property both in time domain and frequency domain, and it also has extensive and effective application in image processing.

(3)Image description: image description is a necessary prerequisite for image recognition and understanding. As the simplest two valued image, its geometric characteristics can be used to describe the characteristics of objects. The description method of general image uses two-dimensional shape description. It has two kinds of methods: boundary description and region description. Two dimensional texture features can be used to describe special texture images. With the further development of image processing, the research of 3D object description has been started, and the methods of volume description, surface description and generalized cylinder description have been proposed.

(4)Image segmentation: image segmentation is one of the key technologies in digital image processing. Image segmentation is to extract meaningful features from the image, its meaningful features, such as the edge of the image, the region, etc., which is the basis for further image recognition, analysis and understanding. Although many methods of edge extraction and region segmentation have been developed, there is no effective method suitable for all kinds of images (Patil and Sunag, 2015). Therefore, the research on image segmentation is still in the process of deepening, and it is one of the hot spots in image processing.

(5)Image enhancement and restoration: the purpose of image enhancement and restoration is to improve the quality of the image, such as noise removal, improve the image clarity, etc. The image enhancement does not consider the reason of image degradation, and highlights the interesting part of the image. If the high frequency component of the image is enhanced, the outline of the object in the image is clear and the details are obvious; for example, the enhancement of low-frequency components can reduce the influence of noise in the image (Zhang et al., 2015). Image restoration requires a certain understanding of the causes of image degradation. Generally, the "quality model" should be established according to the degradation process, and then some filtering method is used to restore or reconstruct the original image.

(5)Image classification (recognition): Image classification (recognition) belongs to pattern recognition. The main content is the image after some preprocessing, image segmentation and feature extraction, so as to determine the classification. Classical pattern recognition methods are often used in image classification, such as statistical pattern classification and syntactic (structural) pattern classification. In recent years, fuzzy pattern recognition and artificial neural network pattern classification have been paid more and more attention in the field of image recognition.

3. THE COMPOSITION OF IMAGE RETRIEVAL TECHNOLOGY

3.1 Image feature extraction

Image feature extraction is a content based image retrieval technique. In a broad sense, image features include text based features (such as keywords, annotations, etc.) and visual features (such as color, texture, shape, object surface, etc.). Text based image feature extraction has been studied deeply in database system and information retrieval field. The main feature of image feature extraction is discussed here.

Visual features can be divided into general visual features and field related visual features. The former is used to describe all the common features of image, has nothing to do with the specific type or content of the image, including color, texture and shape; the latter is based on some prior knowledge of the image content description (or assumed) on the basis of closely related with the specific application, such as human face or fingerprint (Jiang, 2015). For a specific image feature, there are usually different expressions. Due to the diversity of people's subjective cognition, there is no such thing as "the best expression" for a particular feature. In fact, the different representations of image features depict some properties of this feature from different angles.

3.2 Measurement of image similarity

(1) The similarity model of visual features is text based retrieval, which uses text matching. Content based image retrieval uses the similarity matching between computing queries and candidate images on the visual features. Therefore, defining a suitable method of measuring similarity of visual features has a great influence on the retrieval effect. Since most of the visual features can be represented as vectors, the commonly used similarity methods are vector space models. The visual features are regarded as the points in the vector space, and the similarity between the image features is evaluated by calculating the proximity between the two points. The commonly used measurement methods are absolute distance measure, Euler distance measure, two degree distance measure and Mahalanobis distance measure.

(2) The performance evaluation of image retrieval depends on whether the retrieval results are correct or not, and the two main indexes are precision ratio and recall ratio. The precision of the meaning is in a query process, the number of image system returns the query results for all return images with the ratio of the number refers to the number of relevant images; recall system returns the query results for all relevant number of images in the image library proportion (Mezaris et al., 2015). When evaluating the query results, users can determine some images in advance as the relevant image of the query, and then calculate the precision and recall according to the results returned by the system. The higher the value of these two indicators, the better the retrieval method.

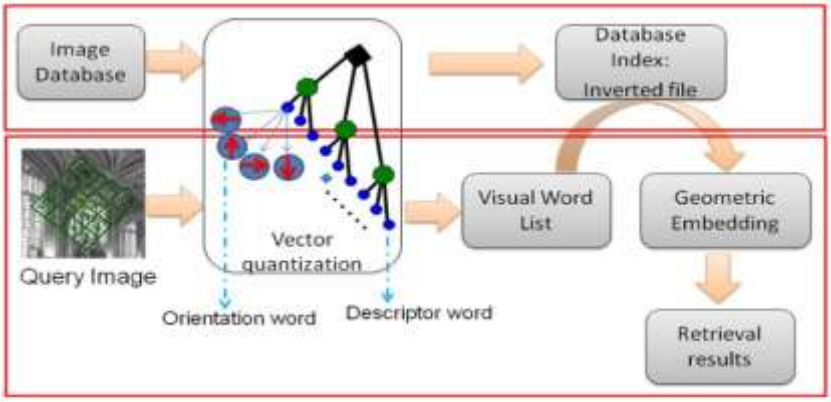

Figure 2. Image retrieval technology

3.3 Relevance feedback technique

According to the query condition submitted by the user, the system finds the most similar image in the image database and returns it to the user. Submit enquiry will be first converted into vector by combining some features. The linear combination method is used to calculate the similarity between the image and the vector in the database. The image similarity retrieval results become high. Although the combination of features and features can improve the effect of image retrieval to some extent, the performance of the retrieval system is still not satisfactory (Quellec et al., 2015). The main reasons are as follows:

Due to a lot of information exist in an image, and the difference of understanding of the same image of different users is great; it makes even the same query, different users hope that the result is also a great difference. Because the low-level feature does not reflect the real semantic information of the image, the user submits an image as a query. The system is very difficult to find the user really want to find the image. These problems lead to automatic image retrieval effect is not satisfactory. Therefore, many systems introduce human interaction, and gradually improve the retrieval results through user relevance feedback (Memon et al., 2015). Using the methods of text information retrieval, we also introduced the relevant feedback to modify the query submitted by the user in the system, making the revised query gradually close to the real needs of users, to improve the retrieval performance of the system.

The performance of retrieval is better than that of original query by relevance feedback. However, most relevance feedback does not have the ability to remember, and each feedback result can only improve the results of this query. Therefore, we introduce semantic network to record the results of each feedback to semantic network, which makes the effect of the system gradually increase with the increase of the number of users.

3.4 Indexing technology

In order to extend content-based image retrieval technology to large-scale image library, we must adopt effective multidimensional indexing technique. The existing problems are twofold:

(1) High dimensionality: Generally, the dimension of the image feature vector dimension is 102.

(2) Non-Euler similarity measure: Since the Euler measure approach may not be able to effectively mimic all human perception of visual content, we often need to adopt other measures of similarity.

In order to solve these problems, the feasible way is to reduce the dimension of feature vector by dimension reduction technique, and then use appropriate multidimensional indexing technology. The two commonly used dimensionality reduction methods are the Karhunen-Loeve transform (KLT) and the clustering method. Although dimensionality reduction, the dimensionality of the image feature vector is still high, we need to choose an appropriate multidimensional indexing algorithm to construct the index for the feature vector. Three research areas have contributed to multidimensional indexing techniques, namely computational geometry, database management systems and pattern recognition. Clustering and neural network technology are widely used in pattern recognition field, which are also possible indexing techniques.

Generally speaking, with the development of multimedia and network technology, the problem of image information management becomes more and more important and challenging. The content based image retrieval technology is one of the effective methods to solve the current image information explosion, so the above key technologies are particularly important, as shown in figure 2.

4. DIGITAL IMAGE RETRIEVAL METHOD BASED ON EUROPEAN ART PICTURE CLASSIFICATION

The improved image retrieval method proposed in this paper includes two parts: image clustering and retrieval. Who will meet the search conditions of the photos to a group by clustering means, and in the process of clustering with the feedback method to adjust the weights of each block, so as to make photo classification more in line with the user's actual needs, improve the performance of image retrieval. Figure 3 is an image retrieval method designed.

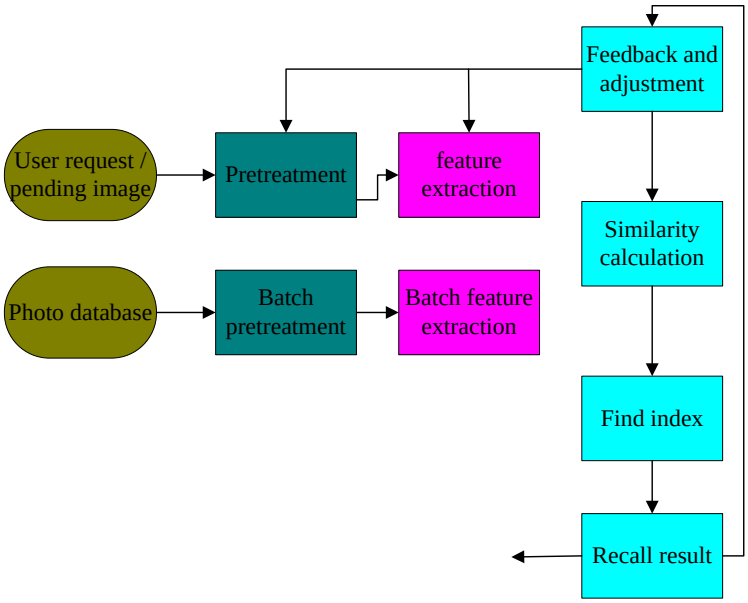

Figure 3. Image retrieval method

4.1 Clustering process

Practical research shows that the quality of feature extraction directly determines the accuracy of image retrieval, and feature extraction is the basis of content-based image retrieval. At present, feature extraction has been the focus of many C B I R research, and they are trying to make the extracted features achieve the actual effect observed by the human eye. The geometric distance between the two images is an important parameter to measure their similarity. In general, the geometric distances between two graphs are calculated as follows:

$$Dist(Q,P)=\sum_{i=1}^{n}\left|Q_i-P_i\right| \tag{1}$$

In the formula, $Q=\{Q_1,Q_2,...,Q_N\}$, $P=\{Q_1,Q_2,...,Q_N\}$ is a feature vector for finding images and target images. Q_i and P_i are the corresponding element values in each block of two images, while N is the specific number of blocks. The smaller the value obtained by the formula, the higher the similarity of the two graphs. Considering the weight coefficient W_i of each block of image, we can calculate the distance between Q and P two graphs according to the following formula.

$$Dist(Q,P)=\sum_{i=1}^{n}\left(W_i\times\left|Q_i-P_i\right|\right) \tag{2}$$

4.2 Retrieval process

In the process of image retrieval, we first try to eliminate some interference factors to preprocess the image, then cluster, feedback and re-cluster the image. In addition, in the image retrieval, we should first find the clustering center related to the image to be found, so as to find the relevant image category, and then search the image from the image to be queried. In terms of specific retrieval steps, it mainly includes the following two steps. The first step: search personnel will target image Pf and Pc as the cluster center relevant feedback, find the cluster center and the target image from each image; the second step: between the target and the clustering center category distance D(Pf, P c) were calculated, and the numerical distance each image corresponds to a reasonable sort order.

4.3 Result analysis

Through the retrieval of this method, we can see that the improved algorithm is more efficient than the sequential search algorithm, and the accuracy is also higher. Compared with the K mean algorithm, the precision ratio and recall ratio have been greatly improved, and the efficiency is higher, as shown in figure 4. It can be seen that the improved image retrieval technology has better retrieval accuracy and efficiency, it is worthy of research and promotion.

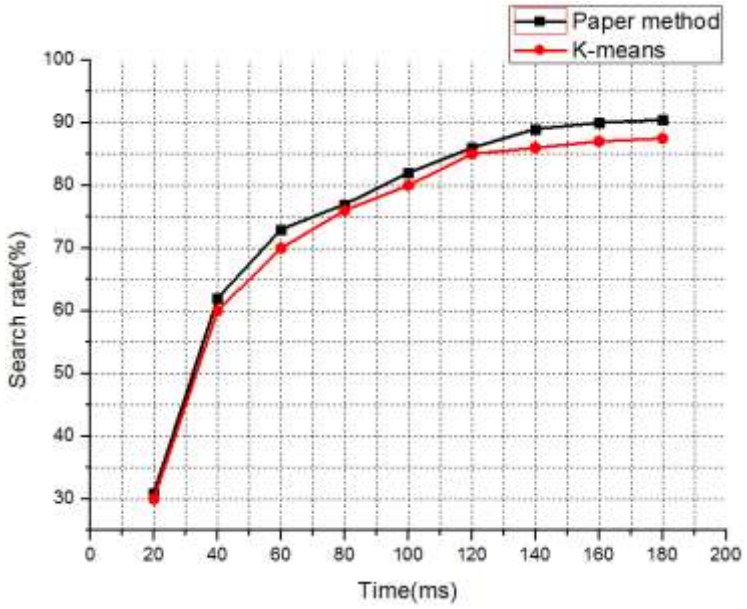

Figure 4. Algorithm retrieval rate comparison

5. CONCLUSIONS

Compared with text based image retrieval, content-based image retrieval technology in the retrieval precision and speed have been greatly improved on, but there are still some deficiencies and shortcomings is worthy of further research, such as feature extraction and characteristics of algorithm, user interaction, visual feature matching algorithm. In this paper, digital image processing technology is used for image retrieval and analysis of European art picture classification. This paper discusses the principle of image retrieval technology and the image retrieval method based on the Digital European art picture classification, so as to better guide the development of digital image retrieval technology.

REFERENCES

Anitha K., Chilambuchelvan A. (2015). NPFAM: Non-Proliferation Fuzzy ARTMAP for Image Classification in Content Based Image Retrieval, Ksii Transactions on Internet & Information Systems, 9(7), 7-20.

Baldi A., Murace R., Dragonetti E., Manganaro M., Bizzi S. (2014). Automated Content-Based Image Retrieval: Application on Dermoscopic Images of Pigmented Skin Lesions, Skin Cancer, 523-528.

Jiang M. (2015). Mapping Knowledge from the Perspective of Image Retrieval Technical Analysis, International Conference on Measuring Technology & Mechatronics Automation, 616-620.

Memon M.H., Shaikh R.A., Li J.P., Khan A.A. (2015). Unsupervised feature approach for content based image retrieval using principal component analysis, International Computer Conference on Wavelet Active Media Technology and Information Processing, IEEE, 162, 271 - 275.

Mezaris V., Kompatsiaris I., Strintzis M.G. (2015). ONTOLOGIES FOR OBJECT-BASED IMAGE RETRIEVAL, Digital Media Processing for Multimedia Interactive Services, European Workshop on Image Analysis for Multimedia Interactive Services, 96-101.

Olaode A.A., Naghdy G., Todd C.A. (2014). Unsupervised Image Classification by Probabilistic Latent Semantic Analysis for the Annotation of Images, International Conference on Digital Lmage Computing: Techniques and Applications, 1-8.

Patil P., Sunag B. (2015). Analysis of image retrieval techniques based on content, Advance Computing

Conference, 958-962.

Quellec G., Lamard M., Cochener B., Cazuguel G. (2015). Multimedia Information Retrieval from Ophthalmic Digital Archives, Health Monitoring and Personalized Feedback using Multimedia Data, Springer International Publishing, 11, 95-114.

Shinde S., Lendal A., Bajaj N., Shelar. (2014). Content based Image Retrieval and Classification using Support Vector Machine, International Journal of Computer Applications, 92(7), 8-12.

Zhang F., Song Y., Liu S., Cazuguel G. (2015). Latent Semantic Association for Medical Image Retrieval, International Conference on Digital Lmage Computing: Techniques and Applications, 1-6.

Zhao F., Zhou F., Wang R. (2014). Textile Image Retrieval Based on BOF Approach, International Conference on Digital Home, 272-276.