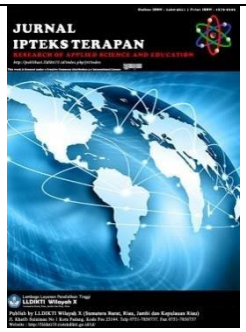

IMAGE SEGMENTATION ON RGB AND HSV VALUE CLASSIFICATION OF A FINGERPRINT OBJECT

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Abstract

Fingerprint identification technology is the most important step in an automatic fingerprint identification system. The purpose of this paper is to introduce an approach to color image segmentation by determining the RGB and HSV values of each threshold value, calculating the distance and, converting the image to the HSV color space. The method used is color segmentation based on values in RGB (red, green, blue) and HSV (Hue Saturation Value). The results obtained are that each value generated for its threshold value for rgb = 2 and hsv = 0.2 will result in an incomplete image of the hsv image as well as the rgb image, if rgb = 3 and hsv = 0.3 then the image for the hsv image the more complete and the rgb is getting smoother and more meeting. the higher the rgb and hsv values, the more unclear the rgb image will be. So it can be concluded that the threshold value of an image with hsv = 0.3 or 5 and rgb = 3 or 5 will get the rgb image smooth and dense and the hsv will be clearer and if it is entered with the value rgb = 3 and hsv = 0.4 then the hsv value clear but incomplete and the rgb image is complete and smooth but not very clear.

Keywords: segmentation, HSV, RGB, threshold

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INTRODUCTION

Current technological improvements and the need to ensure security in every sector with various applications. Biometrics are human characteristics that make up a person's identity, such as heart rate, voice, fingerprints, facial expressions, etc., all of these can be used to determine identity. Fingerprints are the most important and well-known thing. One of the reasons for a fingerprint sensor is that it is the mark that is most often left by someone involved in a crime in a law violation [1]. Segmentation is an activity to separate objects that are of a certain color and texture according to the color reference specified to be separated. In automatic fingerprint identification systems, segmentation of an object also has an important role in increasing detection accuracy and reducing feature extraction computing time [2], also using an RGB area to represent and process color [3]. The lines that form a person's fingerprints is a unique sequence of ridges and furrows. These ridges and grooves have their own uniqueness. Sometimes they end up, sometimes they go their separate ways, and sometimes they cross paths [4]. Changes in the color of red fruit were observed with a decrease in saturation in the red color spectrum range. Our findings suggest that color spectrum fingerprinting can be a useful nondestructive method for monitoring changes in sweet cherry quality during post-harvest handling and shelf life [5]. One of the general parts of a fingerprint recognition system is fingerprint image acquisition, which is a process for obtaining a digital image of a person using a certain sensor [6]. The HSV color scope consists of 3 elements, namely Hue represents color, Saturation represents the level of color dominance, and Value represents the level of brightness. Thus this method tends to detect color and its level of dominance and brightness.

RESEARCH METHODS

Fingerprints are fingerprints that are always left by the perpetrator and are present at the crime scene accidentally around the surface of the crime scene [7]. Fingerprints have created an important biometric technology because of their uniqueness and differences for each person. Moreover, with the increasing popularity of fingerprint technology, especially on mobile phones, technology previously used in the field of criminal investigation is now starting to be commercialized [6]. Image segmentation is one of the main problems in the field of computer vision and image processing. Therefore, fingerprint segmentation is usually the first and most important step in the process of biometric recognition systems based on fingerprints. In addition, the effect of this step directly affects system performance. RGB color space, HSI color space is more widely used in color image segmentation due to clearer color representation through hue information and more natural correspondence with human vision [8].

Every automatic fingerprint identification system precedes the fingerprint segmentation step in its pre-processing phase. The goal of fingerprint segmentation is to separate regions such as

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the spine of the fingerprint from the background. The accuracy of automatic segmentation also depends on how well it includes image feature points [9].

HSV Digital Image defines color in terms of Hue (True Color), Saturation (Color Purity) and Value (Color Brightness). The advantage of HSV is that there are colors that are the same as those captured by the human senses. Meanwhile, the colors formed by other models such as RGB are the result of a mixture of primary colors. Pixel (Picture Elements) color conversion is the value of each matrix entry in the bitmap. The range of pixel values is influenced by the number of colors that can be displayed. If a bitmap can display 256 colors then the pixel values are limited from 0 to 255. A bitmap is considered to have high precision if it can display more colors.

The following equation explains the calculation of the RGB color distance from the given threshold value.

$$RGB = \sqrt{2}(RE + GR + BL \quad \text{.....} . (1)$$

The following equation explains how to calculate the HSV (Hue Saturnation Value) color distance from the given threshold value.

$$HSV = \sqrt{2}(dv + (SR1^2) + (SR2^2) - (2 * SR1 * SR2 * cos(dh))$$

.....(2)

In the segmentation method using HSV color detection, pixel samples are selected as color references to form the desired segment. Digital images use the RGB color model as a color reference standard, therefore the initial process in this method requires converting the RGB color model to HSV. To form segments according to the desired color, tolerance values are determined for each HSV color dimension, then these tolerance values are used in calculating the threshold adaptive process. The results of the threshold process will form a segment area with a color according to the desired tolerance. A depiction of the hue element colors can be seen in Figure 1 .

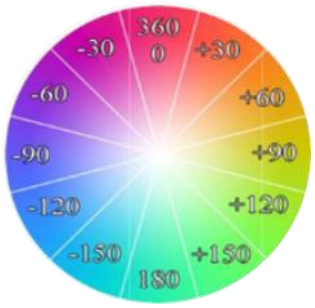

Figure 1. Circle of hue color elements

RESULT AND DISCUSSION

The important steps proposed in the paper are to calculate the color distance of Hue Saturnation Value (HSV) and RGB at each different threshold value. An example of the original image can be seen in Figure 2.

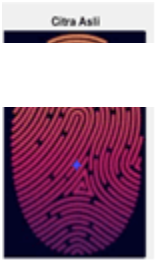

Figure 2. Original fingerprint image

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Image Segmentation in the classification of RGB and HSV values can be seen in Figure 3 and Figure 4.

Resulting image HSV	Value RGB	Valua HSV
	2	0.2
	3	0.3
	4	0.4

Figure 3. Image of HSV results

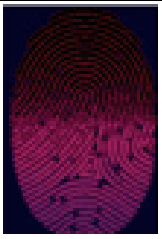
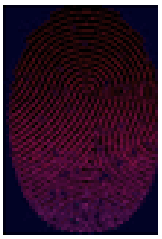
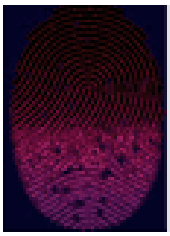
Resulting image HSV	Value RGB	Valua HSV
	2	0.2
	3	0.3
	4	0.4

Figure 4. Image of RGB results

From pictures 3 and 4 produced above, it can be seen that there will be a striking change in the image resulting from HSV, where the lower the HSV value, the clearer the image of the fingerprint will be, and vice versa, the higher the HSV value, the more visible the image will be. increasingly unclear.

Now we compare it with the RGB value =3 and HSV=0.2 and the RGB value =3 and HSV=0.4, seen in Figure 5 and Figure 6.

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Resulting image HSV	Value RGB	Valua HSV
	3	0.2
	3	0.4

Figure 5. HSV image results with HSV = 0.2 and 0.4 with RGB = 3

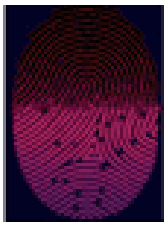
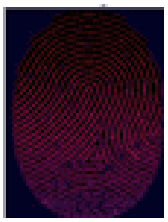
Resulting image HSV	Value RGB	Valua HSV
	3	0.2
	3	0.4

Figure 6. RGB image results with HSV = 0.2 and 0.4 with RGB = 3

From pictures 5 and 6 produced above, it can be seen that there will be a striking change in the image resulting from HSV, where the lower the HSV value, the more unclear the image of the fingerprint will be, and vice versa, the higher the HSV value, the more blurry the image will be. the image becomes clearer.

CONCLUSION

The results obtained are that each value produced for the threshold value for rgb=2 and hsv=0.2 will produce an incomplete image of the hsv image as well as the rgb image, if rgb=3 and hsv=0.3 then the image for the hsv image the more complete and the RGB is smoother and tighter. The higher the RGB and HSV values, the less clear the RGB image will be. So it can be concluded that the threshold value of an image with hsv=0.3 or 5 and rgb=3 or 5 will get a smoother and denser RGB image and the hsv will be clearer and if entered with the value rgb=3 and hsv=0.4 then the hsv value will be clear but not complete and the RGB image is complete and smooth but not too clear. So the segmentation results formed from Rgb values 2, 3 and 4 which are focused on one particular point show that the results of the Rgb segmentation image with rgb=3 and hsv=0.3 produce a clearer/brighter image compared to the other values. In the next research, how to further clarify the resulting image for a higher threshold value.

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