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Application Strategy of Security Detection Technology in the Background of Computer Vision

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Abstract: *At present, the application of computer technology is more and more extensive. The monitoring data can be processed by computer, which can show many advantages such as timeliness, accuracy and intuition. Therefore, computer vision has become an important foundation in safety detection. In order to promote the application effect of security detection technology under the background of computer vision, it is necessary to first clarify the meaning of computer vision and the theoretical basis of security detection technology based on this background, understand the relevant requirements and functions, and finally make a reasonable design for the corresponding computing system, Only in this way can we realize the effective application of safety detection technology under the background of computer vision for reference.*

Keywords: *Computer vision; Safety detection technology; Application Policy*

1. Introduction

The combination of civil air defense and technical defense is the essence of safety protection work. Adding intelligent systems to it is more conducive to improving the effect of safety protection work. In fact, although the traditional video monitoring form is practical, it still has many shortcomings, such as low efficiency of preview mode, untimely front-end fault diagnosis, low efficiency of playback query and low efficiency of storage mechanism. However, the application of security detection technology under the background of computer vision can effectively improve the above shortcomings, It can further improve the quality and efficiency of safety protection work.

2. Discussion on computer vision

Computer vision is a kind of visual function realization method that uses imaging system to replace the visual system and uses computer to play the function of brain. It is similar to the principle of bionics. The simulation objects include human and other animals. The applied technology can involve computer engineering, computer science, signal processing, information technology, physics, biology statistics, mathematics, neurophysiology and other disciplines, the purpose of computer vision research and development is mainly to improve the ability of computers to distinguish things, and use computers to understand the world composition and the world change law [1].

The founder of computer vision is British psychologist and neuroscientist David Marr, who combines neuropsychology, artificial intelligence and psychology to form a new type of visual processing form, and divides the visual system into three different levels, namely, computing level, algorithm level and implementation level, The stages of information processing can also be divided into three stages, namely, image acquisition and low-level processing, image expression and intermediate processing, and image description and high-level processing.

3. Theoretical basis of safety detection technology in the background of computer vision

In the background of computer vision, security detection technology is applied, the core of which is convolutional neural network, which can transfer information through learnable weights and bias neurons to obtain corresponding features.

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3.1. Overall structure

Compared with the ordinary neural network, the convolutional neural network has more neurons, and each neuron has independent bias parameters and weights. After receiving several results of the previous stage, the convolutional neural network can also sum with the accumulated value to activate the function and bias value, and carry out calculation and analysis to obtain the operation results, The response result of the whole neuron can be obtained.

3.2. Local perception

The core idea of local perception is to mine the data essence in the form of local modeling. In general, the widely used local perception methods include two types: (1) local property preservation methods: including Isomap (isometric feature mapping) and LLE (locally linear embedding); (2) Local mapping methods: including local spline and local linear mapping. Such methods generally need to confirm the local relationship based on the nearest neighbor relationship of samples, so as to realize local label transfer.

3.3. Weight sharing

Weight sharing is a kind of feature extraction method. After an image is given, a fixed size filter can be used to scan the image as a whole. The value of the filter is used as the weight, and the value is completely unchanged during scanning. The feature extraction method has no correlation with the image position. As long as the scanner scans the image, That is, the corresponding activation value [2] can be obtained.

3.4. Building data sets

Set keywords or keywords to capture pictures in a timely and accurate manner, which is more conducive to providing guarantee for the quality and efficiency of relevant detection work. At the same time, it is also necessary to improve the collection of pictures, and screen and mark them manually.

4. Requirement and function analysis of safety inspection under the background of computer vision

4.1. Demand analysis

For the contemporary society, one of the important components of the security measures is video monitoring. The main purpose of installing video monitoring is to obtain effective information from the video content. For example, monitoring the wearing of safety helmets of all personnel at the construction site, that is, it is necessary to carry out 24-hour continuous monitoring through the computer, and processes the related information. Therefore, many deficiencies in previous manual management can be effectively improved, and the quality and efficiency of monitoring work can be improved. And from the overall point of view, the manual supervision mode applied by most enterprises in China has been inconsistent with the development needs of the times. Therefore, the traditional static management mode should be changed into a dynamic management mode, that is, computer vision should be used to carry out auxiliary management work to promote the overall improvement of the safety of the construction site. On the whole, the security detection requirements under the background of computer vision are mainly as follows: (1) relevant personnel must use the corresponding account and password to log in to the system. After that, they can view the real-time picture of the construction site through the application of the web browser. The web page can display the historical browsing record, also can play back the monitoring video, and export the report according to their own needs; (2) Relevant personnel can observe the overall state of the system hardware through the web page; (3) The system shall have good denoising ability and can clear the background information of the picture; (4) If the system finds that the personnel do not wear safety helmet, it should automatically send an alarm immediately. Therefore, if the number of cameras is large, a special cluster should be used to control the load balance; (5) It is not only necessary to identify the fixed camera images, but also to use drones to randomly photograph the construction site conditions, and the images are taken by drones [3].

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4.2. Functional analysis

The security detection function under the background of computer vision can include many aspects: (1) login function: various operations can be carried out after the application account and password are logged into the system; (2) Password retrieval: if the user forgets the login password, you can operate according to the prompts on the page to gradually retrieve the login password; (3) Real time play: after logging in and passing the verification, you can enter the main page, where you can perform real-time comparison on the screen, and the screen has been processed and identified; (4) Picture pause: when viewing the picture, you can pause the play as needed; (5) Playback function: any picture can be retrieved and replayed several times as required; (6) Alarm function: when abnormal conditions are identified, such as safety helmet is not worn on the construction site, an alarm can be issued immediately; (7) Recording function: automatically capture and record the images of the personnel who do not wear safety helmet, and save them in the folder in order.

5. Design of real time computing system

In the process of system design, the design basis is B / S structure. Corresponding modules should be built according to the actual needs, and divided into three aspects: image acquisition, real-time computing and web services. According to the corresponding task content of different modules, the design scheme should be further improved.

5.1. Image acquisition module

In the image acquisition module, it is necessary to implement the setting for the micro management system with the help of the multimedia processor, and at the same time carry out the system management of the heartbeat, picture data and alarm.

In the heartbeat unit, the RaspberryPi, as the main platform for directional, regular transmission and summary of information, the effect of information transmission is similar to that of RaspberryPi. The basic operating trend, operating state and detection result data are closely related. For example, the camera can timely obtain the environmental temperature parameters and conduct visual data processing, which can present the temperature parameters on the interface, so that the relevant management personnel can timely obtain the temperature data and carry out corresponding work according to the data content, So as to ensure that the system can continue to operate normally.

In the image acquisition module, the picture data unit belongs to the front-end information data processing part, which needs to be combined with the information acquired by the camera, and implement reasonable coding operation. At the same time, it is properly encrypted according to the actual situation of the working environment, and then the data in the buffer area is summarized with the help of snakemq, so that the image data processing can be carried out in an orderly manner as a whole [4].

The alarm unit needs to carry out information management with the help of safety alarm signals, which can ensure that the staff can get the corresponding notification in time.

5.2. Real time computing module

In the process of practical application of the real-time computing module, because the image collector gradually presents the characteristics of real-time and large amount of computation, the overall computing system is facing higher requirements. At the same time, the number of image acquisition systems is increasing, and the performance of the computer must be optimized at the same time to meet the relevant work requirements. Therefore, you can choose to apply Mesos to the real-time computing module. The framework runs on the basis of Mesos, which contains two components, namely "scheduler provides resources for host registration" and "executor process runs on the basis of proxy node startup". When it is possible to specify the resources that Mesos can provide for each framework, the scheduler corresponding to the framework can select resources. When the framework accepts resources, it can pass the running task description to Mesos, and Mesos can also start the task of the corresponding agent [5].

5.2.1. Image preprocessing

For the computer vision analysis system, it is very important to detect and locate objects. However,

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in fact, it is difficult to identify specific objects from static images because the objects to be inspected can generally show a large degree of appearance changes, such as different colors and shapes of cars, different clothes and postures of people. Applying hog (direction gradient histogram), this technology can count the localized part of the image from the gradient direction. It is similar to the histogram in the edge direction as a whole, with the scale unchanged and the characteristics changed. However, the calculation of hog needs to be based on the dense grid, and the spacing cells of the dense grid are in a uniform distribution state, The overlapping part can also realize the normalization of contrast, and the overall accuracy is high.

Compared with several other types of descriptors, hog descriptors can show several significant advantages: (1) since hog descriptors are only used for local unit operations, any geometric changes and photometric changes can not affect the shape of the object, and such changes can only occur in large spatial areas; (2) After coarse spatial sampling, fine directional sampling and local regularization are implemented for the image, even if there is a certain degree of change, it can be recognized as long as it is still basically upright. Therefore, the hog descriptor is very suitable for image portrait detection. For example, when hog is applied to pedestrian detection, the most appropriate parameter should be 4 8 ×8 pixel units, i.e. 16 pixels per block×16 pixels.

The specific training can be divided into two parts: (1) taking the image of the human object in the middle as the positive sample, and taking the image of the non-human object as the negative sample to obtain the basic classifier; (2) For the new positive and negative samples, the trained basic classifier is used for intensive scanning. If the image data is identified incorrectly, it is included in the difficult samples, and the SVM classifier is used for training again to obtain the final classifier [6].

Try to apply hog to the safety helmet wearing detection at the construction site. Only the upper half of the personnel needs to be detected, so only the upper half of the human image needs to be selected for snapping.

5.2.2. Build data set

Still taking the safety helmet wearing detection work at the construction site as an example, the data set is constructed in the form of self built data set. The source of the data set mainly includes two parts: (1) self shooting; (2) Input keywords in the network and obtain corresponding pictures. After the pictures are confirmed, they are manually screened and marked, and finally normalized. Because the background in the picture is complex, the helmet can show different angles, heights, lighting postures and sizes. The data set is divided into two parts, namely, training set and test. The former contains 9000 samples, 4500 are positive samples, the other 4500 are negative samples, and the number of test samples is 1000.

5.3. Web services module

From the perspective of the system as a whole, when the service processing is carried out for the back-end system with the help of the programming language, it is not only necessary to ensure that the relevant operations are completely matched with the standard code program, but also to ensure that the code itself has good scalability. The data interaction between the computer browser and the server is carried out by applying SSE to ensure the implementation of the detection function. At the same time, after applying SQLite to the database, it should be matched with the basic table in the system in a timely manner. There are two basic tables, one is the user table, which mainly includes the basic information of the user, and the other is the record of the detection result, The contents generally include the basic situation of the detection work and whether to handle the warning. The follow-up work should take the record table as a reference [7].

6. Conclusion

It can be understood from the above that the current safety detection technology based on computer vision has occupied an important position in the detection work. It can not only effectively make up for the shortcomings in the previous related technologies, but also effectively improve the overall quality and efficiency of the safety monitoring work, thus fully highlighting the advantages of computer vision, It is not only conducive to improving the safety of relevant production work, but also can promote the application value of computer vision.

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