Handwriting Analysis Of Detection Method Chalkboard *Perceptron*

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1. Introduction

1.1 Background

According to the meaning literally, the image *(image)*is a two-dimensional image on the field. Judging from the mathematical point of view, the image is a continuous function *(continue)* the intensity of light in the two-dimensional plane. The light source illuminates an object, then the object reflects back a portion of the light beam. This light reflection is captured by optical devices, such as the human eye, a camera, scanner, and others so that the shadow of the object in the form of the image can be recorded (Sitorus, Syahriol, 2006). In scientific writing, the author analyzes on the detection of handwriting on a blackboard. Handwriting recognition is one area of pattern recognition and is a part of computer sciencefield *Computervision* and artificial intelligenceis being developed at this time. While the blackboard were planks of wood with a surface that can be rewritten by using markers. Chalkboard ancient times was made of a thin sheet of slate black or gray. Chalkboard is now made of sheets of thin boards painted with glossy paint, usually white. Whiteboards are commonly used in schools and educational institutions. With a variation of a wide variety of reasons. Chalkboard often unpopular student with written reasons lecturer on the board can not read, so difficult to understand. Although today already use the power points to give the material to the students, but professors are less satisfied if it is not explained on the board as well, because university student would be difficult to understand if it is through the power points. Therefore there is need for a tool that can make the handwriting on the board can be viewed and read by the students clearly, making it easy to understand the material presented by the lecturers. Some of the reasons that caused the system difficult to determine the degree of fit / accuracy of handwriting, which are due to the many variations of handwritten characters.

Pattern recognition is a process of grouping each sample is measured or observed data as a member on several classified or category. Because the pattern recognition is the basic attributes of human and other living beings, it is taken for granted as long. We are now going to find a mechanism that they know, simulate it, and put it into action with modern technology while that for humans. Design system to simulate human recognition, where the nacquis sition information via sensory organ, the processing of this information and make a decision through the brain mainly involved. Pattern recognition is a branch of artificial intelligence. It is a 'wide range of subject disciplines. It is currently a challenge scientists and engineers in various disciplines. Electrical and computer scientists and angineers who worked on this case: psychologists, doctors, biologists, neurophysiologists also working on this case. (Sing T. Bow - 2002) Based on the above background, in this analysis will analyze handwriting by applying *perceptron.* The title of this analysis is**"Analysis of the detection of handwriting on the blackboard using perceptron"** is expected by using *perceptron* this the handwriting on the board a clear bias to writing.

2. Basis Theory

2.1 Literature Review

The first study, entitled "Implementation Method to Detect Hidden Markov Model Handwriting" From Dr. Ir. Bambang Hidayat, DEA, Eka Farda Yuwitaning, Nur Andini, ST, MT (2007). The core of the system defect detection on the letter that comprises the stages of feature extraction and classification. Classification stage used for *Hidden Markof Models* (HMM), which has been implemented in several cases of character recognition using image acquisition *online* and *offline* in the process of classification. HMM is a statistical model, wherein the model system is assumed to be a Markov

process with a hidden parameter. The goal is to determine the parameters that can be observed. The introduction process is done by looking for characters that provide the greatest opportunity to the emergence of the observation sequence in the HMM models.

The second study entitled "Measurement of Handwriting Recognition Using Perceptron And Fuzzy Logic" From Iriansyah BM Sangadji, Meilia Nur Indah Susanti (2008). Handwriting recognition is one field of pattern recognition and is a part of computer science in Computer Vision and artificial intelligence are emerging today. The system can read the degree of fit somebody's handwriting constantly evolving with several models of new solutions to many experiments have do with various methods for recognizing handwritten characters are several reasons why the system difficult to determine the degree of fit / accuracy of handwriting, such as the many variations of the written characters hand. In this method, handwritten letters changed into the form of a matrix with a size of 38x35. These matrices will be used in the process of recognition and training using artificial neural network (ANN) models perceptron. While the use of fuzzy logic is to determine the status of handwritten who have been trained by the percentage of errors, whether recognized or not.

The third study, entitled "Designing Applications For Handwrite Character Recognition Method Using Nguyen Widrow" Of Fate Ridwan Manalu, Pilipus Tarigan (2016). An artificial neural network is one of the information processing system that is designed to mimic the way the human brain works in resolving a problem with the learning process through synapses weight changes. An artificial neural network is able to carry out the introduction of activity based on past data. Past data will be studied by an artificial neural network that has the capability to give a decision on the data that has never been studied. These developments along with the emergence of various problems that can not be solved efficiently by conventional computing process because existing algorithms can not be formulated explicitly and require large amounts of information. (Kris, 2004). One application of the processing pattern is the pattern recognition of handwritten characters by changing the pattern of handwriting into digital form and then make an image of the pattern recognition process. Pattern recognition is the process of grouping data based on numeric and symbolic nature of its patterns. Character is a description, behavior, or characteristic. Writing is a way that humans often used in correspondence using stationery.

The fourth study, entitled "Pattern Recognition Handwriting Java Script Using Multi Layer Perceptron" From Madha Christian Wibowo, I Dewa Gede Rai Mardiana, Sandy Wirakusuma (2015). Java script consists of basic consonants, vowels, numbers, couple, pangkon, and punctuation. The shape of the most basic Java script is a basic consonant alphabet, called Java script Nglegena. Nglegena Java script consists of 20 letters, each letter represents a syllable with a particular sound.
Wirakusuma Wibowo and try to make the application of optical character recognition (OCR) to convert existing Java script written in ancient documents into digital text using a model of multi-layer perceptron (MLP). Java script that is used only five letters, "Ha", "Na", "Ca", "Ra" and "Ka". All samples were used as training material can be identified. However, of the 25 new samples were tested only 14 samples were successfully detected properly. While Hasibuan using self organizing map (SOM) to perform pattern recognition on Java script typefaces with an average success rate reached 75.5%. Basu and Das has managed to recognize handwriting patterns for numbers and letters Bangla and Arabic numerals using MLP with an average success rate above 75%. But they use is the writing that has been extracted image characteristics.

3. Analysis Of Results And Discussion

3.1 Discussion

3.1.1 System Overview

The main purpose of scientific writing is to create a system that can make the detection of handwriting. A flow chart of the system are made can be described as in Figure 7.

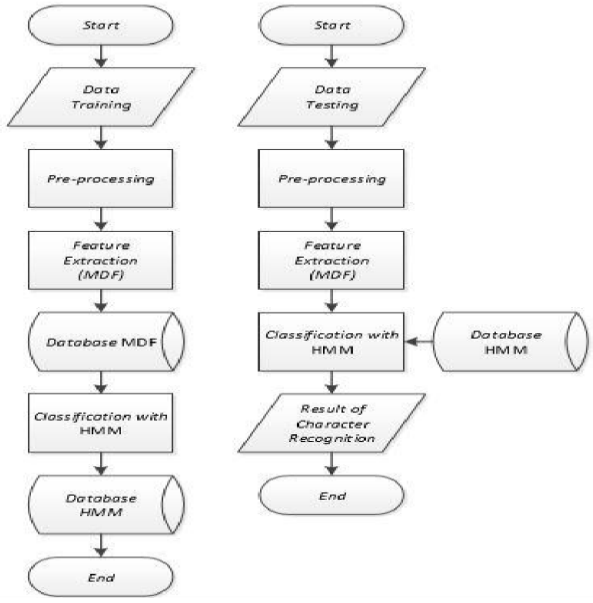

Figure 1 Flowchart System

Initial phaseis looking for a training data with a wide variety of handwriting. On the board 30 writes each capital letter A to Z, the letters a to z and the numbers 0 through 9, it is necessary for a neat handwriting in order to obtain a good characteristic as training data. Then the total test data is processed for the system is 90 test images.

1. Pre-processing

stage of pre-processing performed on the input image is good for training data and test data. Here Figure 2 which is a block diagram to explain the process in the preprocessing stage.

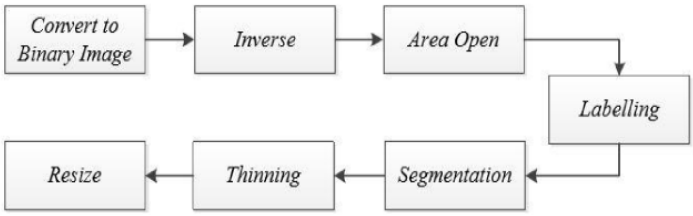

Figure 2. Pre-processing Block Diagram

A. Area Open

Aims to eliminate pixels that are not part of the character, that is by looking at the number of pixels in an area. If less than the specified limit value, then the pixel used as background.

B.Labeling

Labeling here is to provide a sign for each character, it is used to split the image according to the number of characters. The number of characters equal to the number of labels obtained.

C. Segmentation

Of the characters that have been tagged with that label, then the next step is to take the appropriate image of her character.

D. Thinning

From the image of the characters that have been separated, and then the image thinned be one pixel is further used for feature extraction with MDF.

E. Resize

R*esize* intended that each processed image has the same size, It aims to improve the accuracy of the analysis.

2. Modified Direction Feature (MDF)

After the *pre-processing* stage is then performed is looking for feature vector of each character has been segmented using the feature extraction method *Modified Direction Feature* (MDF).

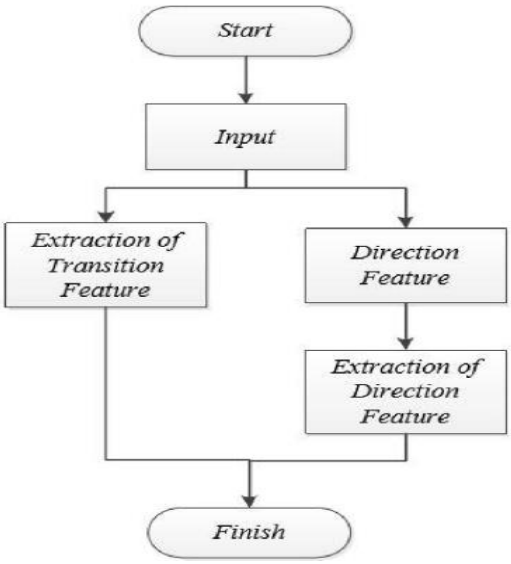

Figure 3 Flowchart (MDF)

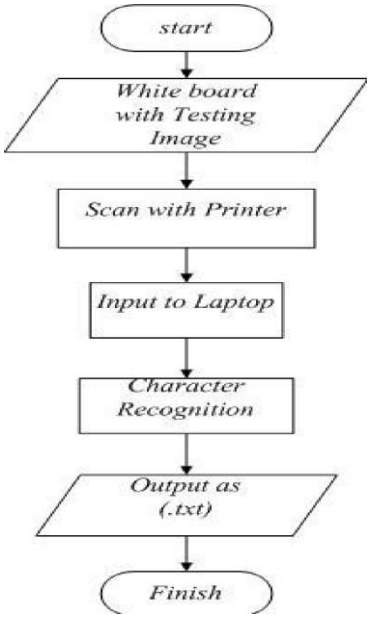

Figure 4 Flowchart System Testing

Process in Figure 3 is an important step in the introduction of letter patterns. This feature extraction zoomed observation room into unique patterns by each letter of an image. Results of the calculations on the *direction feature* transition and each feature has a value which is characteristic of its own.

3.1.2 System Testing

The overall system testing process to get the results can be seen in Figure 10.

1. To test the system work that has been made take one random test images of 30 people with the format (.jpg) which has a wide variety of posts on the board.
2. The blackboard is further in *scanning* with the *scanner*.
3. Enter the test data into programs that have been created for processing and character recognition process is carried out.
4. The output of the data in the form of a text format (.txt).

3.1.3 System Performance

The performance of the system is measured based on the following parameters:

1. Accuracy System

Accuracy is a measure of the accuracy of the system in recognizing handwritten characters and match with the data in the database.acquisition

Mathematically system can be done as in equations 1 and 2 below.

$$\text{ᵲ} = \frac{jumlah\_karakter\_yang\_salah}{jumlah\_karakter\_keseluruhan} x100\% \qquad (1)$$

$$\text{ɯrasi} = \frac{Jumlah\_karakter\_yang\_benar}{Jumlah\_karakter\_keseluruhan} x100\% \qquad (2)$$

2. Time Computing

Computing time is the time it takes the system to perform a process. In this system, the computing time is calculated using *toolbox* the existingdiMatlab, so we get the computing system.

3.2 Results

Table 1 percentage errors in the results of training for each respondent with the target respondent 1 handwriting:

Table 1. Handwriting respondent 1

NO	Kata	Persentase kesalahan	
		Responden 1 (%)	Responden 2 (%)
1	aku	5.7895	9.6241
2	kamu	4.6617	8.2519
3	dia	4.8747	8.7093
4	cinta	6.015	8.6165
5	salah	3.9699	6.0902
6	benar	0.0376	3.8722
7	wah	6.5915	10.0637
8	pusing	0.4323	4.0038
9	bingung	3.1767	9.0038
10	di	2.4962	6.6466
11	rumah	1.2782	5.6892
12	Aja	0	0.3759
13	lah	7.203	14.7368

NO	Kata	Persentase kesalahan		
		Responden 1	Responden 2	Responden 3
1	aku	7.9198	8.8221	9.7995
2	kamu	6.0338	5.4887	3.8722
3	dia	5.6767	5.614	9.6366
4	cinta	5.1729	3.6692	6.9173
5	salah	4.3459	3.7594	4.6165
6	benar	0.0752	0.3383	1.5038
7	wah	6.9173	5.3383	7.6065
8	pusing	1.485	1.203	4.1729
9	bingung	7.6128	6.6353	7.808
10	di	3.2481	3.1729	7.0526
11	rumah	2.406	0.2506	3.208
12	Aja	0	0.451	1.3534
13	lah	10.7218	9.8045	11.0075

Based on Table 1 was obtained percentage smallest mistake comes from the handwriting input respondent 1 for all the words. While the percentage of errors than other respondents handwriting input is greater than the handwriting input respondent 1. These results show that the pattern of handwriting input respondent 1 more similar to the set targets. Table 1 percentage errors in the results of training for each respondent with the target respondent handwriting 1. From the training results in Table 2, for the word ME, RIGHT, and AJA shows the percentage of respondents belonging mistake 2 is greater than the percentage of respondents belonging fault 1. These results shows that the pattern of handwriting input respondent 1 is used as more similar to the pattern of handwriting respondent 2 as a target rather than handwriting itself which made respondent 2 as input. The average error for input respondent 1 at 4.74, the average error for respondent input 2 at 4:19, and the average error by third respondent input of 6:04. Based on the average value of the error, it can be seen that the smallest value obtained from the handwriting input respondent 2. This indicates that the pattern of respondents handwriting input 2 is more similar to the pattern of predetermined targets.

Table 2. The percentage of errors in the results of training for each respondent with a target handwritten respoden 3

NO	Kata	Persentase kesalahan		
		Responden 1	Responden 2	Responden 3
1	aku	4.3108	5.8396	4.9373
2	kamu	2.8759	3.6654	1.9361
3	dia	4.787	6.1153	5.0627
4	cinta	4.2256	5.4286	5.6692
5	salah	4.8722	6.1805	4.812
6	benar	0.3759	0.7895	0.6767
7	wah	5.9023	5.5639	4.9875
8	pusing	1.3722	1.8045	0.9774
9	bingung	5.6015	6.3346	5.8647
10	di	3.6992	5.0075	5.2632
11	rumah	1.0526	3.8847	0.9524
12	Aja	0.0376	0.6767	0.9398
13	lah	6.8872	8.812	7.6541

From the training results in Table 3, for the word I, HIM, LOVE, TRUE, DOUBT, IN, AJA, and LAH shows the percentage of errors belonging to the respondent 3 is greater of the respondents belong error percentage 1. These results show that the pattern of handwriting respondents first used as more input similar to the handwritten pattern respondent 3 as a target than a third of respondents own handwriting is used as input. For the word LOVE, IN, and LAH percentage of respondents belonging fault 3 is greater than the percentage of respondents belonging fault 2. These results show that the pattern of handwriting input respondent 2 who made more similar to the pattern of handwriting respondent 3 as a target rather than handwritten respodent 3 itself is used as input. The average error for input respondent 1 at 3:54, the average error for the second respondent input of 4.6, and the average error by third respondent input of 3.83. Based on the average value of the error, it can be seen that the smallest value obtained from the handwriting input respondent 1. It shows that handwriting input patterns respoden 1 more similar to the pattern of predetermined targets. However, the average value of 3 respondents belong error is relatively small.

Table 3. Average percentage of errors in the results of training for each respondent

NO	Kata	Persentase kesalahan		
		Responden 1	Responden 2	Responden 3
1	Aku	5.7895	8.8221	4.9373
2	Kamu	4.6617	5.4887	1.9361
3	Dia	4.8747	5.614	5.0627
4	Cinta	6.015	3.6692	5.7293
5	Salah	3.9699	3.7594	4.812
6	Benar	0.0376	0.3383	0.6767
7	Wah	6.5915	5.3383	4.9875
8	Pusing	0.4323	1.203	0.9774
9	Bingung	3.1767	6.6353	5.8647
10	Di	2.4962	3.1729	5.2632
11	Rumah	1.2782	0.2506	0.9524
12	Aja	0	0.4511	0.9398
13	Lah	7.203	9.8045	7.6541

Based on the results table above, obtained by percentage of error. This error percentage indicates the degree of fit handwriting. AJA's fault percentage handwritten word respondent 1 at 0%. This indicates that the word AJA recognizable similarity percentage reached 100% In contrast the percentage of error for other words that do not reach 0%. This means that the pattern of handwriting input is not precisely equal to the given target.

4. Conclusions And Recommendations

4.1 Conclusion

Based on the analysis discussion by using method *perceptron* in detecting the handwriting on the board based on the data obtained, it can be concluded that:

1. The application ofmethod *perceptron* for handwriting pattern recognition there is a blackboard.
2. Designing system handwriting pattern recognition statiskal high degree of accuracy.
3. The results of handwriting pattern recognition method *perceptron* and network syaraf relatively accurate imitation with a value range of 80-100%. Training conducted on the words that have been provided with the characters as much as 2 to 6 character.

4.2 Recommendations

Based on the results of research and discussion in the previous chapter there are some suggestions that can be given to the author for subsequent research:

1. Hopefully with the analysis of this study can be utilized by the user associated with the well.
2. The analysis in the previous chapter, the author may be implemented for future research.

3. The author realizes that this paper is not perfect, there are still a lot of shortcomings. for it is expected for other users to be able to develop it.

References

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