Research on Face Recognition Based on Deep Learning

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Abstract: Computer vision is an important field in the study of computer graphics, and face recognition technology is a hot topic in computer vision research. The face recognition system belongs to the category of biometric identification, and has been widely used in various fields, such as intelligent security, financial field, and smart travel. With the application of deep learning methods in the field of image recognition, the accuracy of face recognition is getting higher and higher, especially the application of convolutional neural network technology, which solves the core problem of face recognition algorithm. The deep neural network is trained to extract facial features and classify them, and finally the exact matching between face and individual information is realized. This paper mainly analyzes the face recognition research method based on deep learning, and proposes the design scheme of the attendance system based on face recognition.

1. Deep Learning

The main function of deep learning is to learn some internal laws from the massive data. It mainly completes the learning by adjusting the algorithm parameters, and makes accurate predictions on the problems reflected by the data while performing data analysis. In essence, it acquires higher-order data features by training a large amount of data, and constructs a neural network model with multiple hidden layers to improve the accuracy of data prediction. Deep learning is a branch of machine learning. It tries to learn high-level abstract features in data through hierarchical architecture. Deep learning is not only effective, but also in a fast-developing stage. With more and more network data, computer computing The ability is also getting stronger and stronger, coupled with the continuous reform of deep learning algorithm theory, deep learning technology has been widely used in many fields, including object detection, speech processing, face recognition and so on [1].

2. The Basic Process and Key Technologies of Face Recognition

At present, the development of face recognition technology is very mature, and its application in various industries is more and more extensive. Although the algorithms of different systems are different, the basic processes of the system are not only face detection, face feature extraction, recognition classification, etc. Specifically, the basic process of the face recognition technology includes the following aspects: (1) Face acquisition: The video or image containing the face is mainly collected by the camera to complete the collection of the original data. (2) Face detection: The main basis of face image detection includes feature information such as histogram, facial color and facial structure [2]. The main function of this link is to detect the video of the input system and the face information in the image, and the whole image will be The position and size of the face are accurately identified. (3) Face image preprocessing: After the face detection is completed, the face image needs to be preprocessed to provide a more accurate image for the following face feature extraction. Image preprocessing includes gray scale correction and image noise filtering. (4) Face feature extraction: Face feature extraction is based on the knowledge representation method to extract some features of the face. This method is mainly based on the shape description of various organs of the face, the distance characteristics of the organs, etc. Characteristic data information. (5) Feature matching: The main function of face feature matching is to compare the face image feature data with the face feature template in the original face database. A comparison can be set in the

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comparison process. Value, if the similarity between the face image feature data and the face feature template is greater than the set threshold, the matching result may be input, and vice versa [3].

Although the advantages of face recognition technology are very prominent compared to other biometrics, the characteristics of the face determine that it is also difficult to develop. Because there is a certain similarity between faces, it is difficult to distinguish; and even for the same person, the facial image will have a large difference in different states. This variability also increases the difficulty of face recognition. In addition, in the actual scene, the lighting conditions, shooting angle and other factors will have a direct impact on the face image, and ultimately reduce its recognition accuracy; and the sensing environment is uncontrollable, the body posture of the character when taking pictures, Light conditions, occlusion levels, etc. also change, which leads to greater difficulty in face recognition. It can be seen that the following problems should be considered in the actual face recognition system: first, the lighting conditions. It can be said that the light condition is the most important external factor affecting face recognition. Different light conditions may cause the gray value of the face image of the same person to be greatly different, which ultimately affects the face recognition effect. Second, the attitude problem. Image acquisition requires regular face images, but even the same person, the body posture presented at different times will change greatly. For example, if the face is perpendicular to the camera, rotating the head will cause the face. The information is lost in a large area, making it impossible to complete the identification. Again, occlusion problems. If there is foreign object occlusion when collecting facial images, it will affect the integrity of image collection. For example, wearing glasses and hats will directly affect the extraction and recognition of subsequent facial features. Finally, the expression problem. People's facial expressions change at any time, and facial features such as eyes, nose, and mouth change, which increases the difficulty of face recognition [4].

3. The Face Recognition Based Attendance System Design Based on Deep Learning

The face recognition attendance system proposed by this research is mainly for the analysis of college attendance business process. According to the current situation of college attendance, a face recognition attendance system based on deep learning is proposed. The whole system includes two modules, one is the front end image. The analysis processing module comprises face collection, face detection, face image preprocessing, face feature extraction, face matching recognition, etc.; one is a backend system management module, and the system functions include teacher, student information entry, attendance information Query, personnel information management, attendance statistics analysis, etc. The system workflow mainly collects the face image through the front-end face camera, and detects and pre-processes the face image. After the face image processing is completed, it is sent to the back-end recognition module for comparison, and the final output comparison result is obtained [5]. .

The face analysis module mainly includes two parts: a front-end intelligent face cloud camera and a face analysis intelligent server. Among them, the intelligent face-top camera can realize periodic cruise to the classroom, which can collect indoor panorama. The pan-tilt camera can cover all aspects of the classroom, and can recognize and capture the face image of all the people in the room. The front-end face capture camera uses a deep learning algorithm, which has a built-in UPU chip. The same face can capture multiple images, score these images through a deep learning algorithm, and then return the highest score to the face analysis server. Compare to get higher recognition accuracy. After obtaining the face image, face detection is required, and an ID is generated for a face that meets the feature value requirement for consecutive multiple frames; then the face is tracked and filtered, and the face is periodically captured according to the capture interval, and each capture is required. Face scores are compared, and the scores of the two-frame face images are compared. The images with high scores are retained, and the images with low scores are eliminated.

Facial modeling is performed after face tracking and screening. Face recognition belongs to the supervised learning method in machine learning. It trains the deep learning network model by establishing three elements of model, strategy and algorithm statistical machine learning. Obtain a

network model that extracts facial features. The convolutional neural network takes the local processing and parameter sharing as the core of the technology. Using the convolution kernel to perform local unified processing on the input data, the same convolution kernel can be shared, and finally the parameter sharing is realized, which greatly reduces the number of weight parameters; image data It has local characteristics, so it is not necessary to analyze the data in a pixel-by-pixel manner when processing data, but directly extract the local features of the image; in addition, the multi-level local perception field gradually expands the image abstraction level, which can be more Good extraction of image features. The main function of this link is to extract the feature points of the captured face image, and then form the face model by the key features in the face, such as the eyebrows, eyes, nose, mouth, and chin. To ensure the accuracy of the face model, Minimize the modification or occlusion of the contour of the face. [6]

After the face model is constructed, the face matching module is used to compare and match the face model modeled by the real-time capture model with the face model already modeled in the database. The system sets a similarity threshold for the matching degree. If the matching result is higher than the threshold, the system will consider that the matching is successful, and the output comparison result will compare the results on the traditional information integration platform [7].

The back-end system management module includes a docking personnel signal library, a display attendance result, and a statistical analysis of the attendance situation. The system can interface with the curriculum in the school educational system and the personnel information module containing the face information. The teacher analyzes the student attendance of each class according to the curriculum information; the attendance system module identifies, analyzes and processes the face information[8] . The attendance result is displayed on the attendance interface, and the system can implement manual check-in. After each lesson, the attendance result can be viewed through the attendance result display interface, and the face recognition can be manually supplemented if the face recognition is unsuccessful. In addition, the attendance system can also query and export information according to any teacher, teaching subject, class, time period and other dimensions, so that teachers and students can search at any time. In the actual application process of the system, each time the class starts, because the system and the educational system curriculum are combined, the face database corresponding to the current course can be automatically generated. After the face analysis server receives the corresponding face data, the system starts the classroom. The intelligent face-top camera in the classroom periodically cruises the entire classroom to obtain the indoor face image. After the class ends, the system will send a stop cruise to the intelligent face-top camera in the classroom according to the set time. The corresponding face analysis server will also stop face recognition; teachers and students can query the attendance results according to the query conditions through the computer end, the smart phone mobile terminal, etc. according to their own needs [9].

4. Conclusion

The influence of artificial intelligence on people's life is more and more obvious. Face recognition is an important part of artificial intelligence technology, and its application in various fields is more and more extensive. This study proposes a face recognition time and attendance system based on deep learning. The face recognition technology is used to scan and identify faces and teachers in the classroom. The teacher compares the system identification results with the curriculum and related personnel information. The student's attendance situation is checked in time, and the system can automatically record the student's attendance, which is convenient for the teacher to conduct phased assessment and management. The system is simple in operation and intuitive in results, and can truly realize non-inductive attendance management, which greatly improves the efficiency of classroom attendance management. Of course, there are still some areas in the system that need to be improved. For example, more face data can be used to train the face model to further improve its accuracy. In the follow-up study, we should further explore this direction.

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