[ICT01] TUMOR DETECTION USING IRIS PATTERN

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Introduction

Cancer was the top 10 killer in the world. WHO reported that in years 2000, death cause by cancer patient is 6.2 million people worldwide (WHO, 2003). The earlier cancer patient know he was infected by cancer would give him higher chances to cure it. It is event better if we can predict and prevent it rather than curing it. With iridology, we could analyze cell and body activities (Lindlahr, 1919). When cells growth abnormally, iris will show some sign and changes that iridologist could tell it tumor stated to grow (Lindlahr, 1919). Thus this could prevent the tumor from grow or grow into second stage that is cancer.

If we could computerize the iridology diagnosis method, we believe it would benefit million of people and iridologist to prevent patient cancer. Figure 1, shows proposed computerized iridology system to diagnose patient.

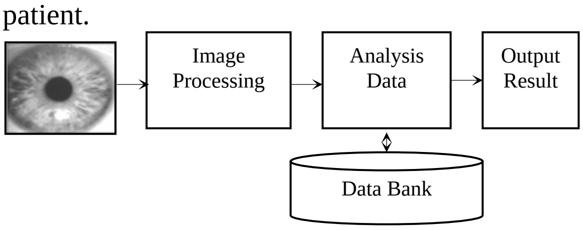

FIGURE 1 Block Diagram of the Computerized Iridology System

Methods

Image Preprocessing

Computerize iridology system may consist of 3 sections, which extracting region of interest from raw image, extracting data or pattern, and analyzed the data. The raw eye image contains noises and unwanted regions. Thus further more it is impossible to capture iris image only from the patient. Gradient operator was use to detect the edge of the region of interest. Hough transform with circular model as equation (1) was use to locate the region of interest.

$$(x-c_1)^2+(y-c_2)^2=c_3^2 \qquad (1)$$

Where (x,y) is a point in the plane and (c_1,c_2,c_3) are the parameters. Note that, (c_1,c_2) is the center coordinates of the circle and c_3 is the radius of the circle. Using this method, the boundary of the pupil and sclera was located. Result as shown in figure 2. Then the Region of interest or iris will be extracted.

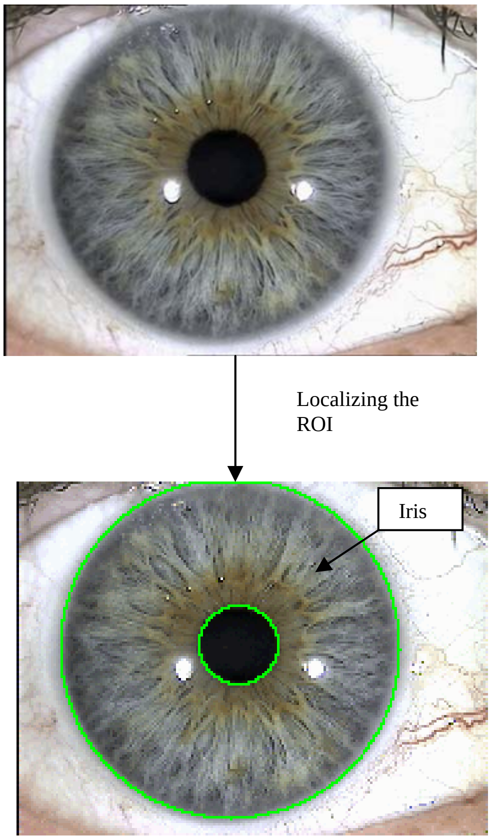

FIGURE 2 Result of the Localizing of the Iris region or region of interest.

Pattern Extraction

Patches appear in the iris is one of the patterns that shows tumor growing in the body. The color, shape and location of the patches that appear in the iris determine the patient would infected by tumor. Histogram threshold was used segment the color of we interest with the background. The threshold value for each space HSV, was determine using a color model. A series of background and patient patches was collected. The background was categorized into Brown color, Blue color, and Other color. Histogram of the background and patches was plotted to analyze to obtain the parameter. Figure 3 shows that it is possible to segment the patches from eh background using bandwidth threshold.

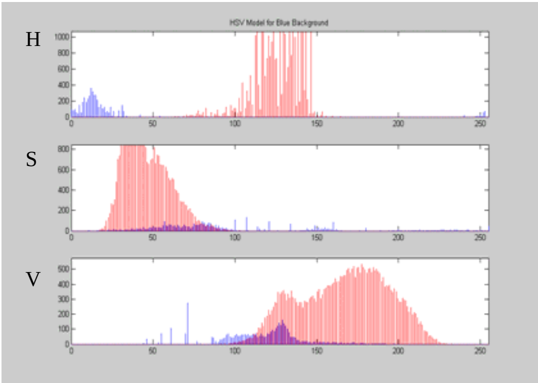

FIGURE 3 Histogram of Patches and Blue Color Background in HSV Space

The threshold method only possible if the color of the patches is applicable only on blue color and other color background iris. For brown color background iris, a multiple threshold was use to segment the intensity of the image. The patches and the background have intensity. Multiple thresholds value was use because the intensity was varied with light, so a threshold value is impossible to segment the patches from the background. The threshold value was calculated using the mean value of the ROI. The mean value of the patches and its surrounding patches was compared to eliminated border cases or false extraction.

Normalized area (A_{norm}) as equation (2), solidity (sol) as equation (3) and best fit rectangle lengths (*dl*) as equation (4), parameter was use to determine the segmented pixel was a patches or noise.

$$Norm\,area(A_{norm}) = \frac{A_{patches}}{A_I} \quad (2)$$

$$sol = \frac{A_{patches}}{l_1 \times l_2} \quad (3)$$

$$dl = \frac{\|l_1 - l_2\|}{\min(l_1, l_2)} \quad (4)$$

Where $A_{patches}$ is area of the patches or object, A_I is area of the localized iris, and l_1,l_2 is the length in pixel of the best fit rectangle of the object. Result of the located patches is shown in figure 4.

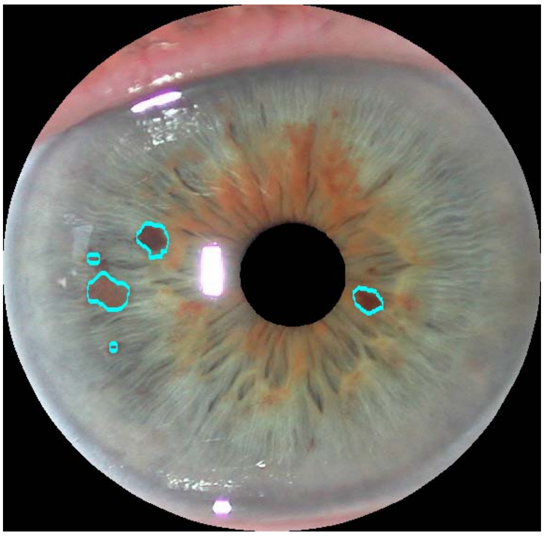

FIGURE 4 Located patches

Data Analysis

A rule base was use analyzed or determine the patient potential have caner or tumor. Arrangement of the patches and location of the patches in the iris was determined. The patches pattern and location will be compare with the iridology chart to determine which organ is infected.

Result and Discussion

The Hough transforms method able to locate all the region of interest in our sample. Deviation of the lighting and angle of capturing iris may affect the accuracy of to detect the true boundary.

Histogram threshold is able to extract 70% pattern in our sample accurately. This is due to the limitation of controlling the environment factor when collecting the data.

Summary

A computerized system of iridology has been presented. There are lots of rooms to improve the system for achieving our goal for developing a computerize system detect tumor using iris pattern.

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