Jurnal Mantik, 6 (1) (2022) 36-42

Published by:Institute of Computer Science (IOCS)

Jurnal Mantik

Journal homepage: www.iocscience.org/ejournal/index.php/mantik/index

Comparison Analysis of Montford Similarity and Mean Manhattan Distance Methods in Recognizing Human Nose Pattern

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A R T I C L E I N F O

Article history:

Received: Mar 06, 2022
Revised: Apr 15, 2022
Accepted: May 09, 2022

Keywords:

Image Processing,
Pattern Recognition,
Binary Similarity,
Human Nose

A B S T R A C T

When you meet someone you just met, the face is the first part that becomes a marker in the brain recording. The face consists of eyes, nose, and mouth which must have different shapes from one human to another, one of the most prominent parts of the face is the nose, the nose is also one of the important icons for women or men in supporting their appearance, this is proven With the increasing number of cases of plastic surgery being carried out in order to get the best nose results, to perform the rhinoplasty, it is necessary to know in advance the type of nose to be operated on. There are several nose patterns on the human face, namely, sharp, pug, small and large. The purpose of this study is to build an application to recognize the human nose pattern on the front view by comparing two algorithms, namely Montford Similarity and Mean Manhattan Distance to determine the performance of each of these algorithms in processing data on the image of the human nose so that the application can be used. for the development of nasal pattern stages with other positions. The research method consists of several stages, namely the image input stage, image resizing, grayscale and the last stage is calculating the energy value of Montford Similarity and Mean Manhattan.

1. Introduction

The face is a marker to recognize someone who has just been recognized, when meeting someone, the thing that becomes the center of attention is the part of the face consisting of the eyes, nose and lips. The nose is one part that is very concerned about by someone to support appearance, as evidenced by the increasing number of nose surgery performed by various parties to get a better nose pattern. In the medical world, rhinoplasty can be performed if the nose pattern can be identified. In the field of psychology, the nose has an important role in reading a person's character, this depends on the type of nose that a person has.

The rapid development of information technology in various fields has given birth to various kinds of applications that can help complete human work, one of the developments in information technology is the application of Computer Vision in image recognition or computer imagery by applying methods or algorithms that are in accordance with the existing problems.

Many algorithms can be used in building an image pattern recognition application, such as approaching the distance value (Distance) to get the level of similarity (Similarity) between the binary value of the image being trained (Training) and the image being tested (Testing). In this study, a comparison will be made of the results of the distance algorithm, namely the Mean Manhattan Distance and the Montford Similarity algorithm, to determine the performance of each algorithm.

Dwi Nugraheny (2015) in his research entitled "Method of Distance Values for Similarities or Similarities of Characteristics of an Image (Cumulonimbus Cloud Detection Case Using Principal Component Analysis)" suggests that the distance determination method using the Manhattan Distance for

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similarity in the cloud detection case has a percentage of 90 %. So this algorithm is considered accurate in recognizing image patterns. The specific purpose of this research is to build a human nose pattern recognition application using the Mean Manhattan Distance and Montford Similarity algorithms to determine the performance results of the algorithm.

2. Method

In this study, all the initial research procedures must first have been carried out such as a library study which was carried out by collecting and reading and understanding references related to the problem. collect and read and understand references related to the development problem of the Human Nose Pattern recognition application. The research framework is as follows:

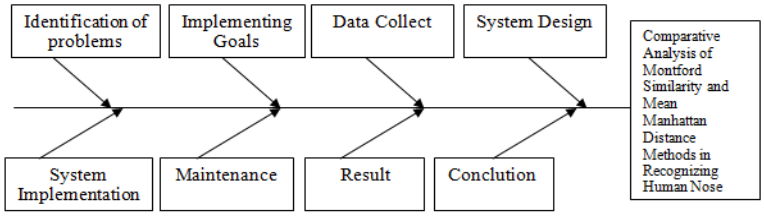

Figure 1. ResearchFlow

The system will accept any input nose pattern image, the image will be grayscaled first to unify the RGB components of the original image in order to facilitate the detection of the image that will be represented in the form of one channel, and ends with edge detection through the convolution process. In the main process, computing using Similarity, the nose pattern vector will be tested to get a weight matrix that is similar to the training weight that has been obtained. The computational weights are used as a test matrix as figure Below:

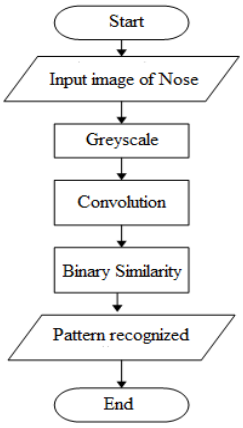

Figure 2. Nose pattern training system schematic

The initial stage starts from inputting a digital image that includes a nose image, Digital image is a unity of various elements consisting of brightness (brightness), contrast (contrast), contour (contour), color (color), shape (shape), and texture (texture). A digital image is an array containing real or complex values which are represented by a certain sequence of bits[2]. In general, digital image processing refers to a 2-dimensional image using a computer. in a broader context, digital image processing refers to any question of 2-dimensional data. certain.an image with f(x,y) whose value is digitized both in spatial coordinates and in gray level. Digitalization of the spatial coordinates of an image is called image sampling. While the digitization of the gray level image is called gray-level

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quantization. The value of the matrix element shows the gray level at that point. then perform the conversion of digital grayscale images. Digital images include Color image or RGB (Red, Green, Blue)A black and white (greyscale, digital image, Color, Shape and Texture: the spatial distribution of the degree of gray in a set of neighboring pixels. then the process of detecting each edge value in the image known as convolution, then entering the value calculation process with the binary siilarity method. The stages of the Binary Similarity process:

a. Input the calculated convolution image value
b. The system will read the value of the training pattern vector (i) and the test pattern (j)
c. Initialize the values a, b, c and d obtained based on vectors I and j
d. The system calculates the Peirce Similarity energy by adding the number of coordinate values of ab and bc, and dividing by the number of coordinate values of ab plus the value of 2bc coordinates and adding the number of values of cd coordinates. These steps are repeated until the value of s_p meets the maximum iteration.
e. If the maximum value of s_p is less than 1, it will be continued to the next stage, and if it does not meet the maximum value, the system will recalculate as in the second stage
f. The output is a Peirce similarity value.

The definition of binary similarity and distance measures can be expressed from Operational Taxonomic Units (OTUs). As table 2 below:

TABLE 2
OTUS TABLE

I / J	I (presence)	0 (absence)	sum
I (presence)	a = i · j	b = $\bar{i}$. j	a + b
0 (absence)	c = i . $\bar{j}$	d = $\bar{i}$. $\bar{j}$	c + d
Sum	a + c	b + d	n = a + b + c + d

Information:
a is the sum of the values of vector i,j which has a value of (1,1) b is the sum of the values of vector i,j which has a value of (0,1) c is the sum of the values of vector i,j which has a value of (1,0) d is the sum of the values of the vector i,j which has the value (0,0)
0.5 is the determination of the formula [3]
Terms of Montford similarity:

$$S_M = \frac{a}{0{,}5\,(ab+ac)+\,bc} \quad \text{.....(2)}$$

Terms of Mean- Manhattan Distance :

$$D_{Md} = \frac{b+c}{a+b+c+d} \quad \text{.....(3)}$$

Physiognomy is the art of reading faces by observing the shape of the eyes, nose, eyebrows, lips and others. This science allows us to read parts of the face that can convey the definition of human character. Recently, the increasing level of human population has also had an impact on the high level of human psychological needs in reading the characters of people in everyday life. The limited number of psychologists compared to the human population, does not allow psychologists to read the character of every human being[17].

3. Result and Discussion

The results discussed are in the form of performance and appearance of the system built. The appearance of the system built is as follows:

a. Main Form

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Figure 3. Main Form

The Main Form is the form that becomes the initial display of the many forms available in this application. 3 buttons to choose from, namely Nose Detection, Help and Exit. The Nose Detection Button functions to display the nose Pattern Recognition form, the Help button serves to display the Help form or tutorial regarding the nose pattern recognition system, the Exit Button functions to close the running application, Here is an image for the main form:

b. Nose Detection Form

The following is a display of the training process and the test process used:

Figure 4. Training display

This nose detection form consists of two columns, namely the Training and Testing column. The image input step can be accessed by pressing the "Select Image" button in the training column which will load the nose input image to be trained. In the training column there are 4 buttons for planting the weights of the training values for each implanted nose pattern. Then there are also several select and test buttons in the test column that are used to identify each nose pattern to be tested.

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Figure 5. Testing display

Measurement of system performance is carried out based on the measurement of all test data based on certain specifications or introductions which are correlated with the amount of training data used. Some of the results of measuring the performance of the system against testing on the nose pattern.

TABLE 3
MEAN MANHATTAN ALGORITHM PERFORMANCE RESULTS

NO	Training Image	Testing Image	*Detection Rate*	*False Rate*	Persentace
1.	mancung	5	3	3	73%
2.	Pesek	6	4	2	70%
3.	kecil	4	4	3	65%
4.	Besar	6	4	2	50%
5	Total	21	13	11	
Persentace of Mean Manhattan		= Total Detecton Rate/ total Testing Image = 15/21 x100% = 71%			

In this study, the sample testing images used were 5 images of the high nose pattern, 6 images of the flat nose pattern, 4 images of the small nose pattern and 6 images of the large nose pattern, so that the total images used were 21 samples. Detection Rate is the number of images that have been recognized by the system while False Rate is an image that is wrong or unknown to the system, so the percentage value of the Manhattan Method is, the total number of Detection Rates is divided by the total total sample image used and multiplied by 100% to get by 71%.

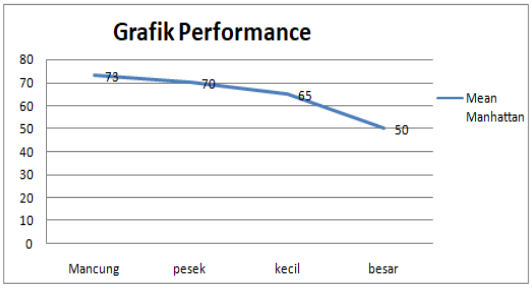

Figure 6. Performance Graph For Manhattan Mean Algorithm

While the graph above is a visual display of the detection of the human nose pattern using the Mean Manhattan method. for the highest Detection Rate value, it falls on the high nose pattern of 73 %. Next, we will do a work test on the Monford method in recognizing the human nose pattern

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TABLE 4
MOUNTFORD ALGORITHM PERFORMANCE RESULTS

NO	Training Image	Testing Image	*Detection Rate*	*False Rate*	Persentace
1.	mancung	5	3	3	60%
2.	Pesek	6	4	2	66%
3.	kecil	4	4	3	75%
4.	Besar	6	4	2	50%
5	Total	21	13	11	
Persentace of Mounford		= Total Detecton Rate/ total Testing Image = 13: 21 x100% = 62%			

The same as the process of finding the percentage value of the Manhattan mean method, the Mountford method also uses the total detection rate divided by the total image used and divided by 100% so that the results are 62% where it can be concluded that the mean Manhattan distance is much more accurate in recognizing human nose patterns.

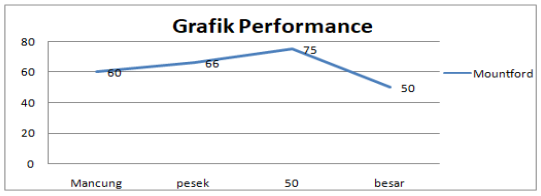

Figure 7. Performance Graph For Mounford Algorithm

While the graph above is a visual display of the detection of the human nose pattern using the Mountford method. for the highest Detection Rate value, it falls on the Small nose pattern of 75 %

4. Conclusion

The conclusions of this study are: Nose pattern recognition system will be easy to recognize if the scanned image is not broken and can be seen clearly. Samples of nose image patterns that are used as training have an impact on the high percentage of nose recognition success. In addition, the similarity factor for each nose pattern is one of the weaknesses in this system, because the system will have a very thin value for these patterns so that a false positive rate will appear. The Mean Manhattan Algorithm is superior in detecting the Nose pattern with a percentage of 71% while the Mounford Algorithm is 62%.

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