

Artificial Intelligence Information Recognition Management System Based on Image Recognition Technology

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Abstract: In order to improve the intelligence and convenience of image recognition technology, the author proposes a research on artificial intelligence information recognition management system based on image recognition technology. The author firstly introduces the principle and design of the system in detail, discusses the system architecture and scheme, the image recognition technology of neural network is analyzed, which has a certain role in promoting the research and application of image recognition. Finally, the PLC control system function is realized, the data management and information sharing realize the unified management of data, and the subsystems are connected in series to eliminate the information island. Strengthening the research on image recognition technology will help to improve its social and economic value, and artificial intelligence-based image recognition technology will also become one of the key technologies necessary in the future.

1. Introduction

With the continuous progress and development of science and technology, the application of image recognition technology in all walks of life is becoming more and more extensive, and it is also gradually applied in various professions in iron and steel enterprises, in particular, it plays an important role in many professions such as face recognition and fingerprint recognition, product quality inspection, and factory environment inspection ^[1]. Image recognition technology usually refers to the use of hardware equipment to extract and process the pictures collected by the front-end equipment according to the established target, image recognition technology is also very closely integrated with daily life, such as license plate capture, commodity barcode recognition and handwriting recognition ^[2]. With the gradual development and continuous improvement of image recognition technology, it will have a wider range of applications in the future. As one of the important components of the production line, the hot-rolled slab warehouse is located between the continuous casting and the hot-rolling heating furnace, it is a link between the past and the future, and it is an important hub for the logistics of the entire company, its smooth operation directly determines the entire production rhythm of hot rolling ^[3]. Therefore, the management of slab data and information is very important, only by ensuring the integrity of information and the circulation of data, can the entire rhythm of hot rolling be guaranteed ^[4].

2. System Principle and Design

2.1 System Principle

The principle of image recognition is mainly to process information with certain complexity, and the computer realization of this technology is similar to the basic principle of human image recognition. Humans have a strong ability to recognize images, and the visual effects produced by the human eye are particularly peculiar phenomena^[5-6]. The human senses will change with the distance, position and angle of the image, and the imaging of the image on the retina will also change the corresponding size and shape, but this change will not affect people's judgment and analysis of the useful information of images. In the field of artificial intelligence, image recognition technology is the most critical technology, the principle of image recognition is actually similar to that of the human eye, the prominent features of images are the basis and premise of image recognition^[7]. Therefore, finding the characteristics of the image is the key work of image recognition, for example, in English capital letters, the sharp corner of V is a prominent feature, the circle of O is a prominent feature, while the acute angle, obtuse angle and line of Y are prominent features, these prominent features become the prominent features to capture and identify special information, and become the effective information to identify this image, judge the outline and color of the image, and objectively judge the content and nature of the image, so as to analyze the meaning it expresses. By imitating the principle of human eye recognition of images, to achieve the realm of human eye recognition, people have compiled calculation methods to simulate human image recognition activities, from this, many computational models for image recognition in various scenes are formed, when an image is captured by the camera, if the image features match the stored computational model for image recognition, the image is deemed to have been recognized. The design principle is shown in Table 1^[8].

Table 1: Design Principle Table

| | | | | |
|-------------------------------------|----------------------------|-----------------|-------------------------------|----------------|
| Front-end deployment | IPC | Thermal Imaging | vehicle electronics | security check |
| Edge deployment | NVR edge terminal | | Embedded server | |
| Data Center Deployment | General purpose GPU server | | | |
| AI model development | AI training platform | | Model Orchestration Platform | |
| AI model deployment and application | cloud eyes | | Industry application platform | |

2.2 System Design

The collection of information data and image recognition are basically the collection of information data, through the reasonable application of optical signals, the specific signals of various sensors are simulated as electrical signals, so as to obtain accurate data and information. In the image recognition technology, according to the special data obtained and the basic characteristics of the image, these information and data requirements can become the characteristics of the difference of the graphics, it is stored in the computer's database to lay the foundation for the use of subsequent processes^[9]. Information data preprocessing often needs to use transformation, smoothing, and denoising to process the image to highlight the features and important information in the image^[10]. Feature selection and extraction, in the process of image processing, the key content of image recognition technology is to extract and select image features. Reasonable selection of the special features of graphics plays a decisive role in whether the image can be successfully identified, different graphics features are extracted, classified, sorted and stored in the computer, and it is used for calculation to provide an accurate basis for recognizing images through calculation^[11]. Classifier design and classification decision, this step is the last work content of image recognition, according to the established procedures and steps, according to this recognition rule, the image can be recognized

according to a certain rule, rather than random recognition, therefore, the recognition rule can highlight similar feature types, improve the recognition rate of the image in the process of recognition, and achieve the confirmation and evaluation of the image by identifying special features [12-13].

3. System Architecture and Scheme

The artificial intelligence information identification management system includes an information identification subsystem and a PLC control unit subsystem. Based on the AI open platform, an image text recognition model is built, and the information is recognized after data set management, model training, model management, and model verification. This module consists of industry application platform, dedicated network camera for AI open platform and Ultrain NVR. On the basis of providing core capabilities such as IoT device access and video networking services, it integrates AI model management components, opens up AI training platforms, and provides AI model deployment and application integration tools. Its core functions include: Model library management, model distribution, intelligent analysis task configuration, intelligent analysis rule configuration, and AI event push [14]. The industry application platform customizes the business judgment logic of the intelligent analysis results according to the identification and verification requirements of the heating furnace, and sends the identified information in linkage according to the business logic judgment results. The system architecture diagram is shown in Figure 1.

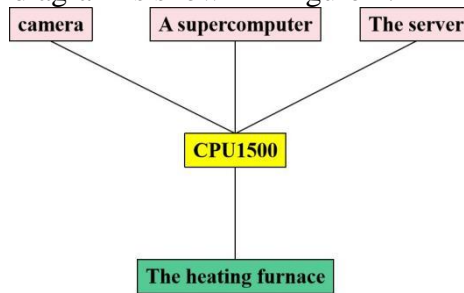


Figure 1: System Architecture Diagram

3.1 Research on the Application of Image Recognition Technology Based on Artificial Intelligence

In order to better explore the image recognition technology based on nonlinear dimensionality reduction, we should first master what neural network is [15]. Neural network technology is generally expressed as a new type of image recognition technology that links traditional image recognition technology with modern neural network algorithms, the calculation process of neural network is mainly carried out by imitating a certain feature in the human brain, in fact, the neural network is not based on the human neural network as it is, but rather relies on the abstraction, simplification and simulation of the human neural network to optimize the computing structure, thereby improving the calculation speed. Image recognition calculation based on neural network, its realization principle mainly relies on the neural network learning algorithm, in the process of using neural network to implement image recognition, the color of the image should be preprocessed first [16-17]. In order to effectively improve the efficiency and accuracy of image recognition based on neural network, corresponding neural network design should also be carried out for the field and target of image recognition, the emphasis covers the design of input and output layers, the design of hidden layers, the determination of initial weights, and the determination of expected errors. After the design of each part is completed, the designed neural network should also be trained practically, so as to ensure that it can well meet the needs of image recognition [18]. Using MATLAB9.3 software as a platform, a

two-layer network is constructed through the function newff, which covers 1 output neuron, 9×9 inputs and a hidden layer of 18 units. The learning function selects learnngdm, and the learning rate is set as 0.009~0.5. Immediately after the experiment was carried out, the author wrote 26 English capital letters for practical recognition, the recognition results are shown in Table 2, it can be seen that the image recognition technology based on neural network can complete letter recognition very well, and can be extended to related applications ^[19].

Table 2: Recognition Results under Different Numbers of Nodes in the Hidden Layer

| Number of hidden layer nodes | training time/s | training times | Recognition rate/% |
|------------------------------|-----------------|----------------|--------------------|
| 14 | 2.7468 | 99 | 91.5 |
| 16 | 3.1158 | 108 | 87.7 |
| 18 | 2.6167 | 89 | 95.2 |

3.2 Function Realization of Plc Control System

The hardware configuration of the PLC control system consists of PM+CPU1511 series, which uses Ethernet communication to connect with the storage server of the information identification system, the information is transmitted to the production control system and checked with the planning information in the production control system, so as to realize the management and control of the automatic steel charging of the heating furnace. This system has the following performance characteristics: High availability; This system provides users with a complete and high-availability design scheme, ensuring that the equipment in the plant has a wide range of high availability. For example: Field testing of controllers ensures high availability through reliable switching with automatic event synchronization. High reliability: The products in the system have excellent stability and good durability in various industrial environments. The product has passed the long-term system test, can reach the target level of the design, and has the relevant certification. Security: In the production site of the enterprise, the application of Ethernet to form network communication, network security has become the primary issue. In order to protect various data in the factory, the system adopts various protection measures to ensure that the PC and control system protect the automation unit equipment of each network. The control system adopts a unit protection scheme, using switch system modules, etc., in order to provide various components to form a good protection unit ^[20].

4. Conclusion

The author proposes a research on artificial intelligence information recognition management system based on image recognition technology. The information verification PLC control system based on image recognition technology is to manage and control the automatic steel charging of the heating furnace, in order to make the steel loading smooth and reduce the inaccuracy of data caused by manual recording errors, so as to ensure the correctness and timeliness of data information, the author makes real-time statistics and reflects the furnace loading situation, which improves the operation efficiency of automatic steel loading. Data management and information sharing realize unified management of data, connect various subsystems in series, and eliminate information islands. Image recognition technology has been widely used in many industries in our country, and has played a very important role, and has a good development prospect. In the future, image recognition technology will be further developed, and it can be more intelligently integrated into people's daily life.

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