HANDWRITING HIJAIYAH RECOGNITION USING GEOMETRIC MOMENT INVARIANT FEATURE EXTRACTION AND SELF ORGANIZNG MAPS

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PENGENALAN HURUF HIJAIYAH TULISAN TANGAN MENGUNAKAN EKSTRAKSI CIRI GEOMETRIK MOMEN INVARIAN DAN SELF ORGANIZING MAPS

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Menyatakan bahwa Laporan Projek saya merupakan hasil karya sendiri dan bukan hasil penjiplakan/plagiat. Apabila ditemukan unsur penjiplakan/plagiat dalam laporan projek ini, maka saya bersedia menerima sanksi akademik dari Universitas Sriwijaya sesuai dengan ketentuan yang berlaku.

Demikian, pernyataan ini saya buat dengan sebenarnya dan tidak ada paksaan oleh siapapun.

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Motto:

- Dream big, start small –Levenight
- Don't worry about what other people think. Hold your head up high and plunge forward –Anonymous
- PAPA

I dedicated this paper to:

- My beloved father and mother
- My beloved family
- All of my beloved friends
- All of my teachers
- Informatics Engineering Unsri Sriwijaya University

PENGENALAN HURUF HIJAIYAH TULISAN TANGAN DENGAN MENGGUNAKAN EKSTRAKSI CIRI GEOMETRIC MOMENT INVARIANT DAN SELF ORGANIZING MAPS

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ABSTRAK

Pengenalan Huruf Hijaiyah Tulisan tangan memiliki tingkat kesulitan yang cukup tinggi. Permasalahan pengenalan tulisan tangan adalah ukuran dan bentuk dari tulisan tangan yang tidak tetap. Penelitian ini bertujuan untuk mengembangkan Algoritma *Self Organizing Maps* (SOM) untuk mengenali huruf hijaiyah tulisan tangan. Selain itu juga dalam penelitian ini menggunakan ekstraksi ciri *Geometric Moment Invariant* (GMI). Data yang digunakan dalam penelitian memakai data primer yang berupa citra huruf hijaiyah tulisan tangan. Hasil pengenalan huruf hijaiyah tulisan tangan menggunakan GMI dan SOM memiliki akurasi sebesar 95%. Karena dalam ekstraksi ciri GMI tidak berubah terhadap perlakuan rotasi, penelitian ini melakukan pengenalan huruf hijaiyah tulisan tangan data yang dirotasi dengan akurasi sebesar 92%.

Kata kunci : Huruf Hijaiyah, Tulisan Tangan, Ekstraksi Ciri, *Geometric Moment Invariant, Self Organizing Maps*.

HANDWRITING HIJAIYAH RECOGNITION USING GEOMETRIC MOMENT INVARIANT FEATURE EXTRACTION AND SELF ORGANIZING MAPS

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ABSTRACT

Handwriting hijaiyah recognition has a high degree of difficulty. Handwriting recognition problems are the size and shape of handwriting that are not fixed. This study aims to develop Self Organizing Maps (SOM) Algorithm to recognize handwritten hijaiyah. Also in this study using extraction feature Geometric Moment Invariant (GMI). The data used in the study using primary data in the form of handwritten hijaiyah image. The result of handwriting hijaiyah recognition using GMI and SOM has an accuracy of 95%.Because in the extraction of GMI characteristics unchanged on rotational treatment, this study made the introduction of handwriting hijaiyah data that rotated with an accuracy of 92%.

Kata kunci : Handwriting Hijaiyah, *Geometric Moment Invariant, Self Organizing Maps*.

PREFACE

Alhamdulillāh, praise and gratitude for the presence of Allah SWT because thanks to His grace and grace is, the author can complete the Final Report entitled "**Handwriting Hijaiyah Recognition Using Geometric Moment Invariant Feature Extraction And Self Organizing Maps**" as a graduate degree requirement at the Informatics Engineering Department, Faculty of Computer Science, Sriwijaya University.

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The author realizes that this Final Project is far from perfection. Therefore, the authors expect constructive criticism and suggestions for the perfection of this

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Palembang, Juli 31th, 2018

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PART I

INTRODUCTION

1.1 Background

Hijaiyah letters are letters or characters that are used in Arabic, the letter hijaiyah have specific forms such as each letter has two to four forms of writing that is almost as dependent on the position of the letters in a word.

Handwritten character recognition is a technique whereby data input in the form of a sheet of paper and scanned using the scanner produces images on a computer with a bitmap format, the bitmap is then processed further using specific algorithms into character, so it can be identified and processed into information. Handwriting recognition characters (letters / numeric) is a difficult job because it has a variety of styles / shapes of different handwriting every person who wrote it (Awaidah and Mahmoud, 2008). This becomes a problem in handwriting. There are several problems handwritten letter hijayah as a way of writing each person is different and varies which can cause inconsistent handwriting, shapes of different sizes, and experience the rotation. Aside from that,

There are several studies that have conducted research related to hijaiyah handwritten letter that focuses on feature extraction such as: 1) Pattern Recognition Letters Hijaiyah handwriting by using fuzzy logic with neural network Backpropagation (Anggara Imam, 2013); 2) Letter Character Recognition Hijaiyah for Early Childhood Education (ECD) (Gestama Fragil

Son, 2015); 3) Pattern Recognition Letters Handwriting Hijaiyah using Fuzzy Feature Extraction and Neural Network Backpropagation (Vermala Tia Helsi et al, 2016); 4) Introduction of Posts Hijaiyah Connect using Template Matching Algorithm Correlation (Angraheni Nina Retno et al, 2017).

Of all that is used to study the handwriting character recognition hijaiyah produce several different levels of accuracy. This becomes a problem in making handwriting recognition more accurate. So to obtain high accuracy, Hijaiyah letter handwriting recognition feature extraction and classification requiring better.

Therefore extraction characteristics in this study using Geometric Moment invariant (GMI). The advantages of GMI are not influenced by changes in the transformation of a good image translation, scaling and rotation (Al-Abudi 2009, Salambue, 2013; Muralidharan and Chandrasekar, 2011; Rashad et al, 2012); as well as providing a high level of recognition accuracy (Ranteke, 2010). Neither the algorithm Self-Organizing Maps (SOM). The advantages of the SOM algorithm is that during the process of recognition does not require a long time (Kibria and Al-Imtiaz, 2012) as well as in terms of the level of accuracy have a higher yield (Sharma et al, 2010).

Based on this, a handwritten letter hijaiyah research will be developed in a software using GMI feature extraction and clustering with SOM algorithm. Contributions are expected to provide a high degree of accuracy.

1.2 Formulation of the problem

The problem formulation in letter recognition hijaiyah writings as follows:

1. How to recognize the image of hijaiyah handwritten letter by implementing the feature extraction GMI and SOM into the software?
2. What level of recognition accuracy hijaiyah handwritten letter with GMI and SOM feature extraction?
3. What level of recognition accuracy hijaiyah handwritten letter in the form of rotation?

1.3 Research purposes

The purpose of research in pattern recognition hijaiyah letter, as follows:

1. Developing computer software for introduction letter hijaiyah handwriting using feature extraction GMI and SOM to recognize handwriting image
2. Knowing the level of accuracy in recognizing the handwriting image hand GMI uses feature extraction and SOM.
3. Knowing the level of accuracy in recognizing the handwriting image in the form of rotation.

1.4 Benefits of research

The benefits of this research are:

1. The results of this study can be used to develop software that can recognize handwriting image hijaiyah letter;
2. The results of this study can be used to develop software that is greater with input relating to handwriting;

1.5 Scope of problem

Limitation of problems in this study, as follows:

1. Handwritten letter Hijaiyah done offline.
2. The image on the handwriting input Picture Bitmap format (* BMP) or JPEG;
3. The data will be used primary data. Primary data was taken from students of the Faculty of Computer Science University of Sriwijaya 5 people who will be attached in Annex A1. Where everyone write letters Hijaiyah 28 of 15 times for a total of 2100 image data.
4. The input image to be used measuring 28x28 pixels.

1.6 Research methods

In conducting this research, there are steps to be taken, namely:

1. Herd sample image hijaiyah handwritten letter;

2. Perform analysis of image data hijaiyah handwritten letter;

3. Applying the feature extraction method with GMI;

4. Applying clustering with SOM algorithm;

5. Doing software development using Rational Unified Process (RUP);

6. Conducting the experiment software;

7. Conduct analysis of the results of research development;

8. Make conclusions and recommendations for the research.

1.7 RUP method in Software Development

Software development is done in this thesis using the RUP (Rational Unified Process). RUP method used to build a software with object-oriented programming. As for the software development phase through which can be seen in Table I-1:

Table I-1 Phase RUP (Rational Unified Process)

	inception	**Elaboration**	**Construction**	**Transition**
Business modeling	- On This phase determines the user involved and briefly describe the user. - Next make a list of initial software use case and a brief description of the use case. - Next create use case scenarios for some of the major use case describes a sequence of user interaction software	- Adding the use case, the pre-processing and feature extraction, there are two use cases previously made that training and recognition. - Making the use case scenario for pre-processing and feature extraction.	- phaseThis makes the actor and the use case by using Visio 2002.	- This phase will make the documentation of use cases and scenarios of the use case.
	inception	**Elaboration**	**Construction**	**Transition**

Software Requirements Analysis	- M-finding journal dealing with GMI and SOM methods to be used as references manufacture handwriting recognition software Hijaiyah letter. - Nextwill collect secondary data from the internet as well as primary data taken directly from the students of the Faculty of Computer Science University of Sriwijaya,	- On These phases improve inception phase. In this phase will step into Adobe Photoshop CS3 software to improve the image of handwritten letters Hijaiyah of noise and resulusi change that image.	- Application needs that have been analyzed at the inception and elaboration phases, namely the use of primary and secondary data and perform image enhancement using Adobe Photoshop CS3.	- Doing documentation by entering the software needs analysis in the report.
	- Primary data consisted of 1400 data for training and 700 for the introduction to be taken from the students of the Faculty of Computer Science UNSRI. - Process the software will use Netbeans JDK 7.2 software for implementation. The hardware used in this			

	software are Processor Intel® Core ™ i3-3217U CPU @ 1.80 GHz 4:00 GB RAM and 64-bit OS.			
	inception	**Elaboration**	**Construction**	**Transition**
Analysis and Design	- designingthe initial appearance of software or prototype hijaiyah handwritten letter recognition and explanation of every way to use it. - The identification analysis software design introduction will be made. - Creating a class analysis, sequential classes and class diagrams for a use case.	- On This phase of improvement back use case diagrams that have been created and designed from inception phase. - Perform analysis and design process in more detail, namely by creating sequence diagrams, and class diagrams. And defines the relationships between classes in the class diagram.	- In this phase use Microsoft Visio 2002 to create a class diagram class overall sequential and applied during the manufacture of coding.	- Preparation of documentation UML diagram
	inception	**Elaboration**	**Construction**	**Transition**

Implementation	- Systemhandwriting recognition software Hijaiyah letter will be created in java language.	- Do revision of the interface prototype using Microsoft Visio 2002. - In this phase implemented in the Java programming language with the Java Compiler Netbeans IDE 7.2 for the manufacture of handwriting recognition software Hijaiyah letter.	- this phase will be implemented into the programming language (coding). - Stages of making coding originally used SOM topology not wear so it is still difficult to recognize the image of the lettering Hijaiyah	- In this phase of programming to make improvements until the final stages. - Make a plan of testing on the system. - Documenting the process of charting system processes hijaiyah handwritten letter recognition.
	inception	**Elaboration**	**Construction**	**Transition**
examination	- Prepare introduction of data to enter Hijaiyah image of handwritten letters.	- Testof software in the form of input data other than BMP format and enter a cluster name, do not enter a name for the cluster. - Test the warning in the software when the	- In phase These advanced testing, by testing the handwriting recognition software Hijaiyah letter with GMI	- At this stage phase documented by recording errors that occur in the software, noted a shortage of GMI and SOM methods and make a conclusion.

		conditions are not in accordance with the software.	and SOM methods.	

1.8 Writing system

Systematics of writing this final report are as follows:

1. Chapter I Introduction

   In the 1st chapter will discuss the background, problem formulation, purpose and benefits of the research, research methods, methods of software development and systematic writing.

2. Chapter II Review of Literature

   In the 2nd chapter contains a literature review contains a number of theoretical basis that will be used in the analysis, design and implementation of the final project.

3. Chapter III Analysis and Design

   In the 3rd chapter contains analysis and design to the use of methods Geometric invariant Moment (GMI) for feature extraction, and algorithm Self Organizing Maps (SOM) to carry out the implementation.

4. Chapter IV Implementation and Testing

   In the 4th chapter will discuss the implementation environment GMI method as ekstrksi characteristics and SOM as a grouping, implementation, execution results and the results of testing against software hijaiyah letter handwriting recognition to be built.

5. Chapter V Conclusion and Suggestions

In chapter 5 will write down all the conclusions obtained from the research and suggestions for future development.

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