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CANNY EDGE DETECTION AND IMAGE SEGMENTATION FOR PRECISION FACE RECOGNITION SYSTEM

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Abstract: Facial recognition is widely used in areas such as video surveillance and database management. Facial images have been used as a preferred biometric feature in many identity recognition systems to obtain good image results in image segmentation. A good image must pay attention to several factors, namely high resolution, good contrast, image sharpness, consistent colors, lack of noise and appropriate lighting conditions. In this face recognition research, using canny edge detection method for 10 original images paired with 10 other images. The original faces taken are male and female. Canny edge detection has a low error rate in image segmentation compared to other edge detections. The purpose of this study is to determine the edge of the image in I-rat and can display the results of a good segmentation of facial images. The results of the test data with data stored in the database in the study is 1 face image produces 67.69% accuracy and 26.92% and 8 other face images produce 100% accuracy. The average success rate of 10 experiments using image segmentation is 89.461%. In conclusion, the canny edge detection method can provide accurate results in the face recognition process.

Keywords: accuracy; canny edge detection; face recognition; image; segmentation

Abstrak : Pengenalan wajah banyak digunakan dalam diberbagai bidang seperti pengawasan video dan manajemen basis data. Gambar wajah telah digunakan sebagai ciri biometrik yang disukai di banyak sistem pengenalan identitas untuk mendapatkan hasil citra yang bagus dalam segmentasi citra. Citra yang baik harus memperhatikan beberapa faktor yaitu resolusi tinggi, kontras yang baik, ketajaman citra, warna yang konsisten, kurangnya noise dan kondisi pencahayaan yang sesuai. Pada penelitian pengenalan wajah ini, menggunakan metode deteksi tepi canny untuk 10 citra asli yang dipasangkan dengan 10 citra lainnya. Wajah asli yang diambil berjenis kelamin laki-laki dan perempuan. Deteksi tepi canny memiliki tingkat kesalahan rendah dalam segmentasi citra dibandingkan dengan deteksi tepi lainnya. Tujuan dari penelitian ini adalah menentukan tepi gambar secara akurat dan dapat menampilkan hasil segmentasi citra wajah yang baik. Hasil dari data uji dengan data yang tersimpan di database dalam penelitian adalah 1 citra wajah menghasilkan akurasi 67,69% dan 26,92% dan 8 citra wajah lainnya menghasilkan akurasi 100%. Rata-rata tingkat keberhasilan dari 10 kali percobaan dengan menggunakan segmentasi citra adalah 89,461%. Kesimpulan, metode deteksi tepi canny dapat memberikan hasil yang akurat dalam proses pengenalan wajah.

Kata Kunci : akurasi; deteksi tepi canny; citra; pengenalan wajah; segmentasi

INTRODUCTION

Nowadays, facial recognition is widely used in computer vision. Facial recognition continues to improve day by day in areas such as video surveillance and database management as spatial feature analysis is critical[1]. Face recognition based on image sets is an important topic in Computer Vision[2].

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As one of the most natural clues to identifying individuals, facial images have been used as the preferred biometric trait in many identity recognition sys tems[3]. Facial recognition that protects privacy involves at least two main parties: one party needs to recognize the image (Party 1), and the other party holds the image database (Party 2) to obtain the desired result[4].

Digital images can be obtained automatically from a digital image captu re system that performs the process of capturing a three-dimensional object and forming a matrix in which the elements express the value of light intensity[5]. In facial recognition light factor is very influential once in the process of extrac tion, segmentation and pengalan other images[6].

Segmentation process the process of separating an image into independent objects according to the intensity of its pixels. It is applied in several areas such as medicine, agriculture and surveillance. One approach the most important and effective for image segmentation is thresholding[7].

In addition to thresholding, edge detection plays an important role in the world of image processing, and is a versatile tool in pattern recognition, ima ge segmentation, contour detection, and feature extraction[8],[9],[10]. Traditional edge detection techniques include robe rts, prewitt, sobel and canny. Improve ments to traditional edge detection techni ques are still being made today. In recent years, edge detection is used for the detection of overlapping objects such as circles [11],[12].

Canny edge detection can detect image edges from the original(initial) ima ge with very few errors and is designed to output a very optimal and good image edge[13],[14].

There are several related research related to facial images from previous research, namely Face Detection and tracking using hybridmargin-based ROI techniques[15]. Real-time Face Detection architecture design for heterogeneous system-on-chip[16].

This study involves multiple thresholding and edge detection methods. First, the face image is taken as input and converted into binary image for processing, then the image is processed by canny method. To get a better calculation then the image segmentation. With image segmentation can get the level of similarity of the paired face image.

Some common criteria for performi ng edge detection in Canny methods[17] include edge detection with a low error rate, which means that the detection must accurately capture as many edges as possible displayed in the image[18]. The detected edge point of the operator must be accurately localized in the center of the edge[19]. Certain edges in the image should only be marked once, and if poss ible, image noise should not create false edges[20].

In addition, the light factor is very influential in the face recognition process in image segmentation. Face recognition performed with traditional edge detection such as sobel, roberts and prewitt is still not good so canny edge detection is needed in pattern recognition. This study aims to determine the performance of canny edge detection in the face recog nition process.

METHOD

This study introduces a new appro ach to face pattern recognition by using canny edge detection and determining the

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accuracy of matching the original face pattern with the specified face pattern pair. Image 1 shows the research frame work of this study:

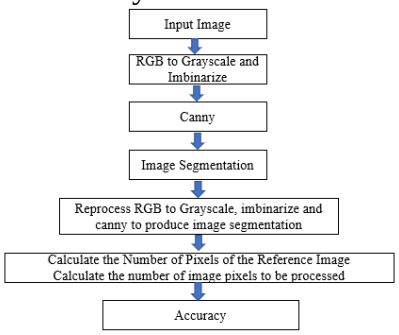

Image 1. Research Framework

Image Input

The Input used in this study there are 20 facial images. This face Image will be the process of looking for facial simila rities with a partner. the image, and perfo rm morphological operations to impro ve the segmentation results. Display the image of segmentation results.

RGB to Grayscale and imbinarize

Converts the input face image to grayscale (rgb2gray) and performs bina rization using the imbinarize function and displays the grayscale face image.

Canny

Apply edge detection using Can ny method and display the edge detection image. Canny 3x3 kernels can be learned with the following values:

$$Gx = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$$

$$Gy = \begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix}$$

Image Segmentation

Fill in the holes in the image, clean the edges that are connected to the edges of the image, and perform morpho logical operations to improve the segmentation results. Display the image of segmentation results.

Reprocess RGB to Grayscale, imbinari ze and canny to produce image segme ntation

Read the next input image, perfo rm RGB to grayscale, imbinarize and canny operations to display the segmented image.

Calculate the Number of pixels of the Reference Image and Calculate the number of image pixels to be processed

Calculates the number of pixels of the reference image and the image of the scanning results. The result is compared the number of pixels and calculated the degree of similarity.

Accuracy

Provides information about the degree of similarity between two images based on the number of corresponding pixels in the form of a percentage(%).

RESULT AND DISCUSSION

In this subsection, we describe the results obtained at each procedural stage and further engage in a comprehensive discourse on the previously described results. The results of the study, includes images generated through different phases of the original image of the face, the original image pair face, canny edge detection, segmentation of the image and the results of the image accuracy.

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Image 2. Original Image Of The Face

Image 3. Couples Original Image Of The Face

From the original image of the face, there are two original images that are paired to get the image segmentation results. The original image pair can be seen in Table 1.

The results of image segmentation of the original image and the original image pair selected can be seen from Table 2. The results of the pair of test images (pixel) and database images (pixel) obtained the value of accuracy, error and identification results, the results can be seen in Table 3. The results of the percentage of faces for the original face image experiment 10-fold and pairs of original face images can be seen in Table 4.

Table 1. Canny Edge Detection

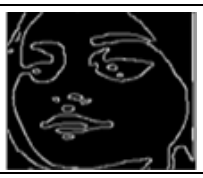
No	Citra Image	Canny Edge Detection	No	Citra Image	Canny Edge Detection
1	face1 with face11		6	face6 with face16	
2	face2 with face12		7	face7 with face17	
3	face3 with face13		8	face8 with face18	
4	face4 with face14		9	face9 with face19	
5	face5 with face15		10	face10 with face20	

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Table 2. Segmentation Image

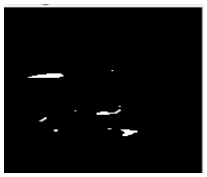
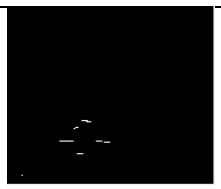
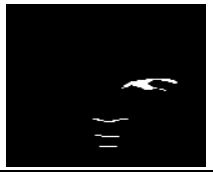
No	Input Image	Database Image	No	Input Image	Database Image
1			6		
2			7		
3			8		
4			9		
5			10		

Table 3. Identification Result

No	Test Image (Pixel)	Database Image (Pixel)	Accuracy (%)	Error (%)	Identification Result
1	337	337	100	0	Matching
2	55	55	100	0	Matching
3	27	27	100	0	Matching
4	159	159	100	0	Matching
5	533	533	100	0	Matching
6	132	132	100	0	Matching
7	32	32	100	0	Matching
8	634	634	100	0	Matching
9	130	35	26,92	73,08	Not Matching
10	130	88	67,69	32,31	Not Matching

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Table 4. Percentage Similarity

No	Number of Face Pixels in the Database	Number of Face Pixels Scanned	Similarity Percentage
1	337	337	100%
2	55	55	100%
3	27	27	100%
4	159	159	100%
5	533	533	100%
6	132	132	100%
7	32	32	100%
8	634	634	100%
9	130	35	26,92%
10	130	88	67,69%
		Rata-rata	89,461%

CONCLUSION

The results found by using the canny edge detection method produces 8 original face images with original face pairs getting 100% accuracy and 2 other images produce different values. The average success rate of this study was 88.461%.

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