UDC 620.9:.658.45

CRIMP WHEEL EXTRACTION OF IRIS IMAGES DURING IRIS DIAGNOSIS

ZHAO YI'AN

Belarusian State University of Informatics and Radioelectronics, Republic of Belarus

Received March 28, 2024

Abstract. Iris diagnostics is a method based on the recognition of patterns in the eye's iris to identify an individual's health status, genetic information and other relevant characteristics. One of the most distinctive features of the iris is the constrictor, located in the middle of the iris, surrounding the pupil. It is important for iris diagnosis because its shape, size, and other characteristics can reveal an individual's physical health.

Keywords: recognition of patterns, iris diagnosis, constrictor.

Introduction

The crimping wheel is an important tool in iris diagnosis, used to extract and analyze feature information in iris images. Iris diagnosis is a method of judging an individual's physical and psychological condition by observing and analyzing the texture, color, and structure of the human eye's iris. It is widely used in fields such as medicine, biometrics, and psychology.

A shrink wheel is a filter used in image processing that has multiple filter windows of different sizes and orientations. In iris image processing, the crimping wheel is used to detect and extract the features of iris texture, which can be used for iris recognition, disease diagnosis, and individual feature analysis.

The working principle of the shrink wheel is to filter the image at different scales and directions to extract characteristic responses at different scales and directions. In iris images, the crimping wheel can help identify and extract information such as the details of the iris texture, the distribution and shape of the texture. By analyzing and comparing the extracted features, applications such as iris recognition, disease detection, and individual feature analysis can be realized.

The application of the crimping wheel in iris diagnosis also includes the extraction and matching of iris features for establishing an iris recognition system. By applying the crimping wheel to each image in the iris image library, its feature vector can be extracted [1], and then the comparison and matching algorithm of the feature vector is used to realize the identification and verification of the iris. This feature extraction and matching method is widely used in iris recognition technology.

Crimp wheel extraction based on structural pattern

In pattern recognition, a method that uses basic element structures (primitives) and the structural relationships between primitives to describe patterns and complete the recognition and classification process is called structural pattern recognition [2]. Through a large number of observations of existing iris images, it can be found that there are boundary areas with drastic changes in grayscale in the iris part of the image, and most of these areas with drastic changes in grayscale exist in a few pixels. The study found that the most drastic changes in grayscale The part is around the inner edge of the iris image, which is a boundary in the iris image. However, compared with the pupil boundary edge, the grayscale of the shrink wheel shows a slowly changing trend within a certain pixel range. Compared with the non-border area There are also many pixels with large grayscale changes. As shown in Figure 1, the pupil area is between the 40th pixel and the 95th pixel, and the curling wheel area is between the 20th and 40th pixels. The curve in the figure Reflects the change in grayscale around the constriction wheel and around the pupil. In order to better find the boundary point [3], this paper approximately defines the

center point within the boundary range as the boundary point of the image within the range, that is, using the basic element structure to count the image range with the largest change in the curling wheel texture in the iris image, and at the same time defining Two modes: border mode and non-border mode, and use the sliding window method to count the number of times each of the two modes appears in the window, find the window containing the curling wheel texture through the rules of the number of occurrences of each mode, and complete the curling Round extraction.

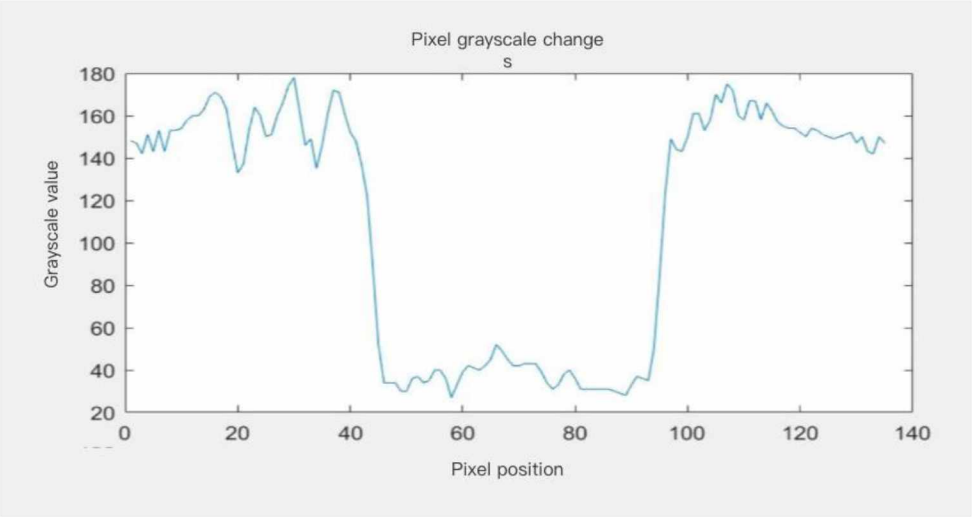

Figure 1. Boundary area grayscale changes

Iris preprocessin

Due to the unique structural characteristics of the human eye, iris extraction is easily affected by lighting, collection angle, environment and other factors. In order to correct the elastic deformation problem caused by this and eliminate the impact of translation and rotation on iris feature extraction, it is necessary to collect the iris features. The image is preprocessed, including iris positioning and normalization. The specific extraction process is shown in Figure 2.

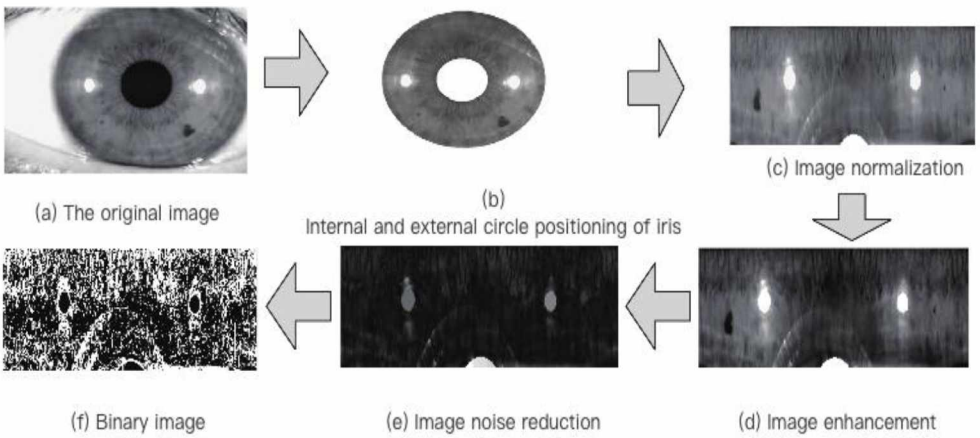

Figure 2. Extraction process

Crimping wheel extraction implementation

Select a 15×15 window and slide it along the direction of Figure 3 on the normalized image. In the same window, if the boundary mode appears more often, the non-border mode will appear less often, and vice versa. In order to achieve an accurate description, the boundary point on a certain column is determined by using the quotient of the number of occurrences of the boundary pattern within the

window and the number of occurrences of the non-border pattern within the window [4], and the quotient is recorded as B.

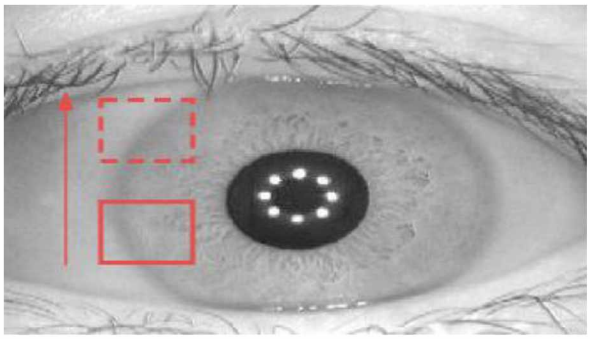

Figure 3. Window sliding direction

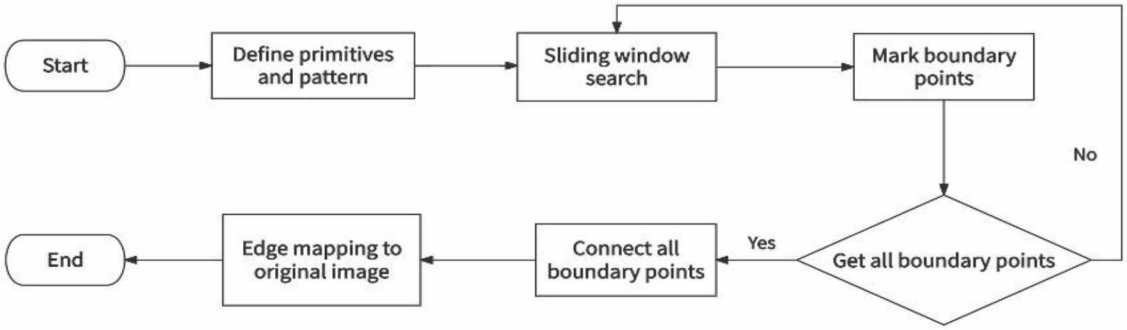

Figure 4. Curled round extraction flow chart

The extraction steps of the crimping wheel are as follows, and the extraction flow chart is shown in Figure 4.

First, use a 15×15 window to slide on the normalized image in the direction, count all B, record the maximum value, and save the center point of the window where the maximum value of the quotient is located, which is the boundary point of the column.

Second, move the window one pixel to the right and repeat the above steps until the image is traversed and all boundary points are found.

Third, connect all the boundary points and map them to the original image, which is the calibrated shrinking wheel.

Experimental results and analysis

The results of the curling wheel extraction are shown in Figure 5. It can be seen from the figure that the curling wheel outline extracted by this algorithm covers the entire curling wheel area, basically outlines the outline shape of the curling wheel, and is not affected by the eyelashes above the iris interference.

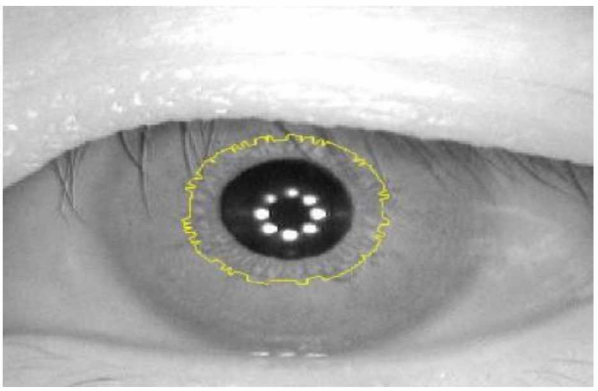

Figure 5. Curled round extraction

Conclusion

As a combination of traditional Chinese medicine visual examination and western medicine iridology, iris diagnostics plays a huge role in the field of human sub-health evaluation and disease prevention. It has gradually been valued by various countries in the world. As a subject that has attracted widespread attention from the world, iris diagnostics has developed an iris-assisted diagnosis system based on this discipline has become an inevitable trend. Crimping wheel extraction is a key step in the iris diagnosis process. Deep learning algorithms can quickly and automatically identify and extract key features such as crimping wheels from a large number of iris images, significantly improving the speed of analysis and batch processing. The use of deep learning to extract crimped wheels in iris diagnosis is not only a technological advancement, but its practical significance and application value involve many aspects such as medical health, safety certification, and technological innovation. It is an important step in the current and future field of artificial intelligence. one of the research directions.

References

1.Guodong X, Wei W. // Research on iris constriction wheel extraction method. Computer Engineering and Design. 2008. Vol. 29. P. 2290-2292.
2.Weiqi Y, Bingwen Y, Xiao S, Hai T. // Iris curling wheel detection method based on gradient extreme value. Computer Engineering. 2014. Vol. 40. P. 162-165.
3.Feixia D. // Eye syndrome differentiation and iris diagnosis. Journal of Changchun University of Traditional Chinese Medicine. 2010. Vol. 26. P. 8-9.
4.Yuan G. // Research on feature extraction method of iris texture. Shenyang University of Technology. 2015. VOL. 15. P. 11.