Application Analysis of Image Recognition Technology in Artificial Intelligence

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Abstract. In the process of the information age, the image recognition technology in artificial intelligence has been used in various fields as a mature technology, infiltrating into our daily life, providing convenience for various work. In the field of information processing, it can process all kinds of information more quickly by using computer instead of human to identify information. Now in our interactive life with information, there is no lack of contact between image recognition technology and us. This paper will start from the meaning and principle of image recognition technology in artificial intelligence, and analyze its development status.

Keywords: Artificial Intelligence, Image Recognition, Application Technology

1. Introduction
Application of image recognition technology has become the core technology in the field of artificial intelligence. The ultimate goal of image recognition is to process physical information by computer instead of human eyes. Image recognition, as the name suggests, is for various image processing, analysis, and finally determine the goal we want to study. Today's image recognition is not only of the human eyes, but also the use of computer technology. Although human beings have very strong recognition ability, but for the rapid development of society, the recognition ability of human beings cannot meet our needs, so image recognition technology has emerged. This is a way for human beings to liberate the labor force, using computers to observe things instead of human eyes. In this way, microscope and other instruments for accurate observation are naturally produced. Usually, when the inherent technology in a certain field cannot solve the demand, corresponding new technologies will be produced. Image recognition allows the computer to process more things instead of human eyes, including things with low recognition rate and things that cannot be recognized at all. With the continuous development of science and technology in China, artificial intelligence technology has been more and more widely used. Bar code recognition, fingerprint recognition, face recognition, medical diagnosis and satellite cloud image recognition are all typical cases of this application, and these technologies have surrounded every part of our lives [1,2]. In travel and work, we will inadvertently contact with image recognition technology, which not only improves our efficiency, saves labor, but also improves the security of information. With the development of artificial intelligence technology, artificial intelligence will become more human-oriented and full-featured, and image recognition technology will have more extensive application space under its influence.
2. Overview of Image Recognition Technology

In order to better understand and study image recognition technology, it is necessary to understand the concept of image recognition technology in artificial intelligence. Before the emergence of artificial intelligence, image recognition technology is only suitable for real people to process information. After the development of artificial intelligence technology, computers have relevant skills after corresponding learning. Image recognition technology as an integral part of the field of artificial intelligence, has gone through three stages of development: character recognition, image recognition and processing digital and physical identification [3]. As the name implies, image recognition is to perform various processing and analysis on the image, and finally determine the target we want to study. Today's image recognition not only of the human eye, but also the use of computer technology. Although the recognition ability of human beings is very strong, with the rapid development of society, the recognition ability of human beings can no longer meet our needs, so computer-based image recognition technology has emerged. It's just like the study of atomic world. Human beings are limited by vision, so they can't see or sense the micro world. So the microscope was invented. In other words, when human beings have desire, it will promote the progress of science and technology. So it is also a truth for image recognition technology. In order to let the computer help human to process the information that needs to be recognized, the information with low recognition rate, and even the information that cannot be recognized by human eyes, the image recognition technology is created. At today's technical level, the processing speed of image recognition technology has far surpassed that of manual work.

The principle of image recognition is not complicated in computer technology, it is a learning process in general. Information processing is the key point of this technology [4]. Since there is no essential difference between computer-implemented image recognition technology and human eye recognition, image recognition technology also needs to complete specific recognition work based on its own image memory. In the process of image recognition, the human brain will extract the image information according to the characteristic factors of the image, and associate the past cognition of various images in the brain to judge whether they have any impression on the image, which is the reason why people recognize an image quickly. Incorporating the principles of the human image recognition, image recognition process, the computer can first complete image classification, select important information, and eliminate redundant information. According to this classification, the computer can combine its own memory storage with related requirements for image recognition. There is no essential difference between this process and human brain image recognition. However, because of the essential difference between computers and human brains, computers do not have the ability to think and analyze independently like the brain, so there are many unstable factors in artificial intelligence image recognition, which often affect image recognition accuracy and efficiency of the technology, so we can know the importance of image features to the image recognition technology in artificial intelligence.

3. Common Forms of Image Recognition Technology at Present

3.1. Neural Network Form

The form of neural network is a common form of image recognition technology at this stage. Based on the existing image recognition technology, it is reasonably integrated into the form of modern neural network algorithms, and new recognition is constructed according to current needs to meet current needs. This form belongs to the field of artificial intelligence technology, mainly artificial neural network. Through artificial intelligence, the distribution characteristics of human and animal neural network are comprehensively analyzed. Compared with traditional image recognition technology, this technology has more advantages. It integrates neural network algorithm to improve the overall complexity and cost. After extracting and capturing the image neural network, the advantages of the neural network program can be used to accurately identify and classify, and provide people with high-quality services [5]. In the image recognition system, the deep learning convolutional neural
network system is used to extract the features of the research object, and then the features are mapped to the convolutional neural network for recognition and classification. Taking license plate automatic recognition technology as an example, when the car passes by the detection equipment, the car itself will react. At this time, the detection equipment will enable the image acquisition device to obtain the front and back images of the car. After obtaining the image, the image must be uploaded to the computer to save for recognition. Finally, license plate positioning module will extract information for identifying characters on the license plate and displaying the final results. In the process of the characters on the license plate will be identified and used in the template matching algorithm based on artificial neural network algorithm.

3.2. Pattern Recognition Form
In fact, pattern recognition form belongs to an effective model. In the process of application of this form, based on a large number of information data recognition images, based on the overall application of computer technology, combined with mathematical principles, complete the recognition of image features, and objectively evaluate their features in recognition [6]. In fact, the recognition mode can be divided into two different stages according to the actual situation, one is learning, the other is realization. Because the process of learning is essentially a process of storage, it is necessary to clarify the importance of storing and collecting images and special information in the application at this stage, recognize according to the actual rules, classify according to the computer storage capacity, and form related programs, give full play to the advantages of its image, based on actual recognition.

From the perspective of feature objects extracted by image pattern recognition, image recognition methods can be divided into the following types: recognition technology based on shape features, recognition technology based on color features, and recognition technology based on texture features. Among them, the key to the recognition method based on shape features is to find the shape of the object in the image and describe it to form a visual feature vector to complete the classification of different images. The variables commonly used to express the shape are the perimeter, the area, and Circularity, eccentricity, etc. For color images, the color histogram with a simple and with the size of the image, not sensitive to rotational transformation characteristics classification based primarily on the recognition color characteristics. The recognition method based on texture features is accomplished by analyzing the features in the image that have very structural regularities or performing statistics on the distribution of color intensity in the image.

3.3. Nonlinear Dimensionality Reduction Form
Non-linear recognition technology is a high-dimensional recognition technology. The existing technology has strong advantages in the application process and can improve its recognition rate as a whole, especially for images with lower resolution, to meet the current demand [7]. Multi-dimensional data will be generated in the process of application identification, increasing the difficulty of its research. Through this technology, the difficulty can be effectively reduced, the calculation efficiency can be improved, and the needs of the current stage can be met. The most direct and effective way to make the computer have efficient recognition ability is dimension reduction. Dimensionality reduction into linear and non-linear dimensionality reduction dimensionality reduction. However, the linear dimension reduction is used to deal with the whole data set, and the optimal low dimension projection of the whole data set is needed. It has been verified that this linear dimensionality reduction strategy has high computational complexity and takes up relatively more time and space. Therefore, an image recognition technology based on nonlinear dimensionality reduction has been produced, which is an extremely effective method for nonlinear feature extraction.

Step 1: the first step of the algorithm is to calculate the k nearest neighbors of each sample point. For example, using the strategy of k, the k sample points nearest to the sample points (commonly used Euclidean distance) are defined as the nearest neighbors of the sample points, and k is a preset value.

Step 2: calculate the local reconstruction weight matrix w of the sample points:
\[ \varepsilon(W) = \sum_i \left( \| \mathbf{X}_i - \sum_j W_{ij} \mathbf{X}_j \|_2^2 \right) \]

And the local covariance matrix C:

\[ C_{jk} = \langle \mathbf{X} - \bar{\mathbf{X}}_j \rangle \cdot \langle \mathbf{X} - \bar{\mathbf{X}}_k \rangle \]

Where \( \mathbf{X} \) is a specific point and its K nearest neighbors are represented by \( \eta \). Therefore, the objective function is as follows:

Minimize:

\[ \varepsilon(W) = \sum_i \left( \| \mathbf{X}_i - \sum_j W_{ij} \mathbf{X}_j \|_2^2 \right) \]

\[ \sum_j W_j = 1 \]

\[ W_j = \frac{\sum_k C_{jk}^{-1}}{\sum_{lm} C_{lm}^{-1}} \]

Core: Here we can calculate \( w \) directly, and then in step 3, we assume that the weight \( W \) obtained by data reconstruction and the weight \( W \) reconstructed in dimension reduction space are shared (the same).

Step 3: map all the sample points to the low dimensional space. The mapping conditions are as follows:

\[ \min \Phi(Y) = \sum_i \| Y_i - \sum_j W_{ij} Y_j \|_2^2 \]

The above formula can be transformed into:

\[ \Phi(Y) = \sum_{ij} M_{ij} (Y_i \cdot Y_j) \]

\[ M = (I - W)^T (I - W) \]

Add the constraints (centralization and unit covariance)

\[ \sum_i Y_i = 0 \]

\[ \frac{1}{N} \sum_i Y_i Y_i^T = I \]

We can get the final solution of the problem: \( MY = \lambda Y \)

The eigen decomposition problem of the subject is to take the eigenvectors corresponding to the minimum m nonzero eigenvalues with \( y \) as \( M \). In the process of processing, the eigenvalues of \( M \) are arranged from small to large. If the first eigenvalue is close to zero, the first eigenvalue is discarded. Usually, the eigenvectors corresponding to the eigenvalues from the second to \( m+1 \) are taken to form a column vector, which is the output result, that is, an \( N \times m \) data expression matrix, assuming that there are \( n \) data points.

This technology can discover the non-linear structure of the image and can reduce its dimensionality without destroying its intrinsic structure, so that the computer’s image recognition can be carried out in the lowest possible dimension, thus increasing the recognition rate. For example, the dimensionality required by a face image recognition system is usually very high, and its high complexity is undoubtedly a huge "disaster" for computers. The distribution of human face is uneven in three-dimensional space, so we need to use nonlinear dimension reduction technology to obtain relatively uniform facial features, so as to improve the accuracy of face recognition.
4. Application of Image Recognition Technology Based on Artificial Intelligence in Life

4.1. Fingerprint and Face Recognition

With the development of big data technology, fingerprint and face recognition has become an artificial intelligence image recognition technology closest to our life [8,9]. The fingerprint identification system, in fact, uses some of the artificial intelligence technology of pattern recognition technology. This kind of pattern recognition mainly deals with and analyzes the details of various forms of information of the real object and some other things. It is to describe some things or phenomena, or to identify them easily. Fingerprint recognition belongs to the category of pattern recognition. Face recognition is a computer technology that analyzes the features of human face. It is also a very popular computer industry research field. In the final face detection or many other aspects, it belongs to a biometric recognition system, which studies and distinguishes the characteristics of an organism itself. Face recognition technology, also mainly depends on the face features of people, coupled with the input of a face image and some other videos, can determine whether there is a face in the end. Moreover, if there are human faces, it will analyze the identity characteristics of these people according to the characteristics of many details of the face, so as to compare and recognize the identity of each face. Nowadays, many mobile phones have set password unlocking as a secondary security protection method, while fingerprint recognition and face recognition with higher security level are primary unlocking methods. Mobile devices learn and record user fingerprint and face features, so as to solve the problem of cumbersome and low security of the password lock. Not only mobile phones, but many anti-theft locks also have this function.

4.2. Identifying Medical Diagnostic Images

Image recognition is an important field of artificial intelligence in medical imaging. Image recognition refers to the technology that uses computers to process, analyze, and understand images to identify targets and objects in various patterns. The interpretation of medical imaging reports is assisted by image recognition technology, which reduces the workload of doctors and improves the accuracy of imaging diagnosis. The first step of image recognition is to input a large number of effective medical images to the computer for processing. Then the noise in the image is removed, and it becomes a clear point line image, so as to extract the correct image features. Combined with the doctor's past experience in reading images, all the features that need attention and mining in the medical image data are extracted, and the computer expresses these features in numerical form. In order to reduce search time and computational complexity, the images are allocated to different image libraries in an accurate and consistent method. Image matching is based on image preprocessing and feature extraction, comparing the features of the currently input test image with the features of the template image saved in advance, and judging whether the two images are the same through the degree of similarity between them. Through image recognition based on image data such as medical imaging and pathology, structured data is obtained and provided to the medical imaging deep learning engine for calculation, and continuous update iterations and corresponding optimizations are performed. The accuracy of intelligent algorithms is gradually improved, the resulting diagnosis is accurate, and the rate also increased. The application of image recognition technology in medical treatment has accelerated the integration of medicine and information technology. In the current development of medical care, image recognition technology is increasingly accurate in identifying pathological images. It can be safely used in pathological diagnosis, analyze the patient's condition, and give more reasonable suggestions based on the patient's pathological images [10].

4.3. Bar Code Identification

All kinds of commodity information are sealed in a short bar code image. The identification of bar code and two-dimensional code is convenient for us to further recall the relevant information [11]. There are three main methods for barcode image recognition. Median filtering is a non-linear signal processing method. Here, because the bar code image is in the form of a column, an improved 5-point
sampling window is used to take 5 points on a column. Scanning the whole image, pixel by pixel point value in the window size of the sort of the last intermediate value in place of the original pixel value of all pixels within the window. Binarization includes three steps. First, the gray value of the image is counted, then the threshold value is calculated. Finally, according to the threshold value, the image is converted into a black-and-white image with a pixel value of 0,1 for further analysis. The selection of the threshold is based on the Great Law. The principle is to take a certain gray value, use it as the boundary to divide the image into two types of gray value size, and calculate the number of pixels in the two types and the average gray value respectively. Then the variance between classes is calculated, and the gray level corresponding to the maximum variance is taken as the threshold. Edge detection is to find an area that is more suitable for bar code recognition, and return the upper and lower boundaries of this area to its main tone function. To judge whether a line is suitable for recognition, the criterion is: if the number of black spots between a line and its next line is less than 5, and the number of black spots in this line is more than 75% of the average number of each line, it is considered that this line can be used for recognition. Find the upper and lower edges of the bar code for recognition, scan the image through the above method, and get whether each line is suitable for recognition (marked with 0 and 1). To find the best recognition range is to scan each line of the image to find a certain range of lines that can be used for recognition. When the number of lines is greater than a certain value, this range can be used as the best recognition area. If it is not found, it is considered that the image is seriously damaged and cannot be used for recognition. In our use of mobile payment, adding friends, and following official accounts, it is the barcode recognition function that makes our life more convenient and faster.

5. Conclusion

It can be seen that the image recognition technology in artificial intelligence has made a lot of beneficial effects on our life. It has changed the way of human life and production, saved a lot of necessary labor costs and human resources. Its importance is very important to promote the development of society. We need to adapt to the needs of the times, and have a tolerant attitude towards image processing technology. In the use of image recognition technology, we also need to further understand and understand it, so that it can be effectively used in a wider range of fields.

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