World Scientific Research Journal (WSRJ) ISSN: 2472-3703
www.wsr-j.org

Analysis of Photos with Time

Hongzhi Chen [a], Zehua Liang [b], Changzheng Zhao [c], Xiaoyu Liu [d], Fengjiao Wang [e]

School of Shandong, Shandong University of Science and Technology, Qingdao 266500, China.

[a]835889654@qq.com, [b]972492713@qq.com, [c]2751787023@qq.com, [d]1596638274@qq.com, [e]761546026@qq.com

---

Abstract: Image is the most closely related to life information related to vision. It is an entity of the objective world that directly or indirectly acts on the human eye to produce visual perception.AI for image recognition is also widely used in network payment, access security, criminal investigation and other fields.In this paper, the image recognition model is used to judge whether the one inch photos of two different ages are the same person, the image recognition is realized by the gray transformation method, and the image recognition system is designed.After reading the file, the Matlab software is first used to transform the grayscale image with the gray scale transformation formula. After the gray level image is obtained, the histogram is established between the gray level and the frequency of the gray level. Then the histogram of the gray image is partitioned to a single inch image, and the cosine similarity is applied to the photograph. The similarity is transformed into the cosine value between the vectors of the two photos and the degree of proximity of 1. in this paper, through the different periods of Andy Lau two photos, Madeleine's inch of photos, three one-inch photo to verify the feasibility of the model built.

Keywords: image recognition, Gray scale transformation, Gray image histogram, cosine similarity.

---

1. INTRODUCTION OF IMAGE RECOGNITION

The meaning of image recognition technology is very wide. It mainly refers to the corresponding processing of the image obtained from the front end of a system according to the specific port through the computer and the method of mathematical technology. With the development of computer technology and information technology, image recognition technology has been applied more and more widely. For example, the analysis and recognition of various medical images in medical diagnosis, satellite image recognition in weather forecast, remote sensing image recognition, fingerprint recognition, Facebook recognition, and so on, the image recognition technology is more and more permeated into our daily life. It can be said

that image recognition technology is the extension of human visual cognition and an important field of artificial intelligence. Now, the application scope of image recognition technology has been far beyond the scope of vision, and more embodies the characteristics of machine intelligence and digital technology.[1]

2. THE ESTABLISHMENT OF GRAY MATRIX

One inch of the experiment we used was Andy Lau's one-inch picture of two different periods for similar operations, and a one-inch picture of Ma Dehua to do dissimilar calculations.3-inch photos of two people are given in the form of BMP format. First, we have to get the digital basis, using the Matlab call function to convert all the pictures into two-dimensional digital matrix Ak, that is, the gray matrix of the picture, in which Ak (I, J) represents the gray value s (0<s<5) of the I row J column of the K tension graph.

2.1 The establishment of photo matrix

Gray scale histogram is the result of statistics on a single pixel with a certain gray level on the image, and the gray scale matrix is the statistics of the two pixels with a certain gray level in the image which keeps a certain distance on the image.

We take an arbitrary point (x, y) in the image (N * N) and deviate from its other point (x+a, y+b), set the gray value of the point pair to (G1, G2). We make x (y) move on the whole picture, then we get a variety of (G1, G2) values, the series of gray values are k, then the combination of (G1, G2) has k^2; species. For the whole picture, we count the number of (G1, G2) values that appear, and then arrange them into a square array, which are normalized to the occurrence probability P (G1, G2) with the total number of (G1, G2) appearing, which is called the gray level co-occurrence matrix. The combination of distance difference (a, b) can get the joint probability matrix under different conditions. The values of (a, b) are selected according to the characteristics of the periodic distribution of the texture. For finer textures, small difference values, such as (1, 0), (1, 1), (2, 0), are selected. When a=1, b=0, the pixel pair is horizontal, that is 0-degree scan; when a=0, b=1, the pixel pair is vertical, that is, 90-degree scanning; when a=1, b=1, pixels are right diagonal, that is, 45-degree scanning; when a=-1, b=-1, pixels are left diagonal, that is 135-degree scanning.

In this way, the probability of the simultaneous occurrence of two-pixel gray levels will transform the spatial coordinates of (x, y) into the description of "gray pair" (G1, G2) and form a gray matrix.

The gray matrix of an image can reflect the comprehensive information about the direction, the adjacent interval and the amplitude of the image. It is the basis of the analysis of the local pattern of the image and the rules of their arrangement.

Let f (x, y) be a two-dimensional digital image whose size is M * N and the gradation level is Ng. Then the gray matrix satisfying certain spatial relations is as follows：

$$P(\mathrm{i}, \mathrm{j}) = \#\{(\mathrm{x}_1, \mathrm{y}_1), (\mathrm{x}_2, \mathrm{y}_2) \in M\mathrm{x}N \mid \mathrm{f}\ (\mathrm{x}_1, \mathrm{y}_1) = \mathrm{i},\ \mathrm{f}\ (\mathrm{x}_2, \mathrm{y}_2) = \mathrm{j}\} \tag{1}$$

x represents the number of elements in the set X, and obviously P is a matrix of Ng x Ng. If the distance between (X1, Y1) and (X2, Y2) is D and the angle between the two and the axis of the coordinate is theta, the gray level co-occurrence matrix of various distances and angles can be obtained.

Select the two photos, first get the two images of the gray matrix A1 (I, J), A2 (I, J) in which I, j is the first element in the top left corner of the screenshot matrix in the ranks of the ranks of the column in A.

2.2 Transformation of vector

In order to calculate the similarity of the gray matrix of the two photos, we convert the A1 and A2 into one dimension vector a1k= {a1k11,a1k12,⋯,a1k1n} , where kij represents the value of the matrix (I, J). The same reason can be known

b1k= {a2k11,a2k12,⋯,a2k1n} , where kij represents the value of (I, J) in the matrix.

3. THE ESTABLISHMENT OF COMPARISON MODEL OF VECTOR SIMILARITY

For the two vector, we can look similarly to the two direction lines that exist in the space, all from the origin ([0, 0,...]) and point in different directions. The two-line segment will form a angle, if the angle is 0 degrees, which means that the two lines are the same and coincide; if the angle is 90 degrees, it means that the right angle is formed and the direction is different; if the angle is 180 degrees, the direction is opposite. Therefore, we can judge the similarity of vectors by judging the angle between the two vectors. The smaller the angle, the more similar the representative is.

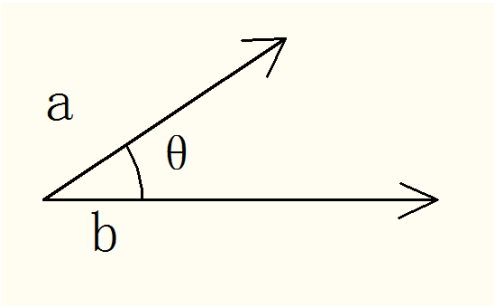

Fig 1. Two space vectors a and b

The A and B above are two vectors in space. We can get the angle between them by using the following formula according to the cosine theorem.

$$\cos\theta = \frac{a^2+b^2-c^2}{2ab} \tag{2}$$

Aassuming that a vector is [x1, y1], B vector is [x2, y2], then the cosine theorem can be rewritten into the following form:

$$\cos\theta = \frac{x1x2+y1y2}{\sqrt{x1^2+y1^2}+\sqrt{x2^2+y2^2}} \tag{3}$$

This method is also established for the n-dimensional vector. If A and B are two n-dimensional vectors, A is [A1, A2,..., An], B are [B1, B2,..., Bn], then the cosine of the angle between A and B2 is equal to:

$$\cos\theta = \frac{\sum_{i=1}^{n}(\mathrm{Ai}\times\mathrm{Bi})}{\sqrt{\sum_{i=1}^{n}(\mathrm{Ai})^2}+\sqrt{\sum_{i=1}^{n}(\mathrm{Bi})^2}} = \frac{\mathrm{A}\bullet\mathrm{B}}{|A||B|} \tag{4}$$

We know that the more the value of the cosine is closer to 1 when the angle is, the more similar the two vectors are, and then that the two one-inch photograph is taken by the same person at different times.

4. IMAGE PROCESSING AND SIMILARITY SOLUTION

4.1 Generating a grayscale image by a photo

The three pictures are transformed by Malab software to grayscale images, and the pictures obtained are shown in the figure. The two one-inch picture of Andy Lau in the following picture is a screenshot on the network. The pixel is adjusted to one inch of the pixel. Because the screenshot cannot satisfy the two photos are both in the standard position and under the standard light, the photos are processed by software. [2]

Fig2. Andy Lau's early one inch illuminated and converted gray scale

Fig 3. After the software aging Andy Lau's inch and the converted grayscale.

Fig 4. Ma Dehua inch photographs and converted gray scale

4.2 The establishment of histogram

According to the generated three grayscale images, the corresponding histogram is established by using MATLAB software, and the program is input into the software, and the histogram obtained is shown in the figure. [3].

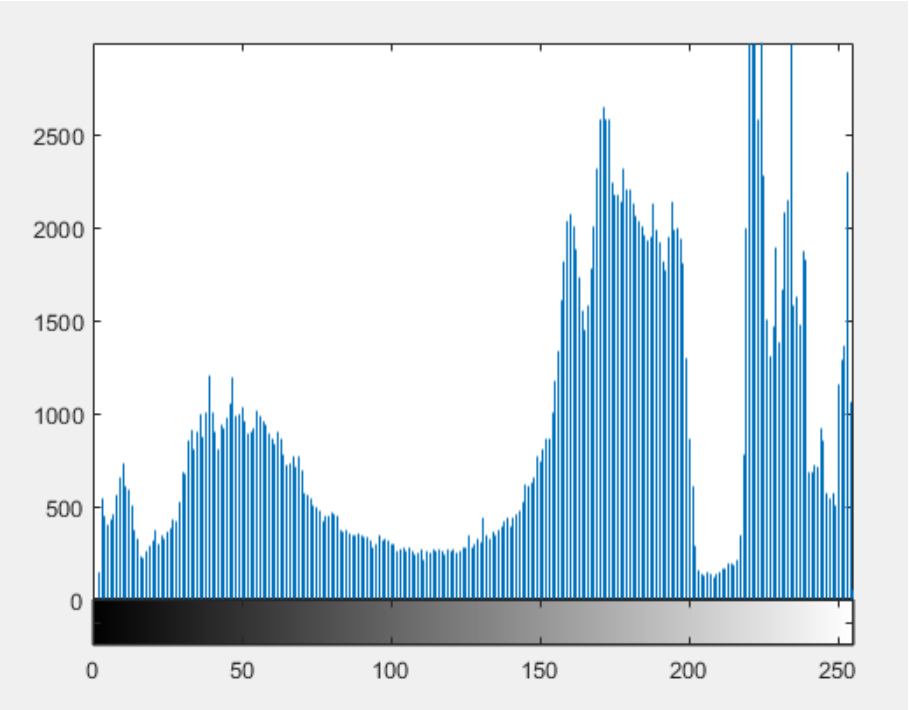

Fig 5. Andy Lau early gray image histogram

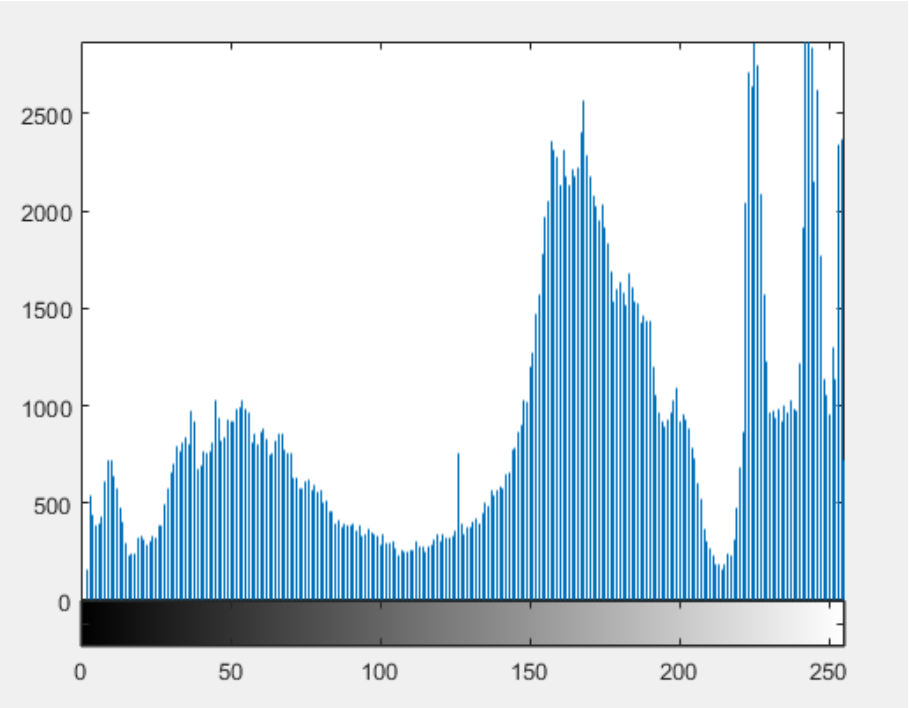

Fig 6. Histogram of gray image after Andy Lau aging

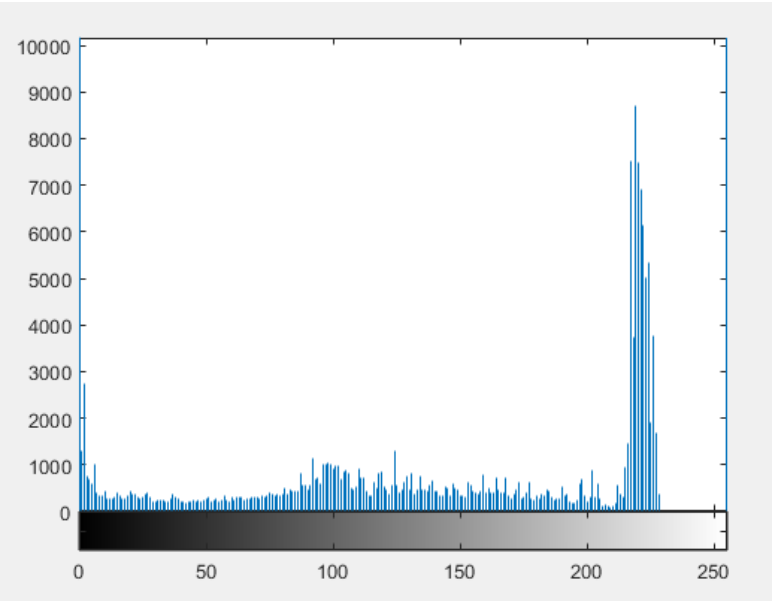

Fig 7. Histogram of Ma Dehua gray image

4.3 Similarity after comparison

MATLAB software was used to compare Andy Lau's early inch photos with photos after aging and Ma Dehua photos. The results are as follows:

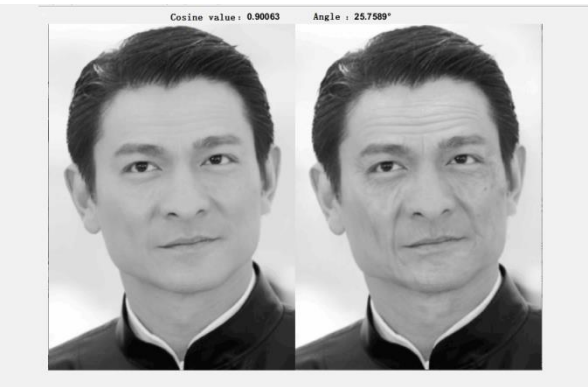

Fig 8. Comparison of similarities between Andy Lau's early and post aging photographs

The cosine value in the analysis is 0.90063, and the cosine angle is 25.7589 degrees.

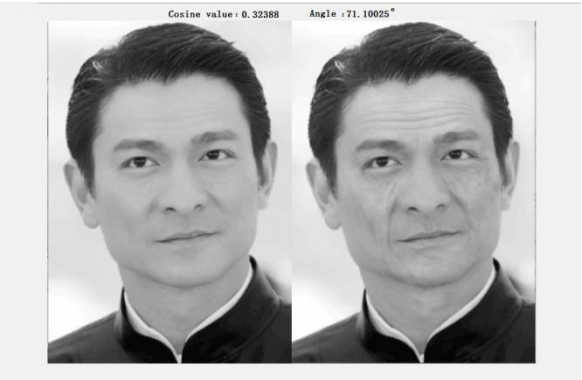

Fig 9. Comparison of similarities between Andy Lau's early and Ma Dehua's histograms

The cosine value in the analysis is 0.32388, and the cosine angle is 71.1025 degrees.

5. CONCLUSION

With the rapid development of science and technology, the traditional method of identity authentication cannot meet the needs of people, and it needs a fast, safe, high precision recognition method. In this paper, a person's two one-inch photo (two photos are taken in the standard position and the standard light), the histogram similarity judgment is carried out through the image gray matrix. After M analysis, we can see the result clearly according to the data. the closer the cosine value is to 1, the closer the space distance between the two vectors is, the more similar the gray histogram of the two pictures is, indicating that the two one-inch photograph is taken by the same person at different times. The algorithm overcomes the shortcomings of the traditional image matching algorithm which uses the correlation coefficient as the similarity criterion. At the same time, it does not lose the advantage of high matching accuracy, thus satisfying the accuracy requirements of image matching. Histogram describes the gray level statistics of an image, and it is applied to image segmentation and image grayscale transformation.

REFERENCES

[1] Hong Hanyu, modern image processing and analysis [M], China University of Geosciences press, 2011.

[2] Shan Shi Guang, research on some key issues in face recognition [D], Graduate University of Chinese Academy of Sciences, 2004.

[3] Rafael C. Gonzalez, etc., MATLAB implementation of digital image processing [M], Tsinghua University press, 2013.