Photo Similarity Analysis

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Abstract

Recently, microblogging hot topic "Conquered by Grilled Fish A Man Found Biological Parents " caused widespread concern, Eventually he succeeded in finding his own family through image recognition techniques. In fact, this kind of artificial intelligence is also widely used in the field of network payment, access control security, criminal investigation and other areas. Through the image recognition model to determine whether two different age photos are the same person, this article designed a picture recognition system. Through the comparison of geometric features based on the method, the gray transformation of the picture, Gabor wavelet transform and graphics matching method, it selects the gray scale transformation method to realize the image recognition. After reading the file, we first use the Matlab software and the gray scale transformation formula to carry on the gray image transformation, after get a grayscale image we create a histogram between the grayscale and the frequency at which this grayscale occurs, we divide the histogram of the grayscale image to get a one-inch photo vector. Finally, the cosine similarity is used to convert the similarity of the photograph into the proximity of the cosine between the vectors of two photographs.

Keywords

Photos, similar.

1. Based on geometric features

The face is composed of eyes, nose, mouth, chin and other components. Because of the differences in shape, size and structure of these components, each face in the world is very different, so the geometric description of the shape and structure relationship of these components Can be used as an important feature of face recognition. The geometric feature was first used for the description and recognition of the side profile of the face. First, several significant points were determined according to the side profile curve, and a set of feature metrics such as distance, angle, etc. for identification were derived from these significant points. Jia et al. simulated the side profile from the integral projection near the center line of the front grayscale image is a very innovative approach.

The use of geometric features for frontal face recognition is generally based on the extraction of important features of the human eye, mouth, nose and other important organ geometry as the classification features, but Roder's accuracy of geometric feature extraction is experimental. The results of the study are not optimistic.

This method is very good, but there are two problems. First, the weighting coefficients of various costs in the energy function can only be determined by experience, which is difficult to generalize. Second, the energy function optimization process is very time consuming and difficult to apply.

2. The grayscale transformation of the picture

Grayscale transformation is a classic and effective method of image enhancement. The principle of gradation transformation is to convert the gradation value of each pixel of the image through a function corresponding to another gradation value to realize the gradation transformation. Common gradation transformations include linear gradation transformation and nonlinear gradation transformation. Histogram processing and similarity judgment are performed using the converted gray matrix.

When the image imaging process is underexposed or excessive, or due to the nonlinearity of the imaging device and the dynamic range of the image recording device is too narrow, the disadvantage of insufficient contrast is caused, the details in the image are unclear, and the image lacks layers. At this time, the gray scale range can be linearly expanded or compressed, and this processing is called a linear gray scale transform of the image. Linear grayscale transformation of the grayscale image can stretch the dynamic range of the grayscale value of the input image to a specified range or the entire dynamic range according to a linear relationship formula.

Let the gradation range of the original image f(x, y) be [a, b], and obtain the image g(x, y) after linear transformation, and the gradation range is [c, d], then the linear gradation transformation formula can be Expressed as:

$$g(x, y) = \begin{cases} d, & f(x, y) > b \\ \dfrac{d-c}{b-a}[f(x, y) - a] + c, & a \le f(x, y) \le b \\ c, & f(x, y) < a \end{cases}$$

It can be known from the formula that for the gray value between the maximum and minimum gray values of the original image f(x, y), the linear transformation formula can be used to correspond one-to-one to the gray range [c, d]. The slope is (dc) / (ba); for the minimum gray value smaller than the original image or the gray value larger than the maximum gray value of the original image, it is respectively equal to the converted minimum and maximum gray values. The transformation diagram is shown in Figure 1:

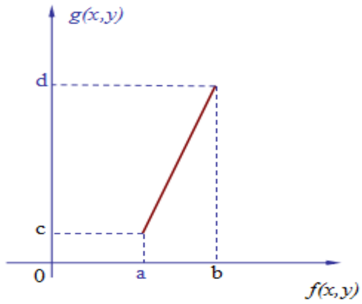

Figure 1. Schematic diagram of linear grayscale transformation

When the slope is greater than 1, the transformed gray value range is stretched, and the image contrast is improved. When the slope is less than 1, the transformed gray value range is compressed, and the difference between the minimum and maximum gray values becomes smaller. The contrast is reduced; when the slope is equal to 1, it is equivalent to not transforming the image.

It can be seen from the above properties that the linear gradation transformation can selectively enhance or reduce the contrast within a specific gradation value range, so the linear gradation transformation can also be segmented: for a valuable gradation range, the slope is adjusted to Greater than 1, for image detail; for unimportant grayscale ranges, compressing images, reducing contrast, and mitigating unwanted interference. The most common method of piecewise linear transformation is to perform a linear transformation in three segments.

Two inflection points are set between the maximum value and the minimum value of the original image gray value. At the inflection point, the gray values of the original image are respectively r1, r2, and the gray values of the transformed image corresponding to the inflection point are respectively s1. S2, in addition, the minimum value of the original image gradation is r0, the maximum value is rm, and the corresponding transformed gradation values are s0, sm. Then the piecewise linear gradation transformation formula is:

$$g(x,y)=\begin{cases}\frac{s_1-s_0}{r_1-r_0}[f(x,y)-r_0]+s_0, r_0\leq f(x,y)\leq r_1\\ \frac{s_2-s_1}{r_2-r_1}[f(x,y)-r_1]+s_1, r_1\leq f(x,y)\leq r_2\\ \frac{s_m-s_2}{r_m-r_2}[f(x,y)-r_2]+s_2, r_2\leq f(x,y)\leq r_m\end{cases}$$

Adjust the parameters in the formula to get different transformation effects.

A histogram is a statistical graph that reflects the relationship between the gray level in an image and the number or probability of occurrence of such gray levels. There are two definitions of the histogram. The two definitions of the histogram are as follows:

(1) Definition 1: A histogram of an array image with a gray level range of [0, L-1] is defined as the following discrete function:

$$h(r_k)=n$$

Where rk is the kth gray level and nk is the number of pixels in the image with gray level rk, k=0, 1, 2...L-1.

(2) Definition 2: The histogram of an array image of a gray scale range [0, L-1] is defined as the following discrete function:

$$p(r_k)=\frac{n_k}{n}$$

Where rk and nk have the same meaning as 1, and n refers to the total number of pixels of the image. Here, the histogram is the probability of occurrence of different grayscale pixels in the image. By observing the histogram of an image, you can judge the contrast and sharpness of the image, and you can also grasp the brightness of the image.

The histogram equalization is to correct the histogram of the original image to a uniform histogram by the transformation function, and then correct the original image according to the equalized histogram. After image equalization, in theory, the histogram of the image is completely flat, that is, each gray level has approximately the same appearance frequency. The effect of histogram equalization is to achieve a uniform distribution of gray levels, increasing the contrast of the image, making the image look clearer.

The principle and method of histogram equalization are as follows. Let r and s denote the normalized original image gradation and the histogram corrected image gradation, respectively. In the interval [0,1], for any gray level r, a corresponding law can be used to correspond to the gray level s, and the corresponding rule is T. $s=T(r)$

In order to make the transformed gray scale still maintain a single change order from dark to bright, and the transformation range is consistent with that before the transformation to avoid the overall variable or darkening, generally: 1 positive transformation, in 0≤r≤1, T(r) is a monotonically increasing function, and 0≤T(r)≤1; 2 inverse transform, r=T-1(s), T-1(s) is also a monotonically increasing function, ie 0≤s≤1 . Considering that the gradation transformation does not affect the positional distribution of the pixels and does not increase or decrease the number of pixels

$$T(r)=\int_0^r p(r)dr$$

discrete cases, the effect of equalization will be limited, not necessarily flat. The equalization method in the discrete case is as follows.

Let the total number of pixels of an image be n, divided into L gray levels. If nk is the frequency at which the kth gray level appears, the probability of occurrence of the kth gray level is p(rk)=nk/n, where 0≤rk≤1, k=0,1,2,. .., L-1. The transformed grayscale is

$$s_k = T(r_k) = \sum_{j=0}^{k} p(r_j) = \sum_{j=0}^{k} \frac{n_j}{n}$$

It can be seen that the histogram equalization in the discrete case is to convert the continuous integral into a discrete superposition sum, which can approximate the straight effect of the histogram.

Matlab calculates the similarity between two photos, and each photo can generate its grayscale image and generate a gray value square map. If the histograms of the two images are close, you can think of them as similar and judge whether the two photos are the same person by similarity.

References

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