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Pre-Processing Image For Palmprint Process

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Abstract

Biometric recognition system is a system used to verify or identify someone using the person's body part or behavior that has a unique pattern suck as palmprintprint. Palmprint is a relatively new biometric, which have unique characteristics such as palmprint lines and stable. The process of pre - processing is grayscale, threshold, region of interest, and intensity normalization. Influence the threshold value used to acquire the region of interest palmprints. While the methods used to get the region of interest using morphological erosion. Morphological erosion itself which aims at reducing the size of the image so that the characteristics of the image obtained palmprints. From the results, it can be seen that in order to get a region of interest of the image is affected palmprints threshold value used. The more characteristic image obtained palmprints, the better the results obtained. This study was limited to the pre - processing, and expected to do more research for the feature extraction process so that it can be used for recognition process by using the palmprint.

Keywords : *Palmprint, Region of interest , and Morphological erosion*

1 INTRODUCTION

Recognition system is a method to determine or identify a person's identity. Verification system aims to accept or reject the identity claimed by a person, while the identification system is to solve a person's identity [8]. The process of recognition can be carried into some method is a method that is based on something you have, something that is known and based on biometrics. Something what you have example is the use of the card. Use of the card has some drawbacks as it can be lost, can be used together and can be duplicated [7]. Something what you know for example the use of PIN and passwords [12]. The use of PIN and passwords are also not without problems, for example if a PIN or password is too long will be difficult to remember, except that there are some cracking tools that can be used to get someone's password [13]. These problems can be overcome by using a system based on biometric recognition.

Biometric recognition system is a system used to verify or identify someone using the person's body part or behavior that has a unique pattern [13]. Biometrics are grouped into 2 physiological biometrics and behavioral biometrics [16]. Physiological biometrics using the

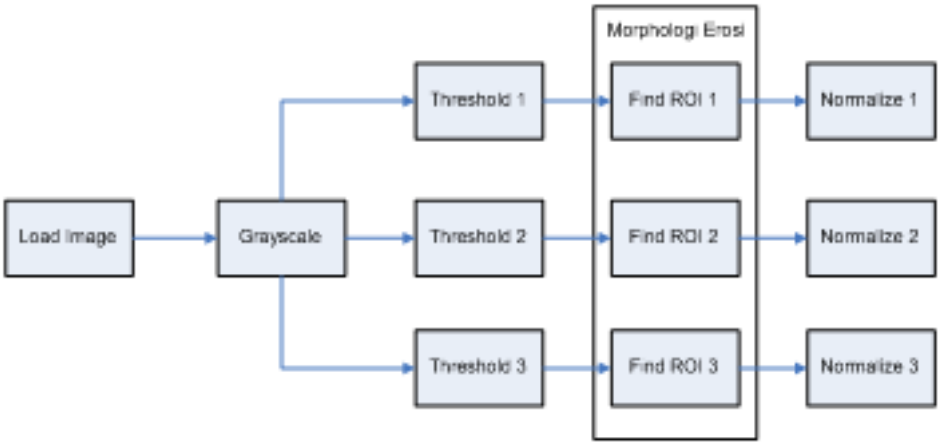

Figure 1: ROI process and normalize

palmprint, face, iris, retina, DNA, and others to verify or identify someone. While using a behavioral biometric voice , signature , gait and typing style as characteristic of a particular individual. One part of the human body which have unique patterns and can be used as an identification tool is the palmprint. Unlike the fingerprint and face the long and widely used for identification systems, biometric palmprint is still relatively new. Palmprints become very attractive for development as a biometric because it has more characteristics than a fingerprint and hand geometry [11].

The palmprint has some unique characteristics , including characteristics of palmprint geometry, the major lines comprising the heart line, head line, life line, tangled lines/weak, and characteristics minusi [10]. Geometry traits such as length, width and area of the palmprint easily forged, while minusi a pattern characteristic of the hills and valleys on the surface of the palmprint like a fingerprint and can only be produced from high resolution imagery. Main lines and wrinkles, often referred to as line characteristics alone , has several advantages over the resulting characteristics of biometric, among others : can be obtained from low-resolution images, the tools used for the acquisition process is quite cheap, hard to forge, and characteristics of the palmprint lines are stable due to slight changes in a long time [3]. Based on the above, the researcher is interested in conducting a pre-processing the image of the palmprint by using morphological erosion so that further research can be used as an alternative tool for verification or identification of a person.

Purpose of Research is Developing a software that is able to perform pre - processing the image of the palmprint by using morphological erosion.

The benefits derived from this research are :

1. Can provide information regarding the palmprint lines effectively.
2. Can provide information on methods morphlogi ROI particular morphological erosion.
3. In order to do further research on the lines of the palmprint.
4. As an alternative that can be used to verify or identify a person and deserves to be applied to specific applications such as attendance system , security system applications

Figure 2: Testing Results threshold 50

Figure 3: Testing Results threshold 80

and other applications.

Restrictions that will be taken in this study are as follows :

1. Palmprint image is taken from The Hong Kong University Polythenic.
2. Image palmprint used in the study did not contain some criteria such as disability or permanent scars.
3. Just analyze the process of pre - processing for image processing using the palmprints morphological erosion.

2 Biometrics

Biometrics is a process for identifying a person by using the unique characteristics of the physiology or behavior of a person [17]. Biometric based on physiological characteristics of a type of biometric system was developed using the physical parts of the body of a person as a unique code for recognition as the palmprint [12], DNA [4], fingerprints [15], iris [13], retina [14], etc. While biometrics based on behavioral characteristics of gait example, beat button, the sound signature and someone to do the introduction. While the biometric system

is a system used to identify a person using a particular body part or behavior that has a unique pattern [13]. Before the biometric technology using conventional methods. Traditional methods are still widely used to this in a variety of applications. Traditional systems can be grouped into two, namely that something is known to be based and possessed by something what you have. Based on what is known, for example the use of passwords . The downside of using a password if the password is too short, then the risk can be guessed by others. And if the password is too long, it will be easily forgotten. In addition, there are some cracking tools are able to guess the password that is a combination of letters and numbers. While based on something that belongs for example the use of the card also has the disadvantage that if the card is lost and found by others then this person can use the card for personal interests [12].

2.1 Palmprint

Palmprints become very attractive for development as a biometric because it has more characteristics than a fingerprint . Surface area of the outer palmprint prints than expected to produce characteristic that has the ability to distinguish more reliable [9]. Biometric characteristic possessed palmprints are as follows [5] :

1. Feature geometry. This characteristic concerns the shape of palmprint geometry, such as the length, width and area of the palmprint. Feature geometry are few, easily available and easily falsified by making a model of a hand. This characteristic also makes it impossible to use the verification system, especially for system identification, because small amounts so low distinguish ability.

2. The main characteristic lines. The main lines or principles can be used to distinguish between one person to another because these lines are unique, stable, and little change in a considerable long period. There are three main types of lines, which heart line, head line, and life line. For reference database size is large enough, very difficult to get high recognition rate by using only these lines because of its resemblance to the main lines of the palmprints of different people.

3. Characteristics tangled lines. The palmprint contains many thin lines that are tangled or different from the main line. These lines are thinner and irregular. These lines are capable of producing more detailed characteristics .

4. Feature point delta. There are five delta area, as the area is at the root of the radius and the outside radius area. This point is unique and stable, but it is difficult to obtain the characteristics of the low-resolution image of the palmprint.

5. Feature minusi. Minusi a pattern of hills and valleys on the surface of the palmprint like a fingerprint. Minusi traits can only be obtained at the image of the high-resolution palmprint and requires a high komputansi.

2.2 Pre - Processing

Before the image of the palmprint can be used for the introduction of a person, the image has to go through several processes [6]. These processes is a grayscale image, threshold, region of interest, and the normalization of intensity region of interest.

Figure 4: Threshold Test Results 110

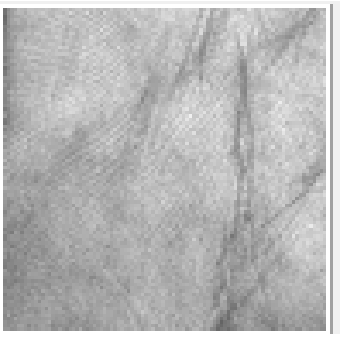

Figure 5: Testing Results Find ROI with Threshold 50

2.2.1 Grayscale Image

Grayscale image is an image that has black, gray and white. Grayscale itself aims to transform the original image into a gray image. The process of converting the original image to grayscale image can be done by using the formula :

$$I(x, y) = \frac{R + G + B}{3} \tag{1}$$

2.2.2 Thresholding

Thresholding will produce a binary image, the image of which has two gray level values, namely black and white. In general, the process of grayscale image thresholded to produce a binary image is :

$$g(x, y) = \left\{ \begin{array}{l} 1 \; if \; I(x, y) \geq T \\ 0 \; if \; I(x, y) < T \end{array} \right\} \tag{2}$$

g (x , y) is a binary image from a grayscale image I (x , y) , and T declared value threshold. There are two types of floating, global thresholding and locally adaptive thresh-

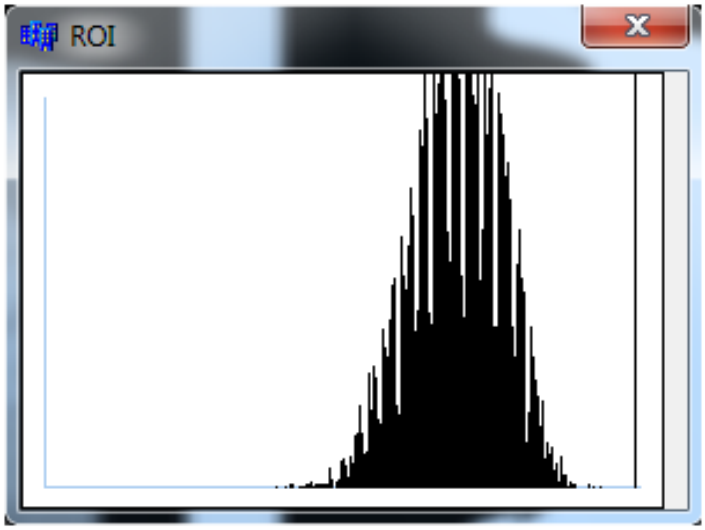

Figure 6: Region of Interest Graphs with Threshold Value 50

olding. In a global floating, entire pixels in the image is converted to black or white with a threshold value T.

2.2.3 Region of Interest (ROI)

Determination palmprint ROI is a very important part of this system because it is essentially a feature match palmprints tested ROI with feature palmprints reference ROI. To menentukkan ROI of the palmprint, the system uses the method of morphological erosio. Morphological image processing techniques using the form as a guide in processing. Value of each pixel in the image is obtained through a process of comparison results between corresponding pixels in the input image with neighboring cells. Morphological operations depends on the order of appearance of the pixels and not pay attention to the numeric value of the pixels so that morphological techniques are appropriate when used to perform image processing binary and grayscale images. Morphological operations use two insert sets is an image and a kernel. Specialized in morphology, commonly called the kernel term structuring elements. SE is a matrix and are generally small. Elements of the SE can be worth 1.0 and do not care. Values do not care is usually characterized by the value of the element left blank or marked with a cross.

Morphological erosion is done by comparing each pixel of the input image with the central value of the SE by means of superimposing the image so that the center of the SE with the SE right with the processed image pixel positions. If all pixels SE exact object all the pixel values of input image pixels then set its value to the pixel value of the object, if not then the input pixel given the background value. A similar process was followed by the SE moving pixels in the input image.

Morphological erosion is the inverse of the dilation process, if the dilation process produces an object larger then the erosion process will produce a smaller object. Holes on the object will appear enlarged as shrinking the object boundary.

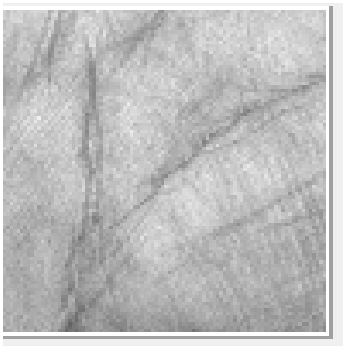

Figure 7: Testing Results Find ROI with Threshold 80

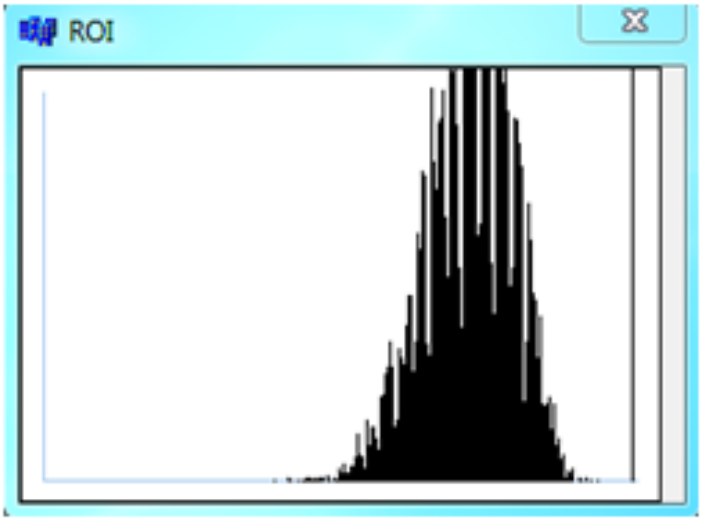

Figure 8: Graph of Region of Interest Threshold 80

To determine the ROI of the palmprint, then used morphological erosion method. Each binary can be formed by morphological erosion method using rectangular elements to produce palmprint ROI. If R is the set of elements with non-zero valued pixels in the binary image and SE is the set of elements with pixel -value is not zero, then the method of morphological erosion can be formulated as follows :

$$R \Theta SE = \{g : SEG \square R\} \tag{3}$$

seg symbolizes the set of elements forming the digesr as g pixels and should not be out of the area of the binary image.

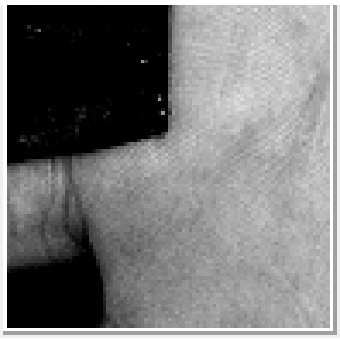

Figure 9: Testing Results Find ROI with Threshold 110

2.2.4 Normalized image intensity ROI

Adjusting the contrast and light intensity or normalization is done by reducing the illumination differences and the impact of noise on the sensor [2]. The following methods can be used pixel operations to solve the problem [1] :

$$I(x,y) = \begin{cases} \phi d + \lambda \, Jika \, I(x,y) > \phi \\ \phi d - \lambda \, sebaliknya \end{cases} \tag{4}$$

with

$$\lambda = \sqrt{\frac{\rho d \left\{ I(x,y) - \phi \right\}^2}{\rho}} \tag{5}$$

I is the result image, I is the original image, and is the average and variance of the original image, and average and variance image of the desired outcome.

2.3 Framework

The framework is designed to solve research problems encountered in this study. Based on the morphology of the above methods, the authors used morphological erosion method because the method can be applied to the pre - processing system in the palmprint of a hand taking an ROI for reducing erosion morphological method of image pixels palmprints. As for the method of dilation would result in ROI image will widen due to have additional pixels. Due to take the ROI of an image that is a way to reduce or minimize the size of the image, the morphological method that will be used in this study. From the image of the palmprint of the same hand, a process grayscale. The second phase , the threshold value is divided into 3 different. From each threshold value do find the ROI process and normalize, show in Figur 1.

3 TESTING RESULT

Based on the results of the testing that has been done, it can be concluded that the interface unit tested and runs well. It is seen from all test scenarios acceptable conclusion.

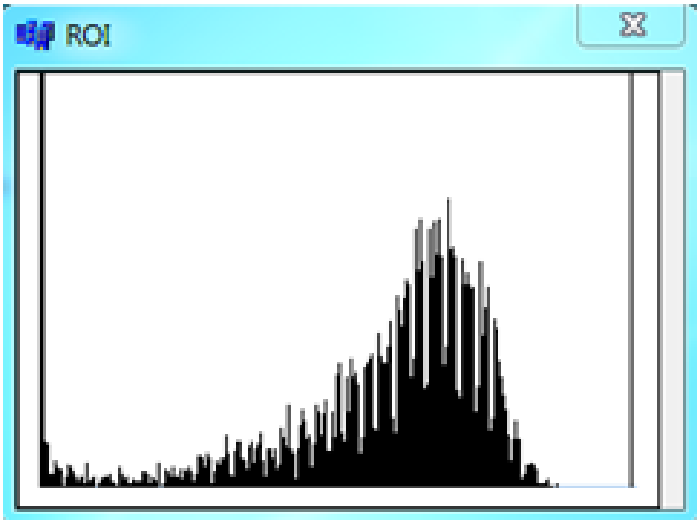

Figure 10: Region of Interest Graphs with Threshold Value 110

3.1 Results of Testing with the threshold value 50

For the first image, the threshold value used is 50. Threshold itself aims to transform the image into a binary image. Seen binary image generated with the threshold value 50 as shown in Figure 2.

3.2 Results of Testing with the threshold value 80

While the second image, the threshold value used 80. Figures show that the resulting image does not like the image with the threshold value of 50 and the picture is also a little bit grainy and less tidy for binary images. Shown in Figure 3.

3.3 Results of Testing with the threshold value 110

The last image testing with threshold value of 110. The resulting image does not look more presentable than the threshold image 50 and 80. Shown below in Figure 4.

3.4 Testing Results Find ROI with threshold 50

The test results further gain region of interest of the image threshold. The results of the first test, region of interest obtained from the threshold value of 50. Then the image obtained is not too get from the characteristics of the palmprint itself. The lines of palmprint slightly shifted from those traits. Shown in Figure 5.

Figur 6. shows a graph of the results of the region of interest with a threshold value of 50. Where the coordinates x and y as the amount of intensity as the sum of the intensity. Seen from the graph that is generated, it can be estimated that the region of interest range from 100-200 pixels.

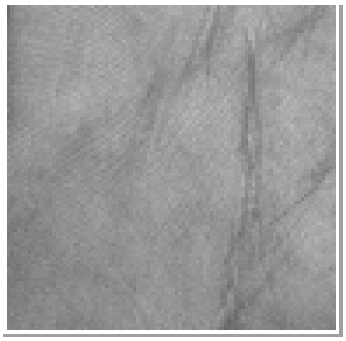

Figure 11: Normalize the Threshold Test Results 50

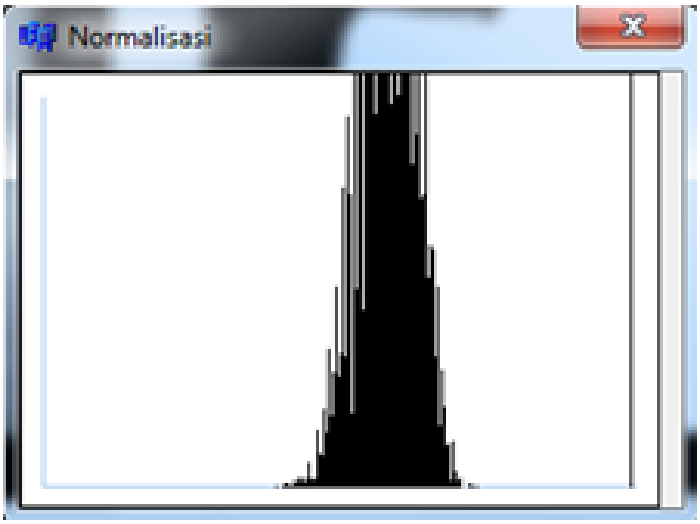

Figure 12: Graph normalize the Threshold 50

3.5 Results of Tests Find ROI with threshold 80

The results of a second test using a threshold value of 80. Characterize the resulting image with the threshold values more characteristic of the image to get the palmprint itself. Show in Figure 7.

Graph 8 is almost the same image with the image where the value of 6 pixels ranging between 100-200 . But it can be seen in the graph, that is different to the top of the chart with the graph in Figure 6.

3.6 Testing Results Find ROI with threshold 110

The results of the last test using a threshold value of 110. The hallmark of the palmprint so far obtained than expected because of these characteristics hardly found at all. Show in Figure 9.

Figure 13: Normalize the Threshold Test Results 80

The graph in Figur 10 is much different from the picture 6 and 8, because the image is based on test results obtained only a few characteristic region of interest is in getting. Region of interest is obtained affect the graph obtained.

3.7 Testing Results normalize the threshold 50

Tests performed on the normalized intensity of the region of interest have been obtained with a threshold value that is different. Normalized intensity of the first testing done with the threshold value of 50. From the image obtained shows that the image of the less experienced reduced light or darker than the image of the region of interest is not in normalisai. Show in Figure 11.

To normalize the resulting graphs with threshold value 50, will be shifted to the middle to find the desired intensity level.

3.8 Testing Results normalize the threshold 80

The second test with the image region of interest with a threshold value of 80. The image has also experienced a reduction in the normalization of the light from the image region of interest that has not done its intensity normalization. Show in Figure 13.

The graph in Fig. 14 is also experiencing a shift in the graph to the middle of the chart region of interest is generated. It also aims to find the desired intensity level.

3.9 Testing Results normalize the threshold 110

And final testing of the image region of interest with a threshold value of 110, the image is also changing from the previous level of brightness of the image. Show in Figure 15.

Judging from the region of interest with a threshold value of 110, characteristic of palmprints can do the normalization process. Since the normalization obtained from the region of interest. The results of the graph, a shift to the middle to find the desired intensity.

4 TESTING

Based on the results of the testing that has been done, it can be seen that the value threhold influence the outcome of a region of interest are obtained. Threshold limit value is

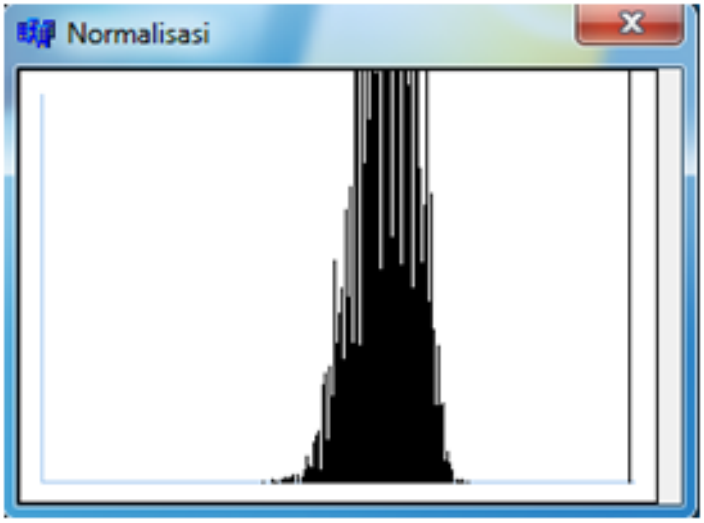

Figure 14: Graph normalize the Threshold 80

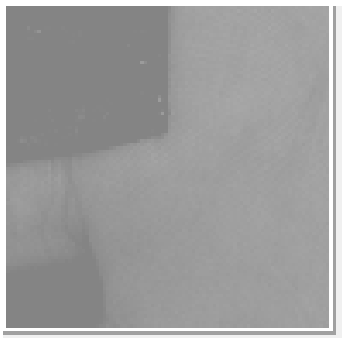

Figure 15: Normalize the Threshold Test Results 110

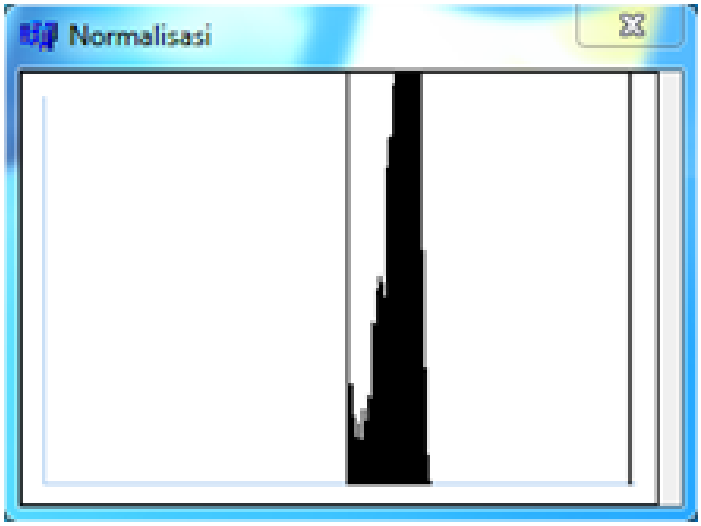

Figure 16: Graph normalize the Threshold Value 110

the value of an image based on the previous image. Where if the value is greater than 80 image, the image will be colored black or 1 and if the value is smaller than 80 image, the image will be colored white. Of test cases performed on the first image using a threshold value of 50 (Fig. 2.) produce characteristic region of interest is much less, is seen in the discussion of threshold testing 50. In the discussion of the second test, the threshold value used by 80 (Fig. 3.). The image produced by the threshold values more characteristic of a region of interest obtained palmprints. And discussion of the latter, the threshold value used by 110 (Fig. 4.), characterize the resulting region of interest is less than the threshold value of 50 and 80. Discussion of the analysis conducted on the discussion of the testing, it was found that the threshold value of 80 (Fig. 3.) considered the best because of the characteristics that earned more than the value threhold 50 (Fig. 2.) and 110 (Fig. 4.). While the threshold value of 110 (Fig. 4.) is considered the most ugly because almost characteristic of the palmprint can not be obtained. For graphs region of interest obtained different (Fig. 5) (Fig. 7) (Fig. 9), is due to the characteristics obtained are also different, so the graph is generated based on region of interest vary. As for graphics normalize each shift in the same graph (Fig. 6) (Fig. 8) (Fig. 10), due to the previous image has intensity levels varying be the same intensity.

5 CONCLUSION

Based on the results and discussion of Pre - Processing for Image Palmprint Process can be concluded that the threshold value affects the gain region of interest of an image of the palmprint. Based on testing, the threshold value of 80 most excellent as well as many palmprints gain characteristics than the threshold value of 50 and 110. While the threshold value 110 worst due to the characteristics of the palmprint is hardly obtained.

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