

Research on the Application of Computer Image Processing and Recognition Technology

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Abstract: With the continuous development of science and technology, and against the backdrop of the information age, computer technology has been increasingly widely applied in society. As an important component of computer technology, the scope of application of computer graphics processing and recognition technology is also expanding further. By enhancing the processing of computer information data, it plays a significant role in many fields. This paper starts by introducing the concept of computer graphics processing and recognition technology, analyzing its advantages, and then delving into the specific applications of computer graphics processing and recognition technology in different fields. This exploration aims to provide more insights for the future development direction of computer technology and serve as a reference for the innovative development of computer technology.

1. Introduction

With the accelerated pace of informatization in our country, the application of computer technology is becoming increasingly widespread. As the computing and storage capabilities of computers improve, so does their level of image processing, leading to a significant enhancement in the efficiency of processing various types of information data. Computer recognition technology is divided into two parts: image processing technology and image recognition technology ^[1]. The common point between these two technologies is that through a series of technical processing of images, relevant data information that people want to understand is obtained. Computer image processing and recognition technology, as an emerging advanced technology, possess advantages such as high processing accuracy, fast processing speed, and high flexibility ^[2]. This technology can further improve the processing and recognition effects of computer images and can change the focus of processing and recognition according to specific needs, thereby achieving widespread applications in various fields such as intelligent transportation, non-ferrous metal industry, public security reconnaissance, and medical healthcare. This technology has broad prospects for development in the future.

2. Overview of computer image processing technology and recognition technology

Analyzing computer image recognition technology from the current technological perspective, it

can be seen as a combination of image processing and recognition methods. With the support of computer technology, specific methods are applied to process images by adjusting aspects such as resolution and clarity. Scanning techniques are then used for image recognition, comparison, and selection, facilitating precise image acquisition. This ensures that relevant industry data can be maximized during the recognition process. In computer image recognition technology, image acquisition may involve spatial mapping, followed by computer processing and analysis to extract basic features. A comparison is made with vast data information libraries to achieve recognizable and high-definition image reproduction [3]. The characteristics of computer image recognition technology are primarily reflected in three aspects. Firstly, it offers high precision compared to previous image recognition technologies that could only process individual images. Computer image recognition technology accurately identifies images with the help of powerful computer systems, ensuring high precision. Secondly, the information processing capacity of computer image recognition technology is greater due to its foundation in computer technology, which relies on databases and various software technologies. This enables rapid and accurate image recognition and processing, significantly improving recognition efficiency. The principles of computer image processing and recognition technology are similar to the perceptual function of the human eye towards images. By converting target images into specific digital signals and processing the results using relevant formulas, computers can identify shapes, colors, sizes, etc., forming fixed memories in the computer image library. When encountering similar objective images again, computers use their processing and recognition capabilities to capture the new image's features, compare them with specific images stored in the database, and find the most similar image information to complete image processing and recognition operations. Compared to manual image processing and recognition, computer image processing and recognition technology applications are more objective, with higher accuracy and efficiency, although the generated images may lack subjective descriptive elements [4].

3. Advantages and characteristics of computer image processing and recognition technology

3.1 Fast Processing Speed

In the context of the development and application of computer image processing and recognition technology, it plays a significant role in various fields and offers substantial application advantages. One of the main advantages of computer image processing and recognition technology is its fast processing speed. Especially after the widespread use of the Internet, where people are exposed to a large amount of data, often complex in nature, traditional processing and recognition techniques are no longer sufficient to meet normal work requirements [5]. Utilizing computer image processing and recognition technology to handle data can enhance data processing and recognition efficiency, enabling quick analysis and processing of data in a short period, demonstrating good application adaptability and compatibility.

3.2 High Accuracy

In specific application scenarios, computer image processing and recognition technology can efficiently and accurately process and recognize multiple images of different types simultaneously, effectively extracting valuable and complete image information from massive image data resources. Compared to traditional manual image processing and recognition methods, computer image processing and recognition technology offers higher accuracy in applications. However, in practical application, this technology lacks intuitive perception and lacks the feedback capability of human image recognition [6]. This results in a certain degree of subjectivity in image processing and

recognition, impacting the recognition results. Therefore, a combination of two image processing and recognition technologies is required to enhance the overall application effectiveness.

3.3 Excellent Flexibility

When applying computer image processing and recognition technology, intelligent settings can be utilized for image processing, allowing technical personnel to adjust the precision of computer image processing and recognition technology applications to achieve automated image processing and recognition functions. The technology offers good flexibility in applications, suitable for various work environments and scenarios, delivering consistent application results^[7]. Additionally, the application of computer image processing and recognition technology can reduce the intensity of manual operations, enhance image information processing efficiency, increase processing capacity, making technical personnel's work more flexible, and improving the practicality and accuracy of image processing.

4. Application of computer image processing and recognition technology

4.1 Applications in Intelligent Transportation Sector

By utilizing computer image processing and recognition technology, information data can be quickly and accurately assessed. This technology can be applied to assist driving or vehicle locating. In the context of assisting driving, it can effectively prevent potential dangers caused by lane departure due to driver fatigue or lack of concentration. Real-time monitoring of vehicle driving status and driver conditions can be achieved through image processing and recognition devices in vehicles. These devices can accurately analyze abnormal situations and provide feedback to the driver to help them make correct judgments and actions based on the analysis and alerts. Moreover, with the improvement of people's living standards and the increasing number of vehicles, various traffic accidents occur frequently, including violations or hit-and-run incidents. Computer image processing and recognition technology can effectively monitor illegal vehicles or traffic accident situations, significantly improving the efficiency of handling traffic accidents. For instance, during high-speed toll payment, a QR code card reader can be used. The detection system can automatically sense the vehicle's driving status, and users can extract and use the vehicle through an IC card without paying supervision fees. Specifically, each vehicle is equipped with a unique QR code identity card, and the internal servo can be controlled by scanning the QR code with the IC card. When parking and paying fees, drivers can upload their identity information in advance, and transmit personal information to public security departments through face recognition and image processing systems for personal information comparison.

4.2 Applications in the Medical Field

With the development of the medical field in our country and the in-depth research on medical technology, the quantity of medical images and data has significantly increased. More efficient processing methods and technologies are needed to improve the efficiency of medical data processing. When applying computer image processing and recognition technology in the medical field, attention should be paid to the classification of its application types. For example, in cell chromosome processing, precise comparison with a database system can determine chromosome types, facilitating accurate analysis by medical workers. Additionally, computer image processing and recognition technology can be applied in ultrasound imaging or virtual endoscopy. Accurate image information can be obtained through image inspection and anatomy, enabling staff to have a

more comprehensive understanding of patients' conditions and implement more reasonable treatment plans. For instance, in diagnosing gastric cancer or breast cancer, medical image CAD diagnostic methods can be used to assist doctors in disease diagnosis by leveraging radiology and medical image processing technology and computer computing power to obtain more precise diagnostic results. The specific image processing and recognition process involve taking medical original images, processing them through segmentation, denoising, and enhancement, extracting and rotating features, constructing high-order symmetric tensors, standardizing dimensionality, inputting the obtained high-order tensor feature matrix into a classifier for accurate identification, and obtaining corresponding diagnostic results. This process can be summarized as image processing, image analysis, and image understanding.

4.3 Application in Agricultural Production

In recent years, the use of harvesting robots in agricultural production has become very common. Through the application of robots, not only is the labor intensity of farmers reduced, but the efficiency of agricultural production is significantly improved. Harvesting robots represent a typical application of computer image processing and recognition technology. When designing harvesting robots, the first step is to accurately determine the precise location of the crops to be harvested and carry out precise positioning. During the positioning process, the necessary data of the crops to be harvested is actually collected and input into the computer system. The system then analyzes and compares the data, identifies which crops are ready for harvesting, and sends out harvesting instructions at the appropriate locations. For example, when certain fruits are in a red state, it usually indicates that the fruit is ripe and ready for harvesting. Computer image processing and recognition technology can be used to determine the color of the fruit. If it is identified as red, the harvesting operation is executed. Furthermore, this technology can also be applied to monitor the growth status of crops, supervise crop diseases, pests, and weed situations, enabling farmers to take timely and effective measures based on monitoring results to improve overall crop yield and quality.

4.4 Application in Meteorological Water Vapor Detection

For flood disasters, the continuous transport of water vapor is the root cause. By analyzing the characteristics of water vapor conditions in depth, the possibility of flood disasters can be accurately assessed. During water vapor detection, based on the actual changes in the air environment and proactive forecasting, computer image processing and recognition technology is introduced to predict future weather conditions accurately, effectively reducing the risk of natural disasters. The analysis of water vapor conditions is a prerequisite for flood evaluation. If the input of water vapor conditions does not meet the standards, it is difficult to analyze flood characteristics. Utilizing GIS analysis maps to study and analyze changes in water vapor, combined with remote sensing images of regional terrain conditions, spatial structural continuity evolution, especially the actual processes of physical quantity changes, can significantly enhance the accuracy of online flood assessment. In this process, by aggregating the actual changes in water vapor flux within a unit time and comparing it with relevant information in the database, the specific trends in future weather development in the region can be accurately simulated. By using computer image processing and recognition technology to extract water vapor detection information coverage, the IDL function module is mainly utilized, focusing on the analysis of ASAR remote sensing data such as ASAR data clipping, density segmentation tasks, and completing the final shape format file output function. Based on the flooding data during the flood period and overlaying it with administrative area maps, the accurate calculation of the flooded areas is performed. By visualizing

the water coverage information from the web and the calculated flood assessment results, flood-affected areas are processed visually. The data output interfaces and image dynamic production technology are used to obtain flood-affected area reports, the computer image processing and recognition technology are used to evaluate and compare different disaster-affected areas.

4.5 Application in the Industrial Manufacturing Field

In the era of informatization, industrial enterprises aiming for substantial development inevitably need to adopt automated and intelligent manufacturing technologies to enhance production efficiency and adapt to societal progress. By utilizing computer image processing and recognition technologies, industrial enterprises can intelligently identify the components needed for production, ensuring that all products match the identified components precisely. This not only guarantees product accuracy but also boosts production efficiency. In practical application, monitoring devices are used to capture required image information, followed by the application of image recognition technology to analyze and interpret the obtained images. This technology accurately identifies non-standard operations, triggers warning systems, and effectively prevents safety incidents. Modern image processing and recognition technologies are highly intelligent, employing smart algorithms to analyze and process images, enabling the detection and identification of irregular operations. Additionally, facial recognition technology can assist in industrial production and security management. As most production processes in modern industrial enterprises involve confidential information, enhancing personnel control in these areas is crucial. Facial recognition technology analyzes employees' facial features to prevent unauthorized individuals from entering production sites, ensuring strong confidentiality. Facial images are dynamic and challenging to recognize, influenced by factors like facial expressions and ambient lighting. However, with the increasing maturity and application of intelligent deep learning technologies in image processing and recognition, dynamic facial information under different environments and expressions can be analyzed and identified accurately. This enhances industrial production management capabilities, effectively preventing safety incidents.

4.6 Application in the Public Security Investigation Field

In the realm of public security investigations, the application of computer image processing and recognition technologies yields positive outcomes, providing enhanced technical support for investigative work. For instance, in suspect identification tasks, the rapid facial recognition enabled by computer image processing and recognition technologies aids in swiftly pinpointing suspects' facial features and whereabouts. This helps narrow down investigation scopes, accelerating case resolution. When faced with incomplete or missing information in images, utilizing computer image processing and recognition technologies allows for the restoration of fragmented image data, making image content more comprehensive. This, in turn, provides additional leads for case resolution, further boosting investigative efficiency.

4.7 Applied in Non-ferrous Metal Manufacturing

Non-ferrous metals, as one of the most widely used metal materials in the industrial field, come in various types and are indispensable in people's daily lives and work. Taking copper as an example, it is one of the most commonly used metals in the field of non-ferrous metal manufacturing. Copper primarily exists in nature in the form of copper ore, with various types and significant differences in properties and states, which increase the difficulty of detecting and

identifying copper ore. When using computer image processing and recognition technology for copper ore detection, with the assistance of various modern detection equipment and instruments, employing a combined physical and chemical detection and recognition method can input the X-ray fluorescence spectrum data of copper ore into the computer system. This method accurately extracts the characteristic points of copper ore, summarizes and analyzes the relevant data information of copper ore. By utilizing the method of comparing information data curves, precise identification and detection of copper ore can be achieved, enhancing the efficiency and accuracy of copper ore detection, saving detection time, and making the detection process simpler and more flexible.

5. Conclusion

In conclusion, computer image processing and recognition technology, as an emerging technology in the context of the information age, have been widely applied in numerous fields and have to some extent promoted the efficient development of data information processing in our country. In the future, with the continuous advancement of information technology, the prospects of computer image processing and recognition technology will be even broader, enabling positive contributions in more areas and further driving social development and progress, thereby enhancing people's quality of life.

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