Research on the Application of Deep Learning in Campus Security Monitoring System

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Abstract. This paper summarizes the background of the construction of campus video security monitoring system, points out that deep learning has an important impact on the development of campus security monitoring system, and puts forward the design principles and ideas of campus video security system. On the whole, the architecture of campus security monitoring system is constructed. The application of deep learning algorithm to campus security monitoring system will realize the precision of campus security management, improve the ability of campus security emergency command and decision, realize the intelligence of campus security operation, improve the efficiency of campus security work, improve the level of campus security management, and ensure the campus more safe and stable.

Keywords: Deep Learning, Campus Security, Monitoring System

1. Introduction
In the 21st century, the crime rate on campus in colleges and universities has increased year by year. At the same time, with the rapid development of high and new technology, high-tech crimes are common. This directly brings great difficulties to the campus safety prevention work in colleges and universities.

According to the current video surveillance system used in colleges and universities, the existing hardware equipment and functions are very backward in many aspects, and can not even meet the needs of the current campus security monitoring work. The main function of the existing "video surveillance security system" is to record the video on the spot and archive the recorded content. The system does not reach the intelligent level. If it is only a simple storage of surveillance video, then video resources can not be effectively used, once a campus security incident, can only be transferred out of the relevant video, the number of video and long time. Video information without any value will occupy video surveillance storage space, resulting in storage space can not achieve reasonable profit, and in tracing related security incidents, it takes a lot of manpower and material resources to search video, which is time-consuming and labor-consuming. This seriously affects the efficiency of tracing.

2. Systemic presentations
The campus security monitoring system studied in this paper integrates all the monitoring objects in
the campus and establishes a unified platform for management. The system integrates face detection algorithm, face tracking algorithm and face recognition algorithm based on depth learning. The introduction of depth learning algorithm can improve the accuracy of face recognition. It can recognize the people involved in the process of campus activities, obtain their face, voice, shape, emotion and other biological features, and find out the suspects through database comparison.

The system can monitor the campus in real time, install high-definition camera in the front end, capture the real-time face of the campus personnel, transfer the real-time face pictures to the database of the monitoring center through network transmission, and carry out real-time comparison. If there are face the system will alarm and realize intelligent early warning. By manipulating the front-end high-definition camera, the situation around the camera can be clearly collected, such as when the system sends out early warning information, the supervisor can quickly locate the early warning location through intelligent analysis, and then can more effectively ensure the safety and stability of the campus.

3. Application of Deep Learning in Intelligent Security

Since 2006, the field of machine learning and artificial intelligence technology have developed rapidly, and the research results have been widely used in various industries. The University of Toronto D.S. Ferreira and his colleagues first proposed the concept of deep learning (Deep Learning) in 2006, pointing out the need to clarify the calculation and learning process of brain neurons and the related principles. With the rapid development of deep learning technology, although it is necessary to further improve the relevant theory and modeling, it has greatly promoted the progress of artificial intelligence technology, using massive data processing and analysis ability. Can automatically identify images and text, to achieve real-time interactive between people and machines.

At present, deep learning technology has been applied in the field of security, which makes the combination of artificial intelligence technology and security engineering more closely. Deep learning technology is to use neural network algorithm to imitate the mechanism of human brain, so as to interpret various data such as image, sound and text. This technology is widely used in the field of image recognition. The huge amount of high-definition video data has produced a huge data processing work on security product technology, which provides a prerequisite for the application of deep learning technology in monitoring system. Machine learning is a multi-domain interdisciplinary subject, which can use computer to simulate human learning behavior, so as to master more skills and improve its knowledge base and performance. Many machine learning methods include adboost neural network, support vector machine and other. At present, there are still many problems in the application of machine learning in the field of security, for example, the target location rate and recognition rate are not high, these problems still need to be solved. At present, the most successful license plate recognition algorithm in the field of security is to improve the accuracy of license plate recognition by using depth learning technology.

For traditional image processing and machine learning algorithm development, hog, sift features and machine learning algorithms can be set first, and then matched with target detection objects. Because of the difficulty of theoretical analysis and long training time, the method has characteristics. Deep learning only requires you to prepare enough graphs for training. While adding new data continuously, you can use computing resources to carry out continuous multi-network level deep learning, thus improving the recognition rate. It is undeniable that deep learning technology also faces some difficulties, such as big data calibration, excessive calculation and training convergence, which requires a lot of training and testing time, but it is difficult to realize front-end and real-time.

By using the face recognition technology based on depth learning, the image content can be analyzed, the face in the picture can be detected, located, tracked, feature extracted, and then compared with the relevant database, so as to achieve the purpose of identifying different people.

4. Principles of system design
4.1. Reliability
It is the basis for the system to maintain long-term stable operation, and the system can meet the requirements users[7]. When developing the system, the principle of reliability should run through the whole development process and adopt mature and advanced technology to ensure the stability and good recovery ability of the system.

4.2. Advanced
Advanced hardware and software equipment is the first choice for system development, considering the application of system technology from many aspects, using advanced and mature technology concept, can effectively improve the stability of the system, but also guarantee the service life, Avoid the system being eliminated because of backward technology and hardware equipment, improve the return on investment.

4.3. Extensibility
The system is developed with advanced technology to improve the openness of the system, to ensure that the system can be well extended later, to provide a good external interface for the system upgrade, and to ensure the provision of scalable services without affecting the normal use of existing functions, so as to meet the needs and of new functions, performance and security of the system[8].

4.4. Easy to manage, easy to maintain
Most of the domestic security personnel have limited education level, the interface design of the whole video security monitoring system should be simple, easy to operate and easy to use, thus reducing the cost of system operation training.

4.5. Security
The most important thing in system development is the security of the system. To improve the security of the system, we must first strengthen security training for users to ensure the correct operation of users and avoid system failures due to operational errors. Finally, it is necessary to do a good job of data backup, backup the core business data and files regularly, so as to effectively avoid the data damage caused by human operation or natural disasters, and provide guarantee for the safe and stable operation of the system[9].

5. The Idea of System Design

5.1. Hardware
Use high-definition monitoring equipment to obtain clear monitoring screen to realize high-definition point position HD monitoring[10]. HD monitoring can view the situation around the monitoring point more widely, greatly reduce the number of monitoring equipment, and then reduce the cost of equipment input, reduce the cost of labor input.

5.2. Software
By arranging the campus monitoring center, establishing a unified centralized management platform, centralized management of campus monitoring points. The video security monitoring system is developed by modular design to facilitate the subsequent function expansion of the security system. The system is designed by interface design to realize the secondary development and integration of the system. Achieve unified system deployment and management.

6. System architecture design

6.1. Video surveillance system
It is the core content of campus security engineering construction and is in the form of distributed
deployment. By setting up high-definition video surveillance equipment, the campus can be monitored in real time, and the data can be stored effectively to ensure the effective video investigation. Video surveillance system can collect, transmit and store video data, browse video content and process video data. Video surveillance system can realize remote real-time view of the situation in the campus, effectively improve the level of campus security management.

6.2. Network transmission system
It is an important part of video surveillance system and also a guarantee of front-end network Camera image can be safely, efficiently and accurately transmitted to the back end of the important link. With the rapid development of intelligent campus construction, the network transmission of campus monitoring system will adopt the mode of infinite network transmission, which will become the development trend in the future. Wireless mesh network not only has high reliability, but also has high adaptability. When the system is interrupted due to failure or accident, it can ensure the quasi-awakening, integrity and consistency of system data transmission, and has good recovery ability. The center of campus monitoring network is the core switch layer, which determines the reliability of network equipment operation.

6.3. General control center
Located in the security room, all resources can be controlled.

6.4. Application of deep learning function
Training algorithm based on convolution neural network for face The generation of algorithm and the design of face recognition technology and process form the function of face capture in depth learning. Compared with the traditional artificial intelligence technology, the face photos captured by face recognition technology based on depth learning have better image and video effect and higher accuracy. The depth learning algorithm plays an important role in the construction of security video surveillance project.

Real-time face capture: the system will produce a large number of real-time face capture photos, the monitor can clearly know which points to produce face pictures, and lay the foundation for the analysis and judgment of the subsequent personnel trajectory. Monitor can view real-time capture pictures. The real-time capture data of the face is collected, and then the corresponding feature vector is generated by calling the same network to the picture, and the corresponding distance is calculated by using the generated feature vector and label vector. Select the label with the smallest distance as the result of recognition. In turn, the captured pictures can be recognized.

Face association video adjustment: when the monitor wants to view a person's related video, you can find the person's face grab picture through the monitoring system, click the button below the picture, and view the movement track of the person in the monitoring point. This function greatly saves the time of the monitor to view the video.

Personnel trajectory analysis: the monitoring system can automatically draw the movement track of a person on the map according to the time and place of a person's face picture collection. This function can effectively analyze the movement law of the suspect.

Face identification: input real-time face photos in the system, can be in the static face feature database according to the image feature point comparison algorithm, retrieve the most similar expected personnel, according to the similarity from high to low order.

Face search: the monitor can select the portrait picture of a suspect in the blacklist of the system, and find the image of the person with high similarity by comparing the face picture captured by the high-definition device. The system will automatically sort from high to low according to the similarity of face images.

Real-time early warning: through the escape or criminal record database and other local feature database into the monitoring system to achieve early warning of related personnel. When the face image captured by the front-end monitoring device is compared with the blacklist in the system
database in real time, and the face similarity reaches the set warning threshold, the system will alarm automatically in real time.

7. Conclusion
Face recognition technology has been widely used in various fields. Face recognition is recognized by face technology, which will be the development trend of identification field in the future. With the rapid development of economy and information technology and the continuous improvement of public security consciousness, video surveillance system has been gradually integrated into the daily production and life of the public. The application of face recognition technology based on deep learning in video security system will give security system higher intelligence and flexibility, greatly improve the accuracy of security system recognition algorithm and reduce a large number of error alarm. At this stage, deep learning is in the development stage in the field of security, and will affect the whole field of security in the near future.

The application of security monitoring system based on deep learning in the security monitoring system of university campus can effectively improve the working efficiency of campus security and provide more possibilities for campus security work. It improves the intelligent level of campus security system and plays an important role in the construction of campus security engineering. With the development of intelligent information technology and the popularization of intelligent campus construction, deep learning technology will be more widely used in the future campus security construction. Intelligent campus construction has put forward new requirements for campus security monitoring technology. How to better apply high and new technologies such as deep learning to campus security construction still needs deeper research and discussion in order to meet the needs of intelligent campus construction.

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