Application Analysis of Face Recognition Technology in Video Investigation

Bo Qiu
Sichuan Judicial and Police Officers Professional College, Deyang, Sichuan 618000

Abstract: This article analyzes the basic application process of face recognition technology. The content of this article includes face information collection, face information detection, face information recognition, synchronization warning function, etc. The author optimized the basic conditions by studying and optimizing the system operation algorithm, and at the same time strengthened professional training and information security management. In normal times, we apply face recognition technology in the detection and solving of suspects in the identification of suspects, and in the detection of crowded scenes and multiple scenes. In addition, face recognition technology will also be applied to road safety precautions and residential area safety precautions. The purpose of this article is to improve the application effect of face recognition technology in work, and to provide more convenient conditions for the smooth development of investigation work.

1. Introduction
When monitoring, retrieving, and finding the relevant information of the target person in traditional manual methods, it will be affected by factors such as human attention, observation, knowledge, and subjective judgment. Therefore, it is prone to negligence and omission. Face recognition technology mainly integrates computer image processing technology and biostatistics principles. It uses computer image processing technology to extract facial features from the video, and then uses the principles of biostatistics to establish a mathematical model. From the actual combat, compared with other biometric technologies, face recognition technology is the winner in terms of reliability, accuracy or other data. The face recognition technology is based on the original video resources and is structured according to the optimized deep learning algorithm, which can perform intelligent storage, comparison and retrieval of faces. In this way, face recognition technology can collect, capture and process relevant face information intelligently, efficiently and quickly. In this way, the purpose of real-time identification and effective combat of suspects can be achieved.

2. The Basic Application Process of Face Recognition Technology

![Figure 1 Figure of Face Recognition Technology Application](image-url)
As shown in Figure 1, in the application process of face recognition technology, the application process should pay attention to the following points.

2.1. Face Information Collection
The primary task of face recognition technology in application is to do a good job of collecting face information and establishing a database for face information recognition. This is also a prerequisite for subsequent big data analysis. At present, the main ways to collect face information are as follows.

Firstly, we can use the camera. Such as the use of notebooks, computers, monitoring equipment and other methods to complete the collection of data information. However, relevant technical personnel also need to screen the information, match the corresponding personnel information, and reduce the error tolerance rate of the identification process, so as to improve the stability of the system operation.

Secondly, we are able to use crawler technology to obtain picture information from the Internet. Subsequently, the face vector features of these pictures are obtained in the feature area, and the corresponding person information is matched to reduce the error tolerance rate of the recognition process. Finally, the matching data is stored in the computer database to improve the reliability of the information recognition results.

2.2. Face Information Detection
There are many algorithm models for face detection, and the most used are MTCNN, Opencv, and Dlib. Besides, because the detection accuracy of MTCNN is relatively good, the face detection module can be completed by using the MTCNN model. MTCNN mainly performs face key point detection and face region detection at the same time, and its overall network structure can be divided into P-Net, R-Net, and O-Net three-layer face detection to achieve the detection process [1]. The specific application points of MTCNN are as follows. First, use reliable technology to build image pyramids. Meanwhile, adjusting the same picture to different sizes will also facilitate the detection of faces of different sizes. Second, the P-Net layer. The main function of this hierarchical network structure is that it can quickly complete the selection of candidate windows in a short time and detect samples at the same time. The basic condition for the realization of the entire system is a fully connected network, which will screen the pyramid image information to determine whether the image is a face, and obtain a detection box for detection. Third, the R-Net layer. The purpose of this layer of network is to select high-precision candidate windows, and we also need to make further information screening on the output face candidate frame. In addition, a set of 128 fully connected layers will be added in practical applications, and the system will be constructed with the help of complex networks. Moreover, in this process, relevant technical personnel will also filter some candidate frame information to improve the accuracy of face detection results. Fourth, the O-Net layer. The main function of this layer is to complete the discrimination of bounding box information. Furthermore, the layer structure also adds a convolutional layer and a set of 256 fully connected layers, with the help of a complex network to complete the system structure. In the end, a total of 5 feature points in the upper left corner, lower right corner, eyes, and nose of the face were selected. The specific flow chart is shown in Figure. As an important reference for face recognition, the accuracy and of face recognition results are improved[2].

2.3. Face Recognition
In order to improve the accuracy of face recognition results, we can use the FaceNet model to assist the entire recognition process. The model mainly uses CNN to map face information to European feature vectors. In addition, we also need to do a good job in calculating the distance of the face in Euclidean space. Because there are some differences between each individual, there are some differences in their individual spatial distance. Therefore, relevant technical personnel can use these data information to complete the network training work, thereby improving the complexity of the system application itself and the completeness and reliability of the system [3].
2.4. Synchronous Warning Function
After obtaining some face data information, it can be identified with the help of the completed face recognition system to determine whether it is a suspect under investigation. After judging that the appearance meets the characteristic requirements, the face recognition technology will give a timely warning. In the meantime, police will be organized to implement the arrest of suspects, in order to improve the efficiency of case detection [4].

3. Specific Application of Face Recognition Technology

3.1. Suspect Identification
The identification of suspects is a very technical part of the investigation. Moreover, the addition of this technology also improves the efficiency of identity information recognition and the work efficiency of the corresponding work. For example, in 2018, the police received a report from Mr. Li that he was robbed of more than 10,000 yuan in cash and a mobile phone by a suspect. The video investigators quickly retrieved the surveillance information at the time, coupled with Mr. Li's identification, quickly determined the suspect's basic facial features. The police subsequently conducted video tracking of the suspect. During the period, the police used ICP and PCA registration to make a clearer identification of the suspect's appearance and locked the suspect's accurate information. In the end, the police successfully captured the suspect in a hotel on the same day and helped Mr. Li recover his economic losses [5].

3.2. Application in Detect Cases
Compared with traditional investigative methods, face recognition has a stronger application function in investigating and solving cases. For example, in 2019, the police relied on facial recognition technology to complete the arrest of the fugitive in a criminal case. The local Public Security Bureau will establish a corresponding large database for these criminal suspects. The contents of the database include gender, appearance, age, fingerprints, etc. At the same time, with the help of the monitoring system and big data processing technology, the image of the suspect is obtained. Although the distance is far, and the frontal image captured is in a state of laughter. However, it is still possible to lock the suspects and bring them to justice by using the overlapping inspection of the tip of the nose in the technology [6].

3.3. Crowded Scene
After touching the legal red line, ordinary suspects will flee to crowded areas for shelter, which also brings greater trouble to human investigations. The application of face recognition technology can accurately locate suspects in a dense crowd, speeding up the arrest of suspects. For example, in 2017, Li escaped after drunk driving and injured someone. Li planned to take a long-distance bus to flee to relatives in other provinces for shelter. When entering the passenger station, the face was captured by the probe. The police confirmed the identity of the suspect after verifying the information. Furthermore, without disturbing the suspect, the police appointed plainclothes police officers to board the car with him, and subdued him after finding a suitable opportunity[7].

3.4. Multi-scene Investigation
At present, the perfection of face recognition technology is constantly being improved. For example, a public security bureau in Shenzhen introduced a dynamic face recognition system in 2017. This can combine the different needs of business personnel to help them complete personnel search, data mining, face control and other content. This also improves the application effect in investigative work. Moreover, the system also has strong application attributes in the application, which can make full use of multiple contents to improve the application effect of the system [8].
3.5. Road Safety Precautions
In the context of the increasing number of road vehicles, the dangers of the road driving environment are also increasing. The application of face recognition technology can quickly locate suspects with the help of snapshots, thereby speeding up the arrest of suspects. For example, in 2017, Zhang abandoned his car and fled after a rear-end collision on the road. The system preliminarily judged that it was drunk driving. The police then used video technology to identify the information and confirm the identity of the suspect. Without disturbing the suspect, the suspect was arrested at the train station, which increased the success rate of arrest [9].

3.6. Residential Area Security
Except to the above content, face recognition technology also has very good applications in the security of residential areas. In the specific application process of face recognition technology, we can install personnel recognition equipment at the gate of the community to accurately identify personnel information. In addition, the neighborhood committee also needs to actively back up the information of new residents and update the system content in time. This also effectively prevents some strangers from entering the community and improves the security of community management [10].

4. Precautions During the Application of Face Recognition Technology

4.1. Optimize System Operation Algorithm
Optimizing the system operation algorithm can effectively improve the application effect of face recognition technology and improve work efficiency. For example, hierarchical feature recognition is currently being promoted in many regions. This algorithm is based on the application of face recognition technology, which transitions HMM to 3D model reconstruction. In-depth development of technology has improved the accuracy of face registration results simultaneously. What we need to pay attention to is that in the process of establishing the 3D model, relevant technical personnel need to obtain the content of the texture image. In addition, it is necessary to refine some feature points and feature locations to give full play to the application value of ICA, PCA, HMM and other models, and improve the reliability of system operation.

4.2. Optimize Basic Conditions
Doing a good job in the optimization of basic conditions can lay a solid foundation for the better application of face recognition technology, thereby accelerating the development speed of the system application system. No matter what type of science and technology, it needs the full support of hardware and software during the application period. Therefore, we should combine the application advantages of science and technology and choose some hardware devices with large capacity and good performance. At the same time, with the help of clearer images to complete the face recognition work. The software system also needs to update the processing software in time according to the actual development situation in the application process. Moreover, we also need to do a good job in the operation and maintenance of the software system, and update the firewall from time to time to improve the reliability and stability of the system.

4.3. Strengthen Professional Training
By strengthening the training of professionals, the advantages of face recognition technology can be better utilized, thereby improving the application effect of the technology itself. Its specific application includes the following steps. First, the unit needs to organize staff to complete the study of knowledge and content related to face recognition technology. Especially for the basic knowledge and theories, innovative content must be optimized. Thereby improving the technical staff's own comprehensive ability level and reducing the probability of human error. Second, do a good job of learning the corresponding assistive technology DNA detection technology and speech recognition technology. Do a good job of technical training for such personnel, so as to assist face recognition technology to
further improve accuracy.

4.4. Strengthen Information Security Management
By strengthening information security management, users' personal privacy can be protected, thereby promoting the stable development of systems. The primary task of information security management is to do a good job of information encryption, and classify user information into ordinary, medium, confidential, etc. In the meantime, we will do a good job of encrypting different levels of information on this basis. In this way, the security level of information can be improved and the risk of information leakage can be reduced.

5. Conclusion
In summary, optimizing the system operation algorithm can effectively improve the application effect of face recognition technology. Optimizing the basic conditions can lay a solid foundation for the better application of face recognition technology. Strengthening the training of professionals can better bring out the advantages of face recognition technology. Strengthening information security management can protect users' personal privacy. The application of face recognition technology to investigation work has a positive effect on speeding up the detection of cases.

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