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Identification of Signature Images with Edge Detection Canny

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ABSTRACT

In authenticating and verifying important documents, one of them is in the form of identifying the authenticity of a signature. In addition, the signature is also a form of ratification and a sign of approval in important documents is mandatory. Along with current technological developments, the signing process can be carried out in digital media such as cellphones and other media. The ability of the system to identify a person's signature becomes important because of the many forgeries that occur. This study aims to implement the Canny edge detection method to identify a person's signature. The number of signature images used is 10 signatures. The results of this study indicate that the Canny edge detection method has a similarity percentage of 70% to 100%, and the similarity values below 70% and above 100% are grouped into signature images that are not original.

KEYWORDS: *Edge Detection, Canny, Signature, Image, Technology.*

1.0 INTRODUCTION

One form of technological development is in the form of information delivery. Information technology is currently developing rapidly. Its development can take various forms, one of which is through images. Images in the context of this digital era are referred to as digital images. A digital image is a two-dimensional image consisting of elements with x and y axes where each element is called a pixel and represents the degree of gray.

An image can be edited and imitated the shape of another image by using applications that are available for free. So that image imitation can occur with image editing applications, therefore someone who suspects an edited image must compare it with the original image [1]. Image as one of the multimedia components plays a very important role as a form of visual information. The image has characteristics that are not owned by text data, namely the image is rich with information. One form of digital image is a digital signature.

Signatures have an important role in the ratification and approval of various important documents. A document is considered valid if there is a signature from someone authorized to ratify it [2]. The validity of the signature is very important. There are frequent cases of forgery of signatures, among others, caused by a poor verification system. Signature verification is mostly done manually, namely by comparing directly using the human eye which has many weaknesses [3].

Signature recognition and verification includes two distinct but closely related parts. The first is the identification of the owner of the signature, while the second is the decision whether the signature is genuine or forged. Identification of a signature is included in the problem of pattern recognition (pattern recognition), generally signature recognition has the aim of identifying someone who is part of the security system or security system. Currently, the identification of signatures is still done manually by matching them with the original signatures.

Signature recognition is a difficult problem in pattern recognition, this is because each person's signature has identical but not the same characteristics. With unique characteristics that are different for each person we can use to identify them. In that case we need a software system to analyze and identify a person's signature [4].

To identify a signature can be done by the edge detection method. Edge Detection (Edge Detection) in an image is a process that produces the edges of image objects, the goal is to mark the part that is a detailed image / image to improve the details of the blurry image / image, which occurs due to the effect of image acquisition process A point (x,y) is said to be the edge of an image if the point has a high difference with its neighbors. A common problem is that someone looking for a signature similarity can't come up with the right percentage. Therefore, it needs a way to detect and produce the right percentage of signature similarity. This research implements the Canny Edge Detection method. detect two signatures so as to get the results of the percentage of similarity in the two signatures. Canny edge detection is an algorithm that can be used to identify images. The Canny algorithm has the advantage of being able to provide optimal edge detection results and at the same time providing flexibility [5].

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This study aim is to implement the canny edge detection method and segmentation in detecting signatures by comparing the scanning value and the value in the database, so as to get the percentage of similarity results in the signature. The benefits that can be obtained from this research are to assist management or people in ensuring the truth or validity of a signature by identifying the original signature and the signature to be checked.

2.0 THEORY OF STUDY

2.1. Digital Image

The digital image is a two-dimensional array with the f(x,y) values which have been converted into discrete forms in both the image coordinates and brightness. Image processing in general can be defined as processing a two-dimensional image digitally. Image processing is an image processing and analysis process that involves a lot of visual perception. This process has input data and output information in the form of images [6].

2.2. Image Segmentation

Image segmentation refers to the technique of fracturing a digital image as multiple segments meaning that pixels are positioned, pixels in an identical portion and dependent on some homogeneous state of color, intensity or texture, to monitor and distinguish image artifacts.

2.3 Canny Edge Detection

Edge detection is a vital part in image processing to detect the desired object. Edge detection is to extract the desired information and filter out unwanted information in object detection and further classification. Edge detection recognizes and finds sharp discontinuities and variations in an image [7].

Edge detection contributes a lot of important information. The edge detection algorithm represents an image with a contour that makes it a recognizable object with detected edges [8-9]. One of the most important features of the edge detection method is that precise edge detection accompanies good object orientation in the image [10]. In a study [11], which also uses the Canny edge detection algorithm, it is stated that the Canny algorithm can handle edge detection problems well, which brings advantages for text recognition. Canny edge detection works on three criteria namely: (i) Low error rate Edge points must be localized accurately (iii) There must be only one single edge response [12].

The Canny operator is an optimal edge detector that uses a grayscale image as the input and produces an output image showing the positions of edges tracked by the discontinuousness of the intensity. The Canny detector is applied here because it satisfies three criteria: a low error rate, edge localization, and displaying one response to a single image [13].

2.4 Grayscale RGB Images

Grayscale RGB images: Generally, the images captured by the camera are all colour images, and the images processed by the camera need to be grayscale images. Therefore, when the Canny algorithm is used, the image is first subjected to grayscale processing. Take the colour picture in RGB format as an example, the greying method is usually used as follows: grey = (R + G + B)/3 [14].

3.0 RESEARCH METHOD

The method was used in research activities as following:

1. Literature study

The research begins with an understanding of the material against previous research methods and through several literature reviews, and collecting information from several journals related to the topic.

2. Sample collection

The collection of samples as data to be used in the program is in the form of a signature image that is scanned using a scanner or printer. It can be seen in Figure 1 the stages of image processing process.

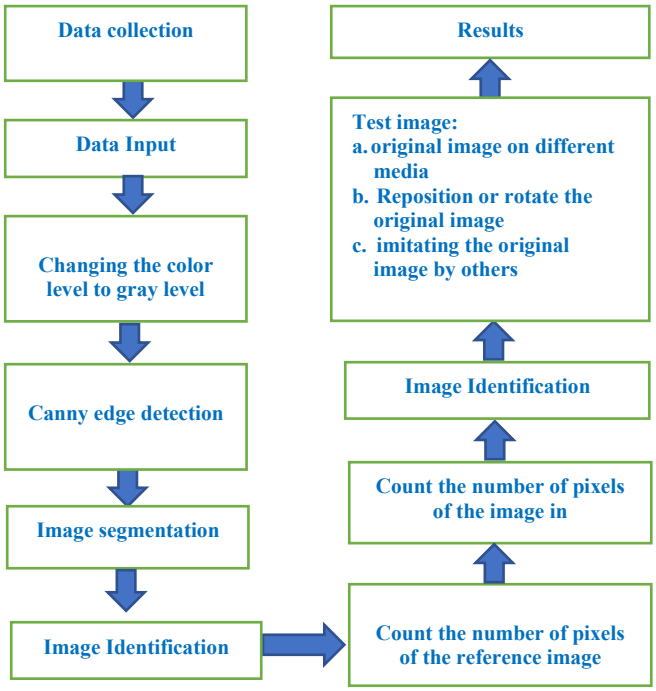

Figure 1: Stages of image processing process

Samples were collected from several students. In this study, 5 student signatures were collected which were used as images. The student's signature image was then changed by adding another image or rotating the image, this is used as a test image or comparison later.

3. Implementation after the image was available

The canny edge detection algorithm was implemented using Matlab software. In Matlab, the syntax was made according to the algorithmic process. So, the signature can be identified. In the syntax, a database process was carried out, which would produce information on the similarity level of the signature image when the testing process was carried out.

4.0 RESULTS AND DISCUSSION

In this research, the following stages are carried out. The activities carried out at the signature image processing stage as

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follows:

1. Data collection, this stage, the original signature image data collection process is carried out. A total of 10 signatures were collected. This signature will later become the original image. An example of an original image is shown in Figure 2.

Figure 2: The original image

2. The collected signatures are entered or stored in a computer system using a scanner. The signature image is saved using the JPG type (Figure 3).

Figure 3: The original image of JPG type

3. For test data or test images, changes are made by adding images to the original image and rotating the original image (Figure 4). This is done to see if the system is able to recognize the original image.

Figure 4: The original image played

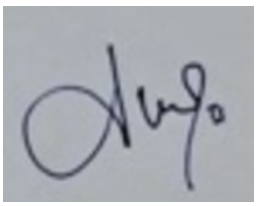

Figure 5: The original image in copy

4. For test data or test images, it is done in three ways, namely:
    a. Testing with original images on different media.
    b. Test by repositioning or rotating the original image.
    b. Testing by imitating the original image by others.

5. Using Matlab software, a syntax is made to perform the signature image identification process. The algorithm process is as follows:
    - Clean the screen
    - Reading the original image
    - Display the original image

Figure 6: An example of the original image

6. Changing the color level to gray level that can be seen in Figure 7.

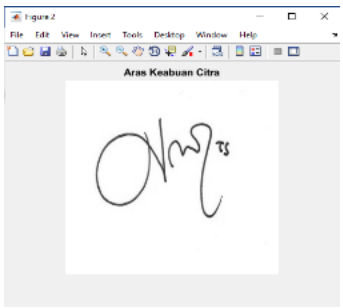

Figure 7: The gray level image

7. Perform edge detection and display edge detection results Edge detection used is Canny edge detection (Figure 8).

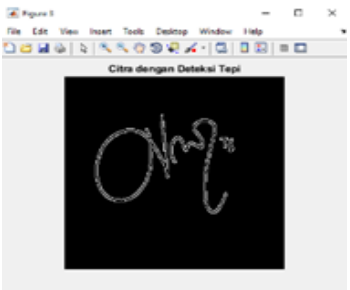

Figure 8: Edge detection image

8. Image segmentation process, the purpose of image segmentation is to partition the image into several non-overlapping regions with homogeneous characteristics, such as intensity, color, and texture (Figure 9).

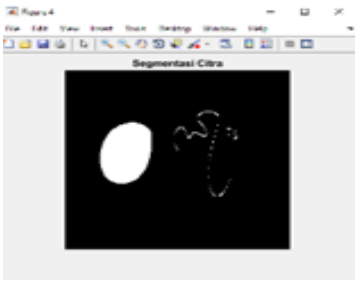

Figure 9: Image result results segmentation

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9. The process of calculating the number of pixels of the reference image. It can be seen in Figure 10.

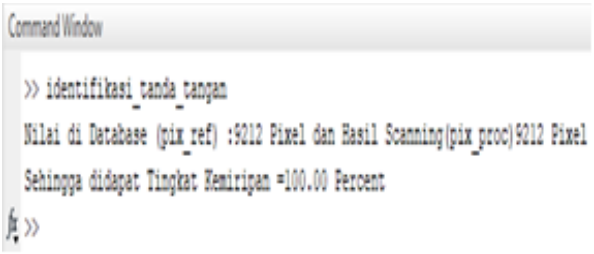


Figure 10: Pixel calculation result

10. This value is stored in the database. The values stored in this database can be used for result information in the form of similarity level information.

The reference number for the similarity value from the results of this study is 70% - 100%. This is obtained from the amount of data tested as many as 13 images data. For the resulting values below 70% and above 100%, the results of the similarity in the signature image test are declared or considered not similar or not original.

In this study, several stages of testing were carried out, which were 3 stages, namely:

a. Test the level of similarity of the signature image with the same signature test image.
From Table 1, which explains the results of image processing for the original image is the same as the test image. It is the same as the image but made on different media. The results will be 100% similar. This explains that the algorithm knows the original image very well.

b. Testing the level of similarity between the signature image and the rotated signature test image.
From Table 2, it can be seen the results of the original image processing were tested with the original image by rotating the image position in the 900, 1800 and 2700 positions. The results of the similarity level obtained from image processing as in Table 2 are 99.88% - 100%. From these results, it is found that the algorithm and the system can recognize the image even though it is in a different position.

c. Testing the level of similarity of the signature image with the signature test image made by others.
From Table 3, it can be seen that the results of the original image processing were tested by imitating the original image by others, the similarity level was above 100%. This shows that the test image is not similar and is not recognized by the algorithm or system because the maximum similarity value is 100%.

Table 1: Image test with the same image for the different media

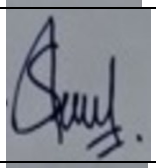
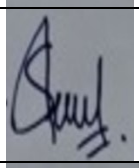
No.	Image 1	Image 2	Percentage of Similarities	Match Results
01.			100	Suitable
02.			100	Suitable
03.			100	Suitable
04.			100	Suitable
05.			100	Suitable

Table 2: Test image with the same image for the position different (played)

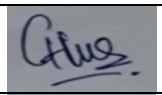
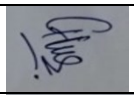
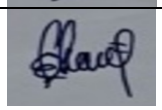
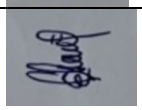
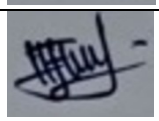
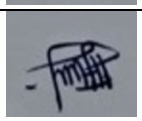
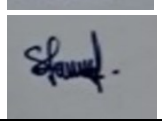
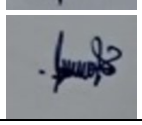
No.	Image 1	Image 2	Percentage of Similarities	Match Results
01.			100	Suable
02.			99.88	Suitable
03.			99.95	Suitable
04.			99.94	Suitable

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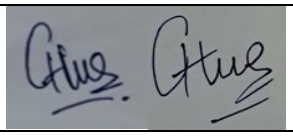
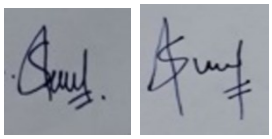
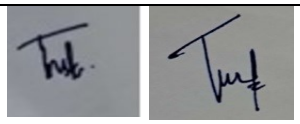
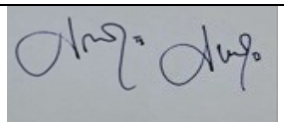
Table 3: Test image with signature images made by other people

No.	Image 1	Image 2	Percentage of Similarities	Match Results
01.			4323	Not suitable
02			12233	Not suitable
03.			6865	Not suitable
04.			2230	Not suitable

5.0 CONCLUSION

Identification of a signature whose original image and test image are the same can be identified with 100% similarity. To identify the test image with the original image that has been changed or rotated, it will be identified as being in the range of 99.88% - 100%, meaning that it can be stated that the signature image is similar or the same. Identification of the original image with the test image in the form of an original image created or imitated by another person will produce a similarity value of 2230% - 12233%, the value is above 100%. From these results it can be concluded that the signature image being tested is not the same as the original signature image because the similarity values below 70% and above 100% are grouped into signature images that are not original. In this case the authors suggest that further research can be carried out by combining signature pattern image detection with signature image identification.

REFERENCES

[1]. Atmaja, N.S. (2022). Implementasi metode levensthein distance dan cosine similarity untuk deteksi kemiripan gambar, *Riau Journal of Computer Science*, 8(2), 85-93.

[2]. Afandi, M.A., Purnama, S.I. & Crisianti, R.F. (2020). Implementasi metode deteksi tepi laplacian dan jarak euclidean untuk identifikasi tanda tangan, *Jurnal Nasional Teknik Elektro*, 9(1).

[3]. Nufus, A.H. (2010). Pendeteksi dan verifikasi tanda tangan menggunakan metode image domain spasial, *Jurnal Sistem Komputer*, 1-8.

[4]. Zaitun, W. & Pauzi, G.A. (2015). Sistem identifikasi dan pengenalan pola citra tanda-tangan menggunakan sistem jaringan saraf tiruan (artificial neural networks) dengan metode backpropagation, *Jurnal Teori dan Aplikasi Fisika*, 03(02).

[5]. Filsa, N., Widodo & Adhi, B.P. (2019). Kinerja algoritma Canny untuk mendeteksi tepi dalam mengidentifikasi tulisan pada citra digital meme, *Jurnal Pinter*, 3(1).

[6]. Sumijan & Purnama, P.A.W. (2021). *Teori dan aplikasi pengolahan citra digital penerapan dalam bidang citra medis*. Penerbit Insan Cendekia Mandiri, Solok.

[7]. Baloch, A., Memo, T.D., Memo, F., Lal, B., Viyas, V. & Jan, T. (2021). Hardware synthesize and performance analysis of intelligent transportation using Canny edge detection algorith, *International Journal Engineering and Manufacture*, 22-32.

[8]. Yang, A., Jiang, W. & Chen, L. (2017). *An adaptive edge detection algorithm based on improved canny*. In Advanced Computational Methods in Life System Modeling and Simulation, 566-575. Springer, Singapore.

[9]. Tariq, N., Hamzah, R.A., Ng, T.F., Wang, S.L. & Ibrahim, H. (2021). Quality assessment methods to evaluate the performance of edge detection algorithms for digital image: A systematic literature review, *IEEE Access*, 10.1109/ACCESS.2021.3089210, 9, (87763-87776).

[10]. Maliki, I. & Sidik, M.A. (2020). Personality prediction system based on signatures using machine learning, *IOP Conference Series: Materials Science and Engineering*.

[11]. Wu, F., Zhu, C., Xu, J., Bhatt, M.W. & Sharma, A. (2022). Research on image text recognition based on canny edge detection algorithm and k-means algorithm, *International Journal System Assurance Engineering Management*, 13(1), 72-80. doi: 10.1007/s13198-021-01262-0.

[12]. Owotogbe, J.S., Ibiyemi, T.S. & Adu, B.A. (2019). Edge detection techniques on digital images - A review, *International Journal of Innovative Science and Research Technology,* 4(11), 329-332.

[13]. Al-Hafiz, F., Al-Megren, S. & Kurdi, H. (2018). Red blood cell segmentation by thresholding and Canny detector, *Procedia Computer Science*, 141, 327-334.

[14]. Xu, H., Xu, X. & Zuo, Y. (2019). Applying morphology to improve Canny operator's image segmentation method, *The Journal of Engineering*, 2019(23), 8816-8819. doi: 10.1049/joe.2018.9113.