Application Research of Image Processing on Face Recognition Technology

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Abstract: Today, with the rapid development of information technology, face recognition algorithm is an important information recognition method. It has the advantages of simple technology, convenience, accurate identification and easy operation. The user acceptance is higher, so it has many fields and professions. A very wide range of applications. However, the facial features of the human body have obvious special characteristics. In the process of face recognition algorithm implementation, image processing will have a direct effect on the accuracy of recognition. Therefore, image processing has become an important foundation in face recognition technology. The article mainly discusses the application of image processing in face recognition technology.

1. Introduction

The wide application of intelligent products has greatly improved the efficiency and effectiveness of people's life, study and work. Bank cards, mobile payment systems, intelligent access control systems, etc. are all in various fields related to people's lives. Traditional human-computer interaction methods such as mouse and keyboard, password lock, smart card, etc. can no longer meet people's increasingly high requirements for high-tech products. It is in this context that biometric technology is more secure and convenient. The advantages have been rapidly developed and gradually become one of the most promising technologies in the field of pattern recognition. Face recognition is based on human facial organ formation and recognition technology. The working process is as follows: First, the training image is preprocessed. The purpose of preprocessing is to eliminate or reduce the influence of objective factors on face recognition accuracy, illumination, size, Angles, expressions, etc. may affect the face recognition process, so it is necessary to reduce such effects through image preprocessing; then extract face image features through face detection and positioning, obtain face image feature data and then deposit In a specific database, the face image is preprocessed, detected, located, and extracted after face recognition, and the face image feature data is obtained and then compared with the data stored in the database, and finally the recognition result is obtained. . Compared with other biometric technologies such as DNA detection, iris recognition, fingerprint recognition, palmprint recognition, etc., face recognition adopts automatic recognition method, which greatly reduces manual participation; and it does not need to contact the tested person when collecting face images, which improves the The acceptability of the object is measured; in addition, the face recognition technology can be completed by using simple input devices such as a camera, a camera, a surgery, etc., and the data collection cost is lower and faster, so the application prospect of the face recognition technology is very broad.

2. The key technology of image processing in face recognition system

The main function of face image preprocessing is to improve the image quality. In the process of image acquisition, noise, illumination and other factors will affect the image quality. Preprocessing the image can enhance the image, which is more conducive to the extraction of subsequent effective information; image preprocessing The image size and angle are also preprocessed. Image preprocessing requirements not only meet system identification requirements, but also be as simple as possible to ensure real-time recognition of the system. Specifically, the processing of the face image in the face recognition system is as follows:

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The collected original face images include two types of color images and grayscale images, and the grayscale processing of the images converts the color images into grayscale images. Because the color information of a color image may be disturbed by its complex background, the accuracy of recognition is reduced. Grayscale images are easier to process, so color images are grayed out. Grayscale images have only one sample color per pixel, generally from the darkest black (0,0,0) to the brightest white (255,255,255), so the RGB component of a pixel varies from 0-255. Image graying processing before face detection greatly simplifies the calculation of subsequent images, but in the whole process, the local and overall brightness and chromaticity level features and distribution of the entire image can be grayed out. The image is reflected. In the specific application process, the corresponding relationship between the RGB components between the color image and the gray image can be analyzed by the following formula to convert the color image into a gray image:

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix}_{Gmy} = \begin{bmatrix} 0.299 & 0.587 & 0.114 \\ 0.299 & 0.587 & 0.114 \\ 0.299 & 0.587 & 0.114 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}_{Color}$$

Whether it is a directly acquired grayscale image or a grayscale image converted from a color image, noise is inevitable, and noise may seriously affect the quality of the image. Therefore, it is better to use the median filtering technique to remove the isolated noise. Maintain the edge characteristics of the image. The median filtering is to scan a window with an odd point on the image, and then sort the pixels scanned by the gray level, and replace the gray value with the intermediate gray value, as follows.

$$g(m,n)=\text{Median}\{f(m-k,n-1),(k,1)\in W\}$$

Commonly used filter sampling windows include square windows, cross windows, center weighted windows, diamond windows, etc., as follows:

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix} \quad \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix} \quad \begin{bmatrix} 1 & 1 & 1 \\ 1 & 5 & 1 \\ 1 & 1 & 1 \end{bmatrix} \quad \begin{bmatrix} 0 & 1 & 0 \\ 1 & 3 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

Square window cross window center weighted window diamond window

Under certain conditions, the median filter can be used to process the linear filter to deal with the problem of image detail blur, and the median filter can filter the pulse interference and image scanning noise, which greatly improves the image quality. However, it should be noted that the application of median filtering for images with more details such as points, lines, and cusps may cause image information loss.

The main function of grayscale normalization is to compensate the image for illumination. Generally, face detection or face recognition algorithms assume that the illumination is in an ideal condition when acquiring a face image. In actual situations, it is difficult to achieve ideal illumination conditions. Therefore, it is necessary to perform illumination compensation processing on the image to improve face detection. Correct rate. Since there is no theoretical function for maintaining the invariance of illumination, it is necessary to select a specific compensation method according to different illumination conditions. However, the theoretical method is difficult to achieve actual illumination compensation. Therefore, the same compensation method is adopted in the automatic identification system. Yes, where the histogram equalization is a typical method that is commonly used. Histogram is an important image statistical feature, which describes the image grayscale distribution profile, including grayscale range, grayscale distribution and other parameters. Histogram equalization processing is essentially an image enhancement technology, the main purpose A uniform histogram is obtained, and the gray scale distribution of the image can be adjusted by modifying the histogram. It can be seen that the histogram equalization is to convert an

image with uneven histogram distribution into an image with a balanced histogram by gradation transformation, so that the image has substantially the same number of pixels at each gray level. If the image shooting conditions are poor, the image gray level will be concentrated in the area where the gray value is small. Otherwise, the image shooting light condition is better, the histogram will be distributed in the area with larger gray value, so the histogram of the image is performed. Equalization can improve the uniformity of image distribution in each gray level to eliminate the effects of light conditions, enhance image contrast, and enhance image detail.

Face organ localization is an important part of image processing. The features of human face make it different from other samples, and the eye is the most important feature in facial surface organs. Therefore, it needs to be positioned by human eyes in face recognition image processing. The entire face area is further determined, and the face area is geometrically normalized to obtain a standard face image. In the actual image processing process, skin color is a relatively reliable and stable feature, which is not only different from most background colors, but also robust to changes in expression, rotation, posture, etc. Therefore, skin color extraction is first performed. In the skin color extraction, it is necessary to select the color space and establish the skin color model for skin color segmentation. Selecting the color space can describe the distribution of the skin color region with the established skin color model, and pay attention to minimize the overlapping area of the skin color and the non-skin color in the color space. After the skin color extraction is completed, the image still contains some noise that interferes with the subsequent operation. At this time, the morphological filtering technique can be applied to the noise reduction processing of the face candidate region, and the image noise point is filtered out under the premise of ensuring that the effective image information is not lost. Firstly, using the structural elements of mathematical morphology to perform an open operation and a closed operation on the binarized image. The mathematical morphology is based on set theory, which uses a structural element as the basic tool to complete the extraction of image features. The basic operation includes expansion. , corrosion, opening, closing, etc. After the opening and closing operations of the binarized image are completed, the same structural element is used for the third etching operation, and the large black block in the skin color region can be eliminated to be the connected region. Next, in order to restore the skin color region after corrosion to the approximate size before corrosion, the same structure is applied to perform 5 expansion operations, and the boundary of each region is measured flat. Morphological processing can reduce the candidate area of the skin color region, improve the speed of the system to detect the face image, and fill the small holes in the skin color region, greatly reducing the probability of regional misjudgment in subsequent detection. After the above steps are completed, in order to improve the speed of eye positioning and reduce the amount of calculation, it is necessary to perform rough positioning and fine positioning of the eye region, first perform coarse positioning on the eye region, and then search for the eyeball to determine the eye search region to complete the rough positioning of the eye region. Since the gray level and position of the eyebrows are close to the eyes, it is necessary to precisely position the eyes by the coarse positioning of the eye area.

When acquiring the original image of the face, the position, imaging distance, and illumination intensity of the subject will affect the image quality. Even if the same person has different face sizes and positions in different photos, it must be original. The images are geometrically normalized to ensure that different face images are the same size, and the relative positions of the key parts of the face in the image are basically the same. Geometric normalization includes image rotation, image cropping, and image scaling. Directly acquired face images The two eyes are usually not on a horizontal line. This feature affects the accuracy of image feature extraction and image segmentation. Therefore, the face image is rotated and changed so that the two eyes are in the same state after the image is rotated. Horizontal line. After the coordinates of the two eyes are rotated to the same height, the face image is cut based on the position of the eye coordinates, and the useless information is further eliminated, and only the face region can be analyzed and calculated, thereby greatly reducing the complicated background to the face. Identification of interference. In the actual image processing process, although the length and width ratio of the rotated and cut images remain

the same, since the horizontal distance between each person's eyes is not necessarily the same, the image size will be inconsistent, so all face images need to be scaled. Unified transformation into images of consistent size. After rotation, cutting, and scale conversion, the face image is processed into a standard image in which the two eyes are in the same horizontal line, and the scale and size are the same.

3. Conclusion

In short, the application of information technology in human production and life is more and more extensive, and people's requirements for information security are getting higher and higher. It can be said that the face recognition system is the most secure and reliable identity verification system. Therefore, its role in ensuring information security is becoming more and more prominent. Of course, the development of face recognition technology based on image processing in China is still in its infancy, and the related technologies and conditions need to be improved. We need to further study in order to promote the development of face recognition technology.

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