Research on 3D Face Recognition Technology

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Abstract: In modern society, information technology is constantly developing, and user security issues have become one of the most concerned issues. Traditional password authentication cannot meet the needs of modern people, and face recognition technology is extremely effective. The way to authenticate users is strongly supported by various industries. The 3D face recognition technology is a typical biometric recognition technology, which utilizes the unique characteristics of the user's bio-metrics to protect the user's information security. This technology has the advantages of complete non-contact information and strong independence, which greatly reduces the traditional recognition technology due to restrictive factors such as expression, age and environment. This article is related to 3D face recognition technology. An overview and key technologies are presented in their entirety.

1. Overview of 3D face recognition technology

1.1 Introduction to 3D face recognition

At present, China's 3D face technology is mainly a typical biometric recognition technology. The technology mainly scans the information about the generalized appearance of a given photo or image, and scans whether the face of a human face appears in the environment. At the same time as the face positioning, the data analysis of the face scale and color is standardized, and then the information data is entered into the system database to prepare for the proofreading of the information. For the traditional authentication method combining username and password, this technology can be applied to informational office and distance education, but the user information in this traditional identification method is easily forged or stolen by illegal elements. In turn, personal information or corporate information is leaked, and there is insecurity. For the new type of biological 3D face recognition technology, it mainly collects the basic features of the person's face. Because the collected information has uniqueness and uniqueness, it can meet the needs of user identity verification. Compared with traditional identification technology, modern identification technology has become more mature and safe with the continuous development of technology, and can meet the contemporary social needs of China.

1.2 The difference between 3D face recognition and 2D face recognition

China's face recognition technology mainly originated from the beginning of the last century. After decades of continuous exploration and discovery by researchers, with the gradual progress of society, 2D face recognition technology has gradually turned into 3D face recognition technology. The three-dimensional face recognition technology has greatly improved the shortcomings in the two-dimensional face recognition technology. For the traditional two-dimensional face recognition, its main defects are: two-dimensional face recognition effect The illumination angle and illumination intensity are very sensitive. When it is affected by the illumination angle and illumination intensity, it will change greatly. Different illumination angles and illumination intensity will give different visual effects of 2D images. Therefore, the posture of the face will be greatly different under this influence, leading to the discriminating error. The change of facial features can also lead to the occurrence of discriminant errors. The traditional two-dimensional face recognition technology is based on the recognition on the plane. When the facial expression changes, it will inevitably lead to the occurrence of discriminating errors[1].

In view of the above defects of two-dimensional face recognition, three-dimensional face recognition can greatly reduce the probability of occurrence of these errors, and the face recognition technology is effectively improved. For example, under different lighting conditions, 3D face recognition technology can use grayscale correction to match the face pose problem, and generate 2D face recognition images under multiple angles, which reduces the modeling process. The influence of face information input and recognition caused by posture changes. For the problem of facial facial expression, 3D face recognition technology can extract facial expression features by frequency statistics, and greatly improve the defect of 2D face recognition. Although the implementation method and effect of 3D face recognition technology have greatly improved the problems in 2D face recognition, there are many algorithms in 3D face recognition system, the scale is large, and the amount of database required is relatively large. The current 3D face recognition system is also faced with many restrictions, and the new 3D face recognition technology also has certain constraints. Due to the continuous progress of the times, the three-dimensional face recognition technology and the two-dimensional recognition technology have different restrictive factors, which requires the relevant staff to continuously improve the recognition technology for the modern market demand.
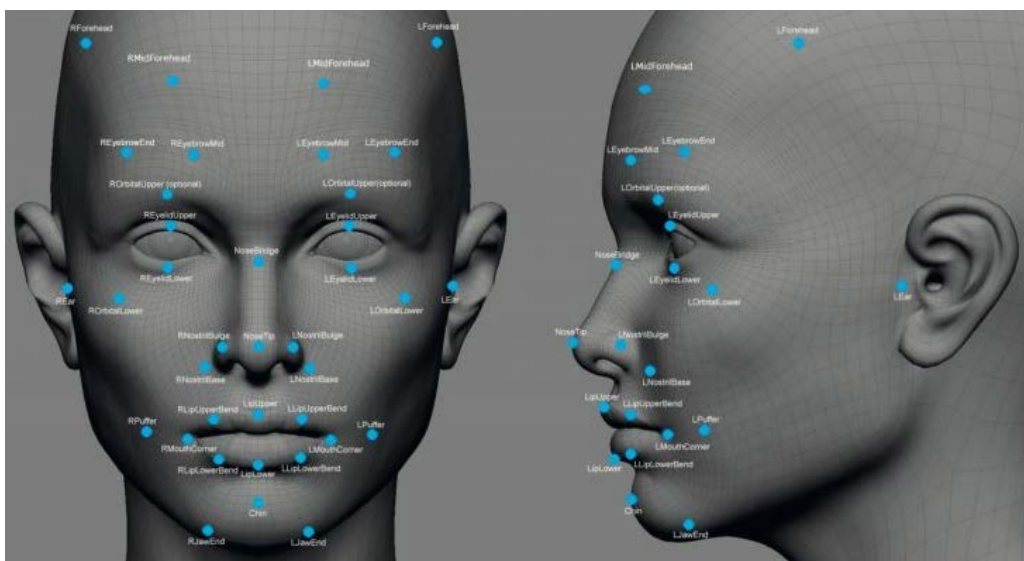

Fig. 1 China's 3D face technology

In addition, modern 3D face recognition technology is a continuation of traditional recognition technology, their purpose is to protect personal or corporate information security, and modern 3D face recognition technology in national security, finance and law enforcement There are huge market demands in various fields such as the judiciary, but at present, China's 3D face recognition technology is not yet mature. There are still many restrictive factors in this information collection and collation, such as the current 3D face image in China. It is not sensitive to lighting conditions, which leads to the appearance of recognition errors due to the expression and age of the image. In order to reduce the occurrence of these mistakes, various technicians should continue to carry out this kind of technical improvement work. For the current colleges and universities, we should also pay attention to the database dimension reduction method learning and research, so as to improve the database information storage volume, and truly apply what we have learned[2].

1.3 Conceptual analysis of 3D face recognition technology

3D face recognition technology is different from other types of bio-related technologies, and 3D face recognition technology is not mature enough for me and even the world. In China, the understanding of 3D face recognition technology by technicians only stays in the sci-fi plots in movies and TV series. Through archaeologists' investigation of the historical development of ancient China, in fact, the notice of rewards in the gates and streets of ancient Chinese government was carried out through face recognition. It can be said that this technology has developed in the early days of China. The prototype. Of course, the three face recognition technologies involved in this article are very different from the traditional face recognition technology. Modern 3D face recognition technology is embodied by high-tech technology, which is an organic fusion of physiology and computer technology. And in the actual development there is a relatively high compatibility. In the actual operation, this technology firstly uses the relevant technology in the computer field to capture the video of the face and capture the dynamic design presented in the video, then generate the basic features of the face, and make the face features and database into the final person. Face identity authentication [3].

2. The key technology of 3D face recognition

2.1 Method based on direct matching of geometric features

On the whole, 3D face recognition technology is a spatial three-dimensional structure. Whether it is collecting information or performing identity verification, this technology is developed on a 3D solid plane. For direct matching based on geometric features. In this way, the method recognizes the recognized face as a single surface, and then matches various data points on the surface. Finally, various methods of face recognition are used to match the data on the surface with the actual data. This method does not require the generation of specific face images for authentication, reducing the pressure on computer calculations.
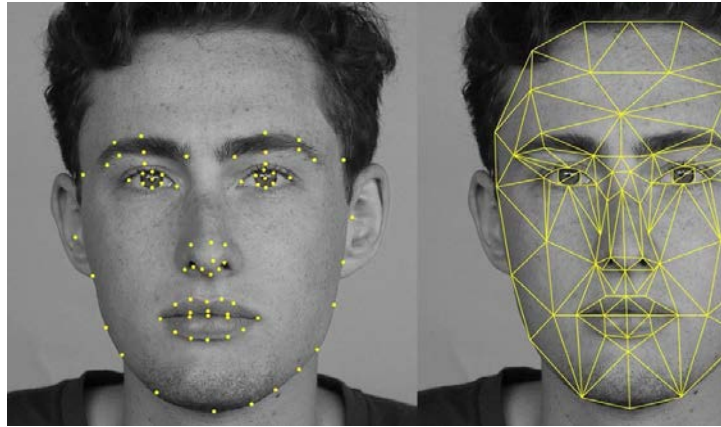
Fig. 2 3D face recognition technology

2.2 Local feature based approach

The three-dimensional face recognition technology mainly recognizes and analyzes the features of the face. This technique has only a certain locality, and sometimes the phenomenon of recognition error occurs. The method based on local features mainly represents the original face through a limited local area of the face, and makes the face appear when information is entered. The amount of data of the feature will be reduced to some extent, and the recognition effect is also good. In order to ensure that the region selected in the local feature method is the most representative, the face local region selection scheme should be analyzed in detail, and the selected schemes should be modified and updated continuously, and the facial features can be expressed and processed. Finally, the purpose of protecting personal information is achieved.

2.3 Muti-data and muti-technology fusion method

In recent years, although China has increasingly increased its emphasis on 3D face recognition technology, in some areas where population is densely populated, security risks still exist. Due to the large population base in China, this indirectly leads to the depth of the hidden potential of criminals. Therefore, the development and implementation of 3D face recognition technology is imminent. Although the 3D face recognition technology reduces the security risks in the market to some extent by collecting and matching the facial feature information of a certain person, each type of data also has With the continuous development of face recognition technology, its limitations are more and more reflected in people's daily life. For example, the database of face recognition system is relatively large, and there are certain differences in recognition accuracy. Moreover, the shape of the face has a high variation factor, which leads to the occurrence of recognition errors. These restriction factors will lead to information leakage of individuals or enterprises. Therefore, in the update and modification of the 3D face recognition coefficient, it should A combination of various means and techniques for these situations can greatly improve the effect of face recognition.

3. Several methods of face recognition

3.1 3D face recognition technology based on complex domain and mufti-data fusion

Mufti-data fusion 3D face recognition technology based on complex domain mainly has three aspects: data-level fusion, feature-level fusion and decision-level fusion. It mainly uses computer to

comprehensively analyze several observations obtained by time series to match the facial features. After that, the person's facial related information is transmitted to the system database to prepare for the decision making and evaluation tasks. In addition, this method of merging data can maximize the amount of useful information and improve the recognition rate of the system. Since any person's face is a specific description of an objective data object, it contains a lot of valuable information in a person's face information, and the mufti-data fusion technology of the complex domain is generally in a mufti-angle manner. Face information processing enriches the face information sample in the database and improves the accuracy of recognition. In addition, the 3D face recognition of this technology largely compensates for the many constraints in the traditional recognition method. Factors have improved the efficiency of face recognition and meet the needs of today's society.

3.2 3D face depth map recognition based on different poses

Regardless of the traditional face recognition technology or the modern three-dimensional face recognition, the face recognition problem has always been the focus of face recognition research. Because when a person's facial expression changes, the recognition area of the entire face will change considerably, and the image of the face will change due to the change of visual perception. In this case, it will make The imaging effect of the entire face area changes within the system, and the face information entered in the 3D face recognition system is static, and only the facial features of the face at a certain moment are recorded, which makes the system perform the person. When the face information is matched, it is difficult to capture the most accurate face information and increase the difficulty of face recognition. In response to this phenomenon, the relevant technician can perform depth recognition on the face from the perspective of setting different postures. In the process of collecting face information, this technology can recognize and record the features of the human face at multiple angles, greatly reducing the probability of recognition errors due to changes in facial conditions.

3.3 3D face recognition based on surface contour features

Generally speaking, the data of surface face recognition is relatively scattered, and its collection points are also different. Therefore, when performing 3D face recognition, the recognition process is subject to many conditions, so some face recognition is not It can be directly identified by the characteristics of the curvature. In addition, due to the noise generated by the machine during the imaging process, this noise will affect the collection of 3D face recognition information by affecting the specific value of the curvature. Therefore, the 3D face of the surface contour feature is performed. When identifying, it must be combined with other methods to ensure the accuracy of the data.

4. Conclusion

All in all, compared with the traditional face recognition technology, the modern three-dimensional face recognition technology is higher in level and more in line with the development needs of modern society, but there are still many restrictive factors in the practical application of this technology. Therefore, relevant researchers should summarize and analyze the errors in the technology according to the actual needs of the technology, and continuously carry out the reform of 3D face recognition technology, in order to cope with China's technology in various fields and situations. Practical application needs.

Acknowledgment

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