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Intelligent Image Recognition Technology and Its Development

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Abstract: *Intelligent technology has outstanding application advantages and can provide management services for various industries and fields, including image intelligent recognition technology. This article takes the working principle of image intelligent recognition technology as the starting point, introduces its process, principles, and key technologies. Based on this, it analyzes the application of image intelligent recognition technology, including application scenarios, advantages, and disadvantages. Finally, it explores the development suggestions of this technology, and proposes measures such as technical linkage, data acquisition and reuse, and multi result fuzzy presentation to further improve the application effect of image intelligent recognition technology.*

Keywords: *Intelligent image recognition technology; Core principles; Intelligent analysis; Technical linkage*

1. Preface

Image intelligent recognition technology is one of the technologies in the field of computer science, which mainly emphasizes leveraging the advantages of artificial intelligence technology to collect, analyze, and compare specific elements in images to identify various different objects and targets. With the development of society, information technology represented by image intelligent recognition technology has been widely valued and applied, and its value has also been more prominent. However, due to the immaturity of related technologies, some problems are still exposed in their application process, making it difficult to maximize the advantages and value of image intelligent recognition technology. In this context, analyzing the working principle, application advantages and disadvantages, and development suggestions of image intelligent recognition technology has certain practical significance.

2. The workflow and principles of image intelligent recognition technology

2.1 Main processes

The workflow of image intelligent recognition technology is relatively fixed and generally includes five stages. One is information collection, two is information processing, three is feature analysis, four is result comparison, and five is decision-making and result presentation.

Taking the common facial recognition access control management system as an example. After entering the access control area, the facial features of the personnel are collected by the collection terminal, and signal processing is carried out through the collection terminal facilities to convert them into language that can be recognized by the terminal facilities and computer equipment. Then, the original information is preliminarily processed, including signal enhancement, filtering and noise reduction, to make it easier to use for feature extraction[1]. Usually, a 64x64 image can obtain 4096 pieces of data, but some of the data is repetitive and lacks characteristics. It is necessary to process a few core information, such as the thickness of the person's lips, the position of the eyebrows, the width of the forehead, etc. These key and unique information should be processed and extracted to form a dataset for comparison. The information in the default information database should be compared to determine the identity of the visitor and allowed to enter or intercept [2].

2.2 Core Principles

Although the application scenarios of image intelligent recognition technology vary, its working

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principle is fixed, that is, using real-time information collection as the direct means, data comparison as the key method, and default feature information library as the basis for comparison, forming a working mode of real-time collection, real-time comparison, and real-time decision-making.

Taking the access control management system mentioned above as an example, in its preliminary stage, it is necessary to organize information collection and dimensionality reduction training to form an intelligent work module. By default, Fumougua is an employee of the company. After the company builds a facial recognition access control management system, the first step is to collect employee information. Fumougua provides facial information to the system based on on-site input, focusing on four dimensions: lip thickness, eyebrow arch position, forehead width, and nose tip shape. After the system completes the collection of original facial information for Fumougua, it uses the system program for dimensionality reduction training to only remember the four key dimensions of lip thickness, eyebrow arch position, forehead width, and nose tip shape, and forms a standard set of personal image features for Fumougua:

[2.32; 2b6; n-2; 8.91] (standard feature set)

When Fumougua attempts to access the access control system, the on-site collection terminal collects its facial features to form a new, real-time facial image. The image is processed to form a real-time personal image feature set:

[2.33; 2b6; n-2; 8.92] (Real time feature set 1)

The four dimensions of information in real-time feature set 1 are basically the same as the standard feature set, with only minimal deviation. Within the allowable range, the system recognizes the visitor as a "lucky melon for enterprise employees" and opens the access control system to allow them to enter. If the real-time personal image feature set of visitors is:

[2.52; 2b7; n-3; 10.22] (Real time feature set 2)

The four dimensions in real-time feature set 2 differ significantly from the standard feature set and do not match the information in other employee standard feature sets. The system recognizes visitors as "non enterprise employees" and does not open access control systems. The application mode of image intelligent recognition technology in other industries and fields is similar to this, which can ensure recognition efficiency and basic quality, and serve management activities.

3. Application of Image Intelligent Recognition Technology

3.1 Common application scenarios

The application scenarios of image intelligent recognition technology are not static and can be selected and adjusted according to work needs. Currently, common methods include remote sensing image recognition, communication recognition, criminal investigation recognition, biomedical recognition, machine vision recognition, etc.

Remote sensing image recognition mainly refers to the use of intelligent technology to analyze images obtained in remote sensing mode, such as cloud maps, forest distribution, disaster control situation, etc. Communication recognition includes video conferencing, image transmission, real-time image recognition, etc. [3]. Criminal investigation identification is mainly used in judicial activities, including judicial appraisal, criminal investigation information processing, etc. Biomedical recognition, such as CT technology and pathological image research. Machine vision recognition includes 3D image analysis and the access control system mentioned earlier. From the perspective of common characteristics, image intelligent recognition technology mainly provides a work platform and analysis carrier with computers and other information technology facilities. At the on-site work end, information processing is carried out with microcontrollers as the center. At the remote end, computers or computer groups are the key carriers for image intelligent recognition technology to play a role. Consulting companies and communication companies that provide services to a large number of users often need to establish computer groups composed of hundreds or even thousands of computers to synchronously meet the service requests of a large number of users[4].

3.2 Current application advantages

The application advantages of image intelligent recognition technology are reflected in three

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aspects: high efficiency, convenient and fast technical application, and overall reliable quality.

Most image intelligent recognition technologies provide services through intelligent modules, which can complete one click operations, including access control recognition, communication recognition, pathological image research, etc., without the need for staff to rebuild work systems. With the help of intelligent tools, software, and operation platforms, processing can be completed, and work efficiency and convenience are good. From the perspective of recognition quality, there are certain differences in the application effects of image intelligent recognition technology in different scenarios. In areas where the technology is relatively mature and the application methods are stable, the application quality of image intelligent recognition technology is also ideal, such as access control recognition systems, CT technology, judicial authentication, etc. In some areas with low technological maturity, the application of image intelligent recognition technology still needs to be improved [5].

3.3 Insufficient existing applications

The application shortcomings of image intelligent recognition technology include three aspects. Firstly, the technology still cannot accurately complete high-quality analysis of all images, and the recognition accuracy needs to be improved. Secondly, the data sharing effect is not perfect, and different image intelligent recognition technology software have different technical standards and work results. The third issue is that the presentation of results is not ideal. In situations where identification cannot be accurately completed, most software may only provide a suspected identification result, which cannot guarantee service quality.

Taking current mobile terminals as an example, most smartphones and tablets have the ability to scan and recognize, but due to the similarity of recognition objects in terms of characteristics or incomplete scanning and collection methods, the recognition results may be distorted. If the object scanned by personnel is "small cars", because the vast majority of small cars have similar appearance structures and driving modes, smartphones often cannot accurately identify them. In terms of sharing effects, from a business perspective, most enterprises that can provide intelligent image recognition services have technical patents and have certain differences in technical standards. Based on the purpose of technological protection and commercial development, these enterprises often do not engage in unnecessary sharing of technology or resources. When users synchronously use services from different service providers, the recognition results obtained may be different or all may be incorrect. In the application process of image intelligent recognition technology, the provision of recognition results is mostly real-time, and generally only one result and several references are provided. If the recognition results themselves have errors, the value of other references is often limited, which cannot provide high-quality service for recognition work.

4. Development suggestions for intelligent image recognition technology

4.1 Technical linkage

In the current application process of image intelligent recognition technology, the problem of low recognition accuracy is worth paying attention to. To address this, it is advocated to take technological linkage as the approach, and attach importance to the interaction between image intelligent recognition technology, cloud technology, and big data technology, in order to improve the real-time analysis and recognition ability of target objects. The main emphasis on the train of thought is to enhance the richness of image intelligent recognition technology in collecting original information, while strengthening the real-time linkage between image intelligent recognition technology and cloud space. By utilizing the unlimited resource library and computing service capabilities of the cloud, a real-time identification library based on big data is formed to improve the objectivity of comparative analysis and enhance recognition capabilities.

Taking the recognition of "small cars" mentioned above as an example, when personnel collect information on site, collection management can be strengthened. Terminal photography equipment should ensure strong resolution and clarity, at least reaching a level of 1080p, and use built-in devices to enhance basic filtering and noise removal of the collected original information, so that various basic and key information of the target object can be collected more effectively. After completing the information collection, adjustments should also be made to the terminal management. Personnel should process the collected images and select objects with certain specificity and recognizability, such as the vehicle logo and model characteristics, to provide assistance to the system. After the intelligent

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terminal obtains the above information, it directly provides it to the cloud system. The cloud system starts a computer group to collect and compare information based on the characteristics of the original information (including special information provided by personnel, the same below), and uses big data technology to quickly process the original information. In the default original information, "small cars" have five characteristics, namely, logo, vehicle type related text, hood inclination angle, chassis height, and tail light position, forming a highly distinctive recognition information set:

[A9; 80; GA; W79; OP] (Small Car Identification Information Set 1)

According to the information characteristics of the small car recognition information set 1, a resource pool formed by big data and cloud technology processing is organized and compared. The default data information for a certain image set is as follows:

[A9; 78; GA; W79; OP] (Small Car Identification Information Set 2)

Small car recognition information set 2 is highly similar to small car recognition information set 1, but the second information is different, indicating that it does not belong to the same vehicle model. The default data information in another image set is as follows:

[A9; 78; GA; W79; OO] (Small Car Identification Information Set 3)

The small car recognition information set 3 is highly similar to the small car recognition information set 1, but the second and fifth pieces of information are different, indicating that they do not belong to the same vehicle model and the tail light positions are different. The default data information in another image set is as follows:

[A8; 80; GA; W79; OP] (Small Car Identification Information Set 4)

Small car recognition information set 4 is highly similar to small car recognition information set 1, but the first piece of information is different, indicating that its logo is different, but other information is completely the same. This may be because the vehicle does not require a logo design or the logo is hidden, and there is a high possibility that it belongs to the same type of vehicle as the small car to be recognized. This information can be provided to users for their reference. With the support of big data and cloud computing technology, the application effect of image intelligent recognition technology can be improved, and the recognition effect and accuracy can be enhanced through the linkage of multiple technologies.

4.2 Data collection and reuse

Considering the commercial protection needs of image intelligent recognition technology, and the varying willingness of related parties to cooperate in technical research and application, it is not realistic to require them to share technology and resources. In the future, it is advocated to strengthen data collection and reuse management, based on a more complete resource pool, to improve the effectiveness of data sharing.

Enterprises and organizations that provide intelligent image recognition technology can establish big data storage mechanisms to collect information, demands, results, and other content related to intelligent image recognition provided by all users, forming big data. As reported by multiple users, the image intelligent recognition provided by our company has biometric issues and insufficient recognition accuracy. Enterprises can conduct targeted analysis on the information provided by users, evaluate the probability and reasons for errors in biometric results. Assuming that the analysis indicates that the enterprise's resource library is not rich and there are unclear images, which leads to abnormal recognition, it is possible to first adjust the enterprise's resource library, update its resources, troubleshoot and handle various errors, and ensure the quality of information and clear images in the library. On this basis, the biometric technology will be re launched and tested to determine whether it can cope with work problems. If the biometric effect is still poor, the original data collection and processing can be further strengthened and reused in resource library construction and biometric work until the problem is solved or significantly improved.

4.3 Fuzzy presentation of multiple results

The fuzzy presentation of multiple results mainly addresses the problem of a single presentation method for intelligent image recognition results, and advocates the use of synchronous analysis and presentation of multiple suspected results to replace it.

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In the technology linkage mode mentioned above, based on big data and cloud computing technology, target object recognition can be quickly completed in a short period of time. If the identification cannot provide a unique, accurate, and effective result that is completely identical to the target object, similar results during the identification process can be analyzed, and big data data can be used to determine their similarity and rank them, including the highest similarity, high similarity, and certain similarity levels. Information that meets the above requirements from all analysis results can be selected and provided to users. The default image provided by the user is a BMW 740 car, and the "highest similarity" target can be a BMW 740 car or a BMW 730 car. The "high similarity" or "certain similarity" can be other BMW car series, and the user can analyze it based on multiple choices of information to improve the service effect of image intelligent recognition technology.

5. Conclusion

In summary, image intelligent recognition technology is widely used in modern society, mainly relying on information technology to enhance recognition capabilities and provide basic services. The current robot design, access control management, industrial services and other scenarios rely heavily on image intelligent recognition technology, which has the advantages of high recognition efficiency and ideal accuracy. However, there are also problems such as high difficulty in complex image recognition and distorted recognition results, which need to be optimized. The development of future intelligent image recognition technology may focus more on technological linkage, data acquisition and reuse, and indirectly address the issue of identification accuracy from the perspective of multi result fuzzy presentation, providing more choices for workers.

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