Research on the Application of Image Processing and Pattern Recognition

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Abstract: At present, in computer and artificial intelligence, the application of pattern recognition and image processing is wide. Pattern recognition belongs to new discipline in the application field of computer. After decades of development, it brings convenience for people's life. This paper analyzes new methods of image processing and pattern recognition and explores its application, to provide reference for the development of relevant industries.

In daily life, people have access to pattern recognition all the time, such as Optical Character Recognition (OCR), vehicle license plate recognition, biological recognition (fingerprint, iris), engineering project (bank bill, digital watermark processing) and so on. The growth of computer technology replaces partial brainwork of human being. The maturity of pattern recognition technology brings convenience for people's daily life and has bright development prospect, which shall be studied [1].

1. Image Processing

Image processing is to transform image signal into digital signal, analyze and process by virtue of computer, also called digital image processing and computer image processing. Early in 1950s, people begun to process image and image information with computer, which is digital image processing in early stage. However, it becomes an independent discipline in the early 1960, mainly to enhance the overall quality and visual effect of image. Image processing is to input images with poor quality into computer, process and output images with clear quality. Enhancing, coding, recovering and compressing technology are main process methods of image. The US Jet Propulsion Laboratory is the first practical success. It mainly uses the methods of noise removal, geometric correction and gradation transformation to process the lunar photos transmitted by the space probes. At the same time, the moon environment and the sun position are fully considered. The map of moon surface is drawn by virtue of computer [2]. Then the technicians used image processing technology to process nearly 100,000 photos sent back by the spacecraft, and produced the topographic map, color map and panoramic mosaic of the moon, which enabled people to have a preliminary understanding of the terrain of the moon. It has made certain contributions to human exploration of the moon and landing on the moon, and laid a foundation for the establishment of digital graphics processing disciplines. In view of the in-depth study of the moon, people began to use digital image processing technology to detect Mars and Saturn and achieved certain achievements in the aerospace technology. In addition, in the medical field, digital image processing has also achieved certain achievements. In 1972, the British EMI company engineer Housfield invented the X-ray computed tomography device, which is mainly used for head diagnosis, namely CT (Computer Tomograph). CT diagnosis is mainly the reconstruction of the head section projection by means of computer, also called image reconstruction [3].

2. Pattern Recognition

The pattern recognition integrates computer, machine, and automatic identification of the machine to describe, classify, identify, and interpret the information that each thing or phenomenon needs to convey. Using machine to serve human and mastering human's ability to analyze and judge things and phenomena is the main purpose of pattern recognition applications. Pattern recognition is

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more intuitive and involves many things in daily life. Both humans and animals have the ability of pattern recognition, but for computers, it is difficult to complete pattern recognition. Although some achievements have been made in the field of pattern recognition, many problems still need to be studied in the future development [4].

Over years of accumulation, the pattern recognition discipline has been relatively mature. Several new methods are presented.

2.1 Shared kernel function model

Probability density estimation is one of the types of unsupervised methods. Probability density estimation is based on the original density function model established on the unlabeled data set. Its main purpose is classification. The mixture of statistical pattern recognition and density model is the main method of density estimation. According to the shared kernel function, the conditional density estimation is more general model, and the conditional density can be represented by the kernel function generated by the estimation [5]. First, a model is proposed that modifies the classical radial basis function network, and if output, it is represented as a class conditional density. If the result is reversed, it is expressed as an independent hybrid model. The density of each class is selected to use independent mixing density, and finally a general model is proposed for analysis [7].

2.2 Rough set theory

In the 1970s, Polish scholars and some logicians analyzed the logic characteristics of information systems. Until 1982, rough set theory was formally proposed [6]. After the introduction of this theory, it has stimulated the research interests of many logicians and scientists, and they began to work together to promote the application of rough set theory in practice. After discussing the rough set at relevant international conferences, it has also accelerated its further development, and more scholars have begun to join the research. At this stage, rough sets have become an important foundation in many fields such as knowledge acquisition, decision analysis and machine learning, and are a new academic hotspot.

2.3 Bionic pattern

In the field of pattern recognition, bionic pattern recognition belongs to the new model, and the main purpose of recognition is to recognize things. Compared with the traditional statistical pattern recognition with the best division, the bionic model is closer to human cognition of things, which is also the origin of the bionic pattern recognition name. Bionic recognition mainly relies on the analysis of the continuity of similar samples in the feature space. Relevant scholars have confirmed that in the all-round identification process of ground plane rigid targets, such as animals or vehicles with similar appearance features, the recognition accuracy rate can reach 99.75% [8].

3. The Application of Pattern Recognition in Image Processing

After years of development, pattern recognition technology has been fully utilized in many important fields, contributing to the development of China’s national economy and the growth of national defense technology [9].

3.1 Cell recognition

In recognition technology, cell recognition has received widespread attention. In the past disease diagnosis process, doctors can only judge the cause by means of appearance, and the experience of medical staff is the main criterion for judgment. This is also the main reason for the high rate of misdiagnosis of diseases in the early stage of science and technology development. At this stage, microscopic image can be used to view the disease and make a diagnosis, which is of great help to understand the disease, treat the disease and observe the treatment effect. At present, with the regional characteristics of images, certain results have been obtained using cell recognition technology. However, the cell composition is more complicated, and the technology possessed at this stage cannot be completely and accurately identified. In order to effectively improve the

classification accuracy, it is necessary to use the more characteristics of the cell to establish a perfect discriminant function, and better lay a theoretical foundation for the diagnosis of the disease [10].

3.2 Character recognition

The character recognition technology mainly analyzes and processes two types of information, such as text and data, and is one of the important contents of pattern recognition in image processing. Text information mainly includes text and characters in handwritten and printed form. Data information mainly includes number and statistical data, such as reports, postcodes, Arabic numerals, etc. In government, enterprises or banks, special characters are used more, and digital characters are mostly used in government announcements, corporate project budgets, and funds allocation, finance. Among the accounting, the most core technology is handwritten digital recognition technology.

3.3 Speech recognition

Speech recognition technology is more widely used than cell and character recognition technologies. Among biometric recognition, voiceprint recognition technology is more applicable because of its convenience, accuracy and economy. The speech recognition of continuous hidden Markov model is the main content of speech recognition technology. It mainly uses genetic algorithm to complete recognition, which is faster and has higher recognition rate. The pitch and timbre of human speech are quite different. Therefore, speech recognition will become more and more widely used in the field of application.

3.4 Fingerprint recognition

Left-handed, right-handed, double-rotated, spiral, arch and account are the five main categories of fingerprints, while grammar analysis, singular point implementation and neural network implementation, and other approaches are the main four methods of fingerprint recognition. One-to-one fingerprint recognition technology has been relatively mature, and the accuracy of one-to-many fingerprint recognition technology is still low, and the comparison time is relatively long, which has great drawbacks. Based on this, in order to improve the speed of fingerprint recognition, it is necessary to preprocess the simplified image and improve the algorithm, but this is still a big problem in the field of fingerprint recognition.

4. The Practical Application

4.1 The pattern recognition of image and character characteristics

Taking the license plate as an example, the image recognition will involve the abbreviation of province and city plus the license plate number. The provincial and municipal abbreviations are all Chinese characters. Because of the large number of Chinese strokes, the adhesion and disconnection are more difficult for image recognition. And the position and shape of Chinese characters will also change due to changes in font characteristics. In the process of recognition, video images are also characterized by variability and uncertainty. When extracted and discerned, they are affected by video image defects, resulting in recognition errors or unrecognizable. Based on this, it is necessary to use statistical features or structural features to improve the recognition accuracy. Statistical feature recognition can effectively avoid the mistakes in the traditional recognition process. At the same time, when extracting Chinese characters, it can also ensure that the proportions after translation and rotation do not change, which is recognized by many experts and scholars. In the method of identifying by using structural features, the skeleton method is widely applied, that is, recognition is based on the stroke structure of the Chinese character and the trend of the font, for example, according to strokes, glyphs, transitions, connections, and the like. In the process of extracting characters by means of the skeleton, it is necessary to limit the range of extraction, and the extraction range is inversely related to the image sharpness. When the definition is high, it is more advantageous for recognition. Thus, the decomposition is performed by means of wavelet

transform, and the game can be improved in image sharpness and recognition speed. In wavelet transform, Fourier transform is more common. The basis of the transform is computer multimedia, but the efficiency and speed of the transform are higher than the wavelet transform. The computer's computing function can effectively segment the image and ensure its clarity and integrity. It is widely used in environmental protection, bioengineering, license plate recognition and other fields. Local grayscale features are also called coarse mesh features. In the process of license plate recognition, because the license plate is exposed for a long time, it is easy to be affected by dust and light, and is affected by the background color of the license plate and the color of the characters, resulting in higher color saturation than the license plate itself, and the recognition is more difficult. For example, Korean license plates are red background, white characters, and China's license plate has various background colors, such as blue, yellow, black, and white, and the character colors include black, red, and white. At this time, the local grayscale method can be used for recognition. The recognition method is to divide the license plate image according to a certain standard, and make it into the same grid, and finally implement the chroma processing, so that it is conductive to extracting the acute characters.

4.2 The application of image and character characteristics and recognition

According to relevant research, there are many ways to identify characters, and the following three methods of identification are more widely used.

First of all, starting from the character recognition process, structure and statistics are the main methods of identification, and the two can be combined to maximize their role. The structural methods and statistical methods have their own characteristics, while the structural methods mainly apply the model as a theoretical model. When the pattern is recognized, there will be image blurring, which is not conducive to high-efficiency recognition. The statistical method can realize the definition processing, effectively avoid the deficiency of the structural method, and can describe the characters more completely.

Secondly, from the perspective of the character recognition system, when the recognition angle is different, offline characters and online characters can be selected. The former does not need to be connected to the computer network, and the image characters can be effectively recognized and extracted only by the storage of the computer itself. However, this recognition method has a high error rate and a relatively slow extraction speed. Online recognition can accurately locate the shape, stroke and structure of the characters by means of the corresponding character features in the network, and has the characteristics of high recognition speed and relatively high accuracy.

Thirdly, considering the characteristics of the recognition, it includes module matching and related technology, feature analysis and matching technology. The former mainly compares the characters stored in the computer with the extracted characters, finds similar characters according to its characteristics, and finds the same character in further recognition. The latter extracts the selected image characters into the computer, further analyzes the structure by means of the two-dimensional feature space, and selects the closest character for the analysis result.

4.3 The application of pattern recognition in intelligent construction

In the field of intelligent construction, the computer simulates the human recognition method, and divides the intelligent construction environment image according to the degree of relevance, and extracts the important skills required, that is, image preprocessing. Then, pattern recognition technology is needed to extract and process the effective features in the architectural environment image. Image processing belongs to the advanced stage of image recognition in intelligent construction environment. In order to enable computer systems to recognize images seen by human vision, it is necessary to study its calculation methods, and then carry out in-depth analysis of image features. At the same time, the pattern recognition technology is applied in the recognition of images in intelligent construction environment to ensure that the computer system can recognize these features.

5. Conclusion

In recent years, computer and artificial intelligence have been widely used. People have begun to use computers to realize automatic image processing, and the application requirements for pattern recognition technology are getting higher and higher. The development of pattern recognition technology has not been able to be recognized by a single model or a single technique in the process of recognition. Based on this, it is necessary to combine statistical and syntactic methods in the process of image recognition, and integrate statistical patterns, syntactic patterns and artificial intelligence heuristic search methods to complement each other, so that pattern recognition is more widely used.

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