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ACTIVE SHAPE MODEL IN AUTOMATIC SEGMENTATION OF HAND FINGERNAIL IMAGE

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Abstract

This paper presents a new method for segmentation of hand fingernail image. This method done by automatically to get fingernail area. The method consists of three steps are grayscaling, a process which change color image to grayscale image, contrast stretching to repair contrast in the image and the last process is active shape model as a process which produce fingernail area. From this research is known that active shape model be able to find fingernail area in the image. Hence, active shape model can segmenting fingernail area with some suggestion.

Keywords: ***active shape model; hand fingernail image; image segmentation; fingernail image; segmentation of hand fingernail image***

Introduction

Nails are part of body which grow taller in the end of finger. Its function is to protect nerve in finger and to improve touch ability [1]. Nails can be used in biometric. Biometric is a method to identify someone based on unique characteristic [2]. In Biometric, area nail in finger is needed so finger image must experience segmentation process.

Firdaus [3] present segmentation of nails using two method are region growing with watershed and without watershed. The conclusion of research is segmentation of fingernail image is better in performance and the accuracy is 60% but its procedure is done by manually. The work [4] proposed about separate parts of nail with blob method and watershed which the accuracy is reaching 84%. Furthermore, Garg [5] perform procedure to segmentation of fingernail image using interferometer technique. But this method has weakness in nail paint and skin attributes. So in this work will present segmentation of fingernail image which produce area nail automatically using other method is active shape model. Active shape model is a boundary segmentation technique which work effectively in short time and accurate [6] and suitable to determine shape of object in medical image using landmark point as representation of contour [7].

Data in this paper is hand fingernail image which show skin finger, finger and nail. The method is consist of three steps. First step is graycaling is used to change color image to grayscale image. Next step is contrast stretching is used to enhance certain characteristic or feature in image. The concept of contrast stretching is repairing contrast in image. The last step is active shape model to find nail area in image.

The remaining part of the paper is organized as follows : Section II presents material and proposed method. Experiment and result will be provided in Section III and last section – section IV provides conclusion of this paper.

Research methods

A. Material

Hand fingernail image is taken using digital camera. Hand fingernail image is used in this research is from left hand as well as right hand. It also consist of finger skin and fingernail. This research utilizng a collection of 40 hand fingernail images. One of hand fingernail image shown in Figure 1.

Figure 1. Hand fingernail image

B. Method

There are three steps in the proposed method. The first step is grayscaling process then the second step is contrast stretching. The purpose of first step and second step is to prepare data before go through segmentation using active shape. And the last step is active shape model. The whole step in paper is shown in Figure 2.

The first step is performed in this research is grayscaling process. Grayscaling process is process which change color image to grayscale image. Grayscale image is image which consist of three color are black, gray and white. Gray level is gray color with various level from black approaching white. Grayscale image have color depth8 bit or 256 combination of gray color [8].

Next step is contrast stretching which is one of enhancement image which its used to enhance certain characteristic or feature in image, so image can be precepted easier and analyzed accurately. The concept of contrast stretching is repairing contrast with increasing dynamic range of intensity value in image. Contrast in image is distribution of bright color and dark color. A low contrast image is image which its dynamic range is narrow and if its dynamic range is wide, it can be called a high contrast image. Dynamic range is based on different between highest intensity value and lowest intensity value that compose pixels in image [8].

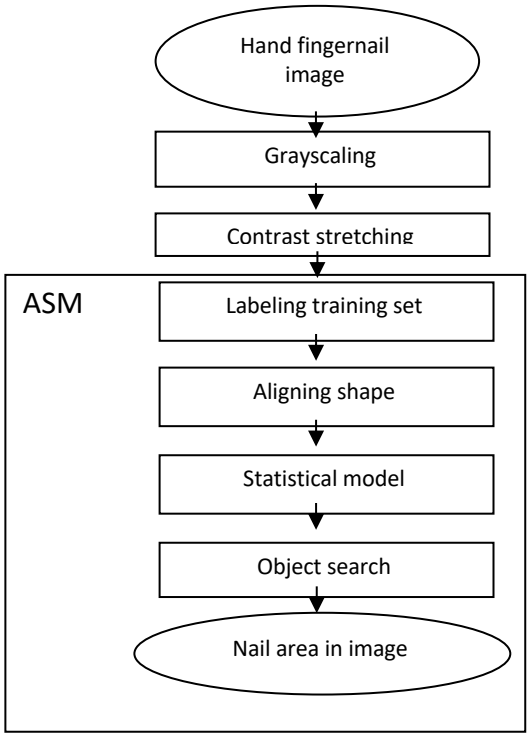

Figure 2. Procedures in research

The last step is segmentation using active shape which produce nail area. Active shape model is a method is used to determine shape of object in image [9] using fitting between point distribution model from active shape model with object in image. Active shape model is a boundary segmentation technique which work effectively in short time and accurate [6] and suitable to determine shape of object in medical image using landmark point as representation of contour . The number of landmark point is used in active shape model have influence correlation measurement [7]. Therefore, in this paper using seven landmark points as representation of contour object in image.

In the labelling training set, we must to label shape model using landmark point. This process is done by manually and every point must be placed in the same position to every training set in object. The position of point is examined statistically to produce point distribution model (PDM). PDM is shown average position of points and have parameter sum to control a mode of varian in training set. In aligning shape of ASM, applying transformation like scalling, rotating and translating of position points. Furthermore in this step also done by minimize the sum of weighted distance between equivalent point in different shape. Determination of weight is used to show the most stable point among points. Collection of stable point is forming statistical model.

The next step is object search by placed statistical model in image. Then statistical model will be reform to find the best fit for points. The best fit is adjustment along model boundary which move to the strongest image boundary with stronger magnitude. The movement of the control points is limited by training data in this case the normal object contour.

Research Results and Discussion

Material of this research is digital image which consist of hand fingernail. The number is used in this paper is 40 data. Material of research is shown in Figure 3.

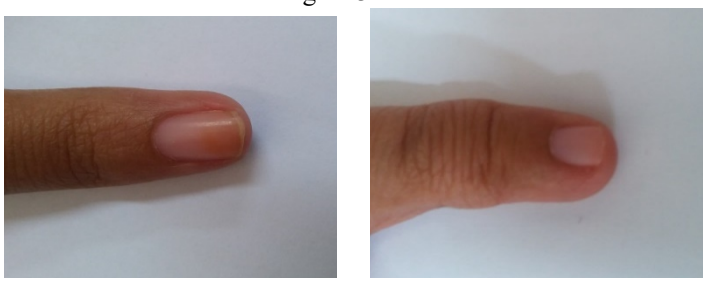

Figure 3. Material of research

The initial process experienced by the digital image is grayscaling. This process is done by using the GUI (Graphical User Interface) to make user easier to operate it. In this GUI, there are several buttons including the open file button, process grayscaling button, save photos button and exit. GUI of grayscaling process is shown in Figure 4. The result image of the grayscaling process is grayscale image which is shown in Figure 5.

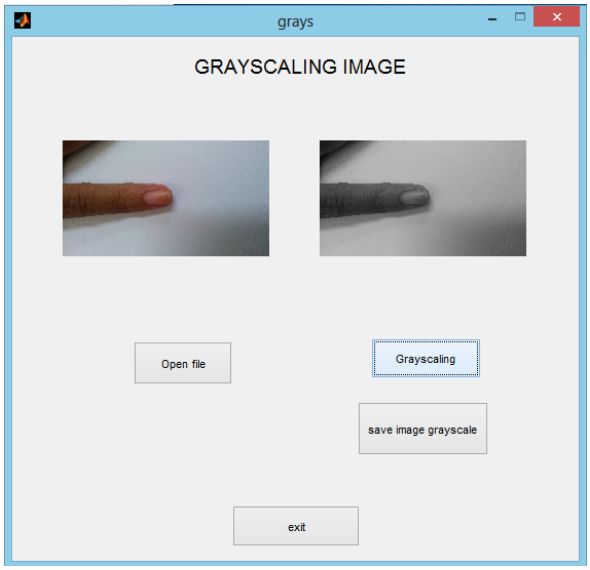

Figure 4. GUI of grayscaling process

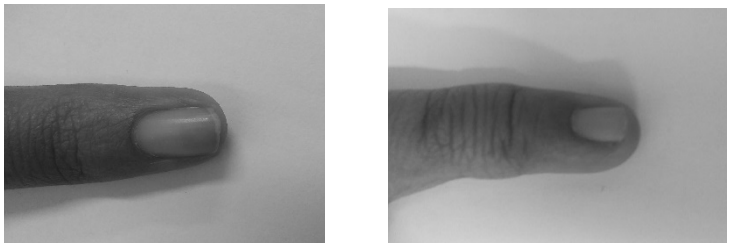

Figure 5. Grayscale image

Next process is contrast stretching. This process is also done using GUI (Graphical User Interface). In GUI of contrast stretching, there is histogram of grayscale image and histogram of contrast stretching image. From its histogram, user can know the changes and differences in the image before and after contrast stretching process. GUI of contrast stretching is shown in Figure 6 and the result image of contrast stretching is shown in Figure 7.

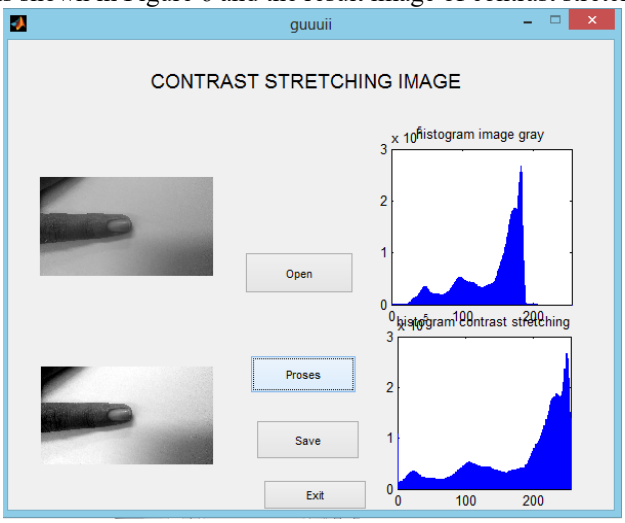

Figure 6. GUI of contrast stretching

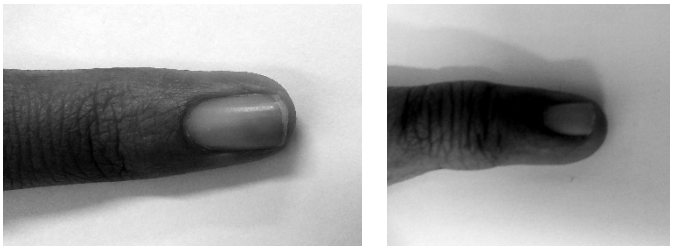

Figure 7. The result image of contrast stretching

The last process in this research is active shape model. In active shape model, data is divided into two groups are training data and testing data. The number of training data is 35 data while the number of testing data is 5 data. Figure 8 show image in labelling training step. In labelling training step, user is labelling in nail area. The number of landmark point is 7 points which representation of object in image. Result of labelling training set will be trained so produce shape model which flexible. Figure 9 show result image of object search which become result image of active shape model.

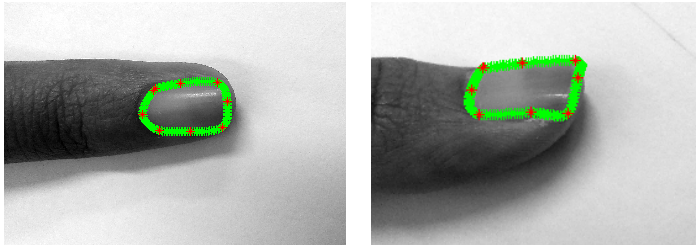

Figure 8. Image in labelling training step

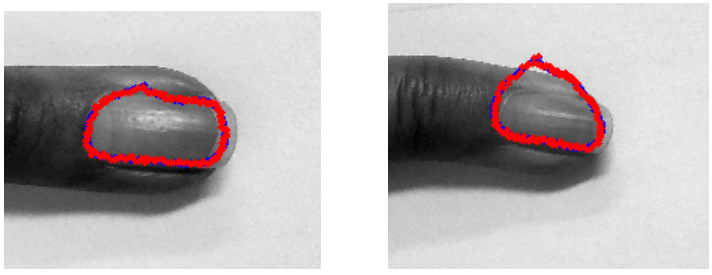

Figure 9. result image of active shape model

Based on Figure 9, it can be seen that the result of segmentation is not too good. In some image object (nail) in image is not detected by active shape otherwise in some image object (nail) in image is well detected. Furthermore, there is part of image is not include of object is detected as well. When active model model is executed, each process of testing data requires 45 minutes. This is because the size of both training data and testing data is 2340 x 4310. So for next research, before grayscaling process there is preprocessing step. Preprocessing step is reduce size or resize.

Therefore for the next research is expected at the beginning will do research that is before the grayscaling process can be done the process of resizing the image becomes smaller (resize). With reduced image size will affect the reduced pixels that must be processed by the active shapes starting from laying the training set to the process of searching the object that will result in active model process running in the not long enough time. Reducing size of image will influence to number of pixel which processed by active shape model and take a short time.

In addition, to improve the accuracy of the active model we must increase number of training data. With the large amount of training data, the shape model of nail will be more various and can be learning process for program in making a flexible shape model of nail.

Conclusions

This paper presents a method for segmentation of hand fingernail image. This process is done by automatically using active shape model. Result of object search in active shape model show nail area is not detected. Time to execute every testing data in active shape model take long time is 45 minutes. However, this work is still in its developing phase. The future work is adding new step before grayscaling process. Its new step is reduce size or resize. Other than that, increasing the amount of training data is one of topic in next research and segmentation process can be done using other technique.

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