

Implementation of Pierce Similarity Distance Algorithm to Detect Harfu Jar In the Quran As a Basic Learning media Of Arabic Language Science

Miftahul Jannah¹, Adli Abdillah Nababan²

^{1,2}Rekayasa Perangkat Lunak, STMIK Pelita Nusantara, Jl. Iskandar Muda No.1, Medan, Indonesia

E-mail: miftahuljannah0077@gmail.com¹, adliabdillahnababan@gmail.com²

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ABSTRACT

Arabic is a language that is rich in rules and rules in composing sentences and understanding speech. As we know, a collection of Arabic languages is found in the Holy Qur'an of the Islamic Ummah. In the Al-Quran there are many jar letters that have special meanings in each letter. In Arabic language rules, In the Letters jar is a letter whose job is to give a hard line in the sentence in front of it. The purpose of this study is to build a basic Arabic learning media in detecting JAR letters using the pierce similarity method. In building the system, an image processing theory approach is carried out. The stages of the detection system process begin with the file.bmp extension process of the original image, then resizing, namely the process of placing the image to the specified coordinate points, Grayscale, convolution or edge detection and distance calculation with Pierce similarity where this algorithm will store the value of bits in the pattern of letters that are trained and then will match the values in the image to be tested. Input image is the result of drawing the verses of the Quran.

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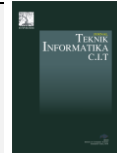
1. Introduction

In the Arabic order there are rules that apply when we want to say a sentence or just build a story. that rule is called nahwu. Al- Quran is also the word of God revealed in Arabic that is inseparable from the rules of nahwu knowledge contained in the giving of dignity or lines in the Al-Quran. Nahwu is a science that studies the final rules of sentence structure whether it is in the form of rafak (row dhammah), or nasab (top row), or jar (kasrah line), or jazam (breadfruit). In the rules of nahwu science there is one law of giving lines called jar majrur.

Jar are types of letters in Arabic where each letter has its own meaning and becomes a letter that influences the line in the word in front of it. The term Majrur is something that is affected by the entry of the Jar. Because of the lack of human knowledge about the jar letter, making a lot of problems that arise about it. In the era of globalization, the rapid development of technology, especially in the IT field especially software has given birth to many intelligent applications, one of which is the application of the Qur'an.

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In the era of globalization, the rapid development of technology, especially in the IT field especially software has given birth to many intelligent applications, one of which is the application of the Qur'an. Al-Quran has now become one of the software applications that can be installed on a personal computer or smartphone. Although currently the application of guidance on reading the Quran is widely circulated, but applications relating to learning the rules of nahwu are still very little known by the ordinary people, even though the rules of introducing nahwu in jar is one of the basics when someone wants to learn Arabic.



2. Literature Review

a. Arabic Language

Arabic is a language that is actively used by around 280 million people worldwide, most of whom are in the Middle East and North Africa. Arabic is also the mother tongue of nearly 25 countries, and has become one of the official languages recognized and used in official UN sessions. Besides that, Arabic cannot be separated from the development of Islam, because Islam itself was originally born and developed in the Arab lands. Along with the spread of Islam throughout the world, Arabic also develops and spreads throughout the world, even with different levels of distribution different. [1].

The sentence structure pattern in Arabic has two forms; First, the number of Ismiyah. Second, the Amount of Fi'liyah. The number of Ismiyah is also called the nominal sentence is a sentence that uses Isim (noun) which shows the meaning of Tsubut (fixed) and Istimrar (continuous). While the number of Fi'liyah (also called verbal sentences) is a sentence that uses Fi'il (verb) which shows the meaning of tajaddud (new) and huduts (temporal). Each isim has its own reading provisions, i.e., a draft which is etched, an isim that is incarnated and an isim that is framed. There are three types of Isim that are read by jar, they are journaled, jarred because of idhafah, and answer. [2].

In the Awamil book page 1 by Syech H. Ahmad shows that there are several letters that have the task of influencing the level of a sentence in front of the letter. In the rules of nahwu there is a law of giving lines or dignity called jar majrur law. Jar is a letter (harfu) which shows its own meaning which has its own duty. While majrur is an isim or sentence that is affected by the inclusion of the jar letter behind the sentence itself [10].

Table 1.
Example of Jar Majrur

No	Huruf jar	Isim	Jar majrur
1	من (min)	النَّار	مِنَ النَّارِ
2	في (fi)	الأرض	فِي الْأَرْضِ
3	بِ (bi)	العُشْبَى	بِالْعُشْبَى
4	إلى (ila)	الْفَلَكَ	إِلَى الْفَلَكَ

Each of these letters has its own meaning. As the letter "min" is translated with the meaning "from", so also with "ila" is translated with the meaning "to", "fi" is translated with the meaning "in / in", "ala" is translated with "above" "bi" Translated with the meaning "and so on [5].

b. Digital Image

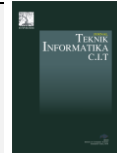
Digital image is a unity of various elements consisting of brightness, contrast, contour, color, shape and texture. Broadly speaking, the image can be divided into two types, still images and still images (motion images). indicate the gray level at that point. [9].

Based on the pixel value, the image can be categorized in several criteria, namely:

1. Binner image, which consists of black and white or called a monochrome.
2. Grayscale image is a digital image that only has one right value in each pixel,
3. Color Image (8 bit) where the maximum pixels used are 255 colors.
4. 16-bit color imagery where the maximum pixels used are 65,536 colors [6].

c. Image Processing

At the stage of image processing, image data samples undergo several stages of image processing operations, namely binaryization operations, open-close morphology, median filtering, slicing, and resizing. Binary operation was first performed on images. At this stage a color or gray image is converted to a binary image. Binary imagery is represented by a two-dimensional matrix that only has two intensity values ("0" and "1"), which are black and white only. In this operation,



the color intensity value of each pixel in an image will be changed based on a predetermined threshold value. Image processing is an activity to improve image quality so that it can be easily interpreted by humans / machines (computers). The input is the image and the output is also an image but with better quality than the input image, for example a color image that is less sharp, blurring, contains noise (eg white spots), and so on so that there needs to be processing to improve the image because the image becomes difficult to interpret because the information conveyed is reduced. [7]

d. Pattern Recognition

Pattern is intensity that is defined and can be defined through its characteristics (features). These characteristics are used to distinguish one pattern from another. A good feature is a feature that has a high distinguishing power, so that the grouping of patterns based on the characteristics possessed can be done with high accuracy. Unlike the discipline of image processing which is limited by the use of images as input and output, a pattern recognition application aims to do. In other words, pattern recognition distinguishes an object from other objects [4.]

e. Pierce Similarity

Seung-Seok Choi, Sung-Hyuk Cha, Charles C. Tappert said in his journal that there are two vector objects namely vector i and vector j in the Mountford method which represent binary value vectors. The definition of binary similarity and distance measures can be expressed from Operational Taxonomic Units (OTUs). Like table 2.3 below:

Table 2.
Otus Table (Seung-Seok Choi, Sung-Hyuk Cha: 2010)

$i \backslash j$	I (presence)	0 (absence)	sum
I (presence)	$a = i \cdot i$	$b = \bar{i} \cdot i$	$a + b$
0 (absence)	$c = i \cdot \bar{j}$	$d = \bar{i} \cdot \bar{j}$	$c + d$
sum	$a + c$	$b + d$	$n = a + b + c + d$

The value of b is obtained from the vector i and j value (0,1) so that means vector i does not have a match with vector i (absence mismatches), the value of c is obtained from the vector i and j value (1,0), it means the vector value j does not have a match with vector i (absence mismatches), the value of d is obtained from the value of vector i and j is worth (0.0) so that means the value of vector i, j has no match at all (negative mismatches).

Conditions of Peirce similarity:

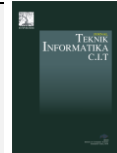
$$S_p = \frac{ab+bc}{ab+2bc+cd}$$

3. Method

The research method used is an experimental method in which an experiment using a sample image of the Quran to detect the Jar letter contained therein.

a. Data Collection techniques

The authors design a system that will be built in accordance with the field under study. The data used in this study consists of a collection of images of the Quran that will be used for the training process and system testing used in the system development process. The data used is only



limited to 24 bit images with bitmap extensions.

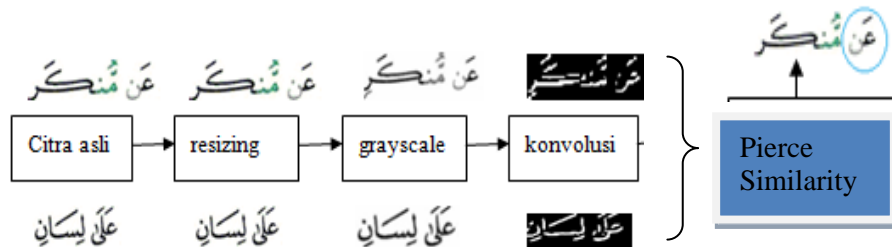


Fig 1. Scheme of System

The following sample jar pattern used

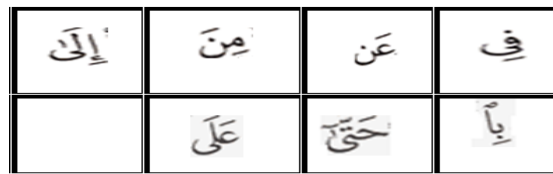


Fig 2. Sampel of Jar Pattern

b. Analysis of Device Requirements

The components including the hardware used in the design of this system are as follows:

1. AMD E2-1800 APU with Radeon (tm) 1.70 GHz HD Graphics
2. DDR3 RAM 2.00 GB
3. 320 GB HDD

Components included in the software used

1. Operating System: Microsoft Windows 10
2. Application Program: Borland Delphi 7.0.
3. Adobe Photoshop 7.

4. Results Of Research

The appearance of the system being built is

- 1) Main Menu.



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Fig 3. Main Menu

Figure 1. is the form that is the initial display of the many forms available in this application. 3 pieces of choice, namely Jar Letter Training Pattern, Jar Letter Detection and Material Flash. The Jar Letter Detection Button Practice Pattern serves to display the Jar Letter Pattern Train form, the Jar Letter Detection Button serves to display the Jar Letter Detection form, the Material Snap Button function displays the jar letter material review form.

2) Training Form



Fig 4. Training Form

Figure 2 As the first step of the application process, the author has chosen the pattern of the jar letter, so the user is not allowed to press the training form so that the specified jar pattern cannot be tampered with. The author will conduct training on the application by using one sample image so that the value of each sample image appears inputted. Next, the writer directs the coordinates to the jar letter pattern, then presses the respective jar letter button. The value of each pole planting will be saved to bit.txt, bi2.txt, up to 8.txt bits.

3) Testing Form

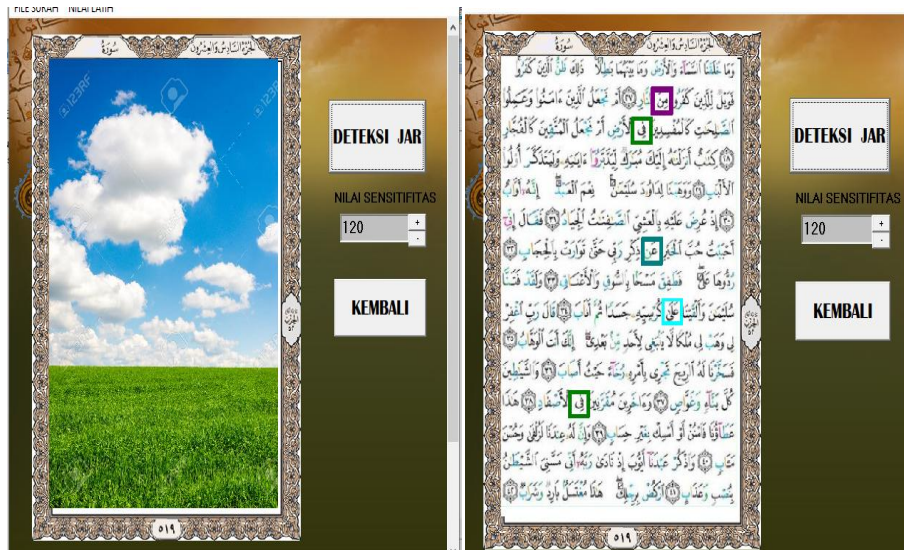


Fig 5. Testing Form

The testing process is carried out for detection of the image of the Quran. This stage serves as the output of the whole process. After obtaining the value of each jar letter pattern, then the value of the pattern from the jar letter and the test image will be compared with the value that has been implanted in each type of jar letter. The results with the closest value to the training value indicate the detection of Jar Letters on the test Qur'an image.

4) Ulasan Materi Form

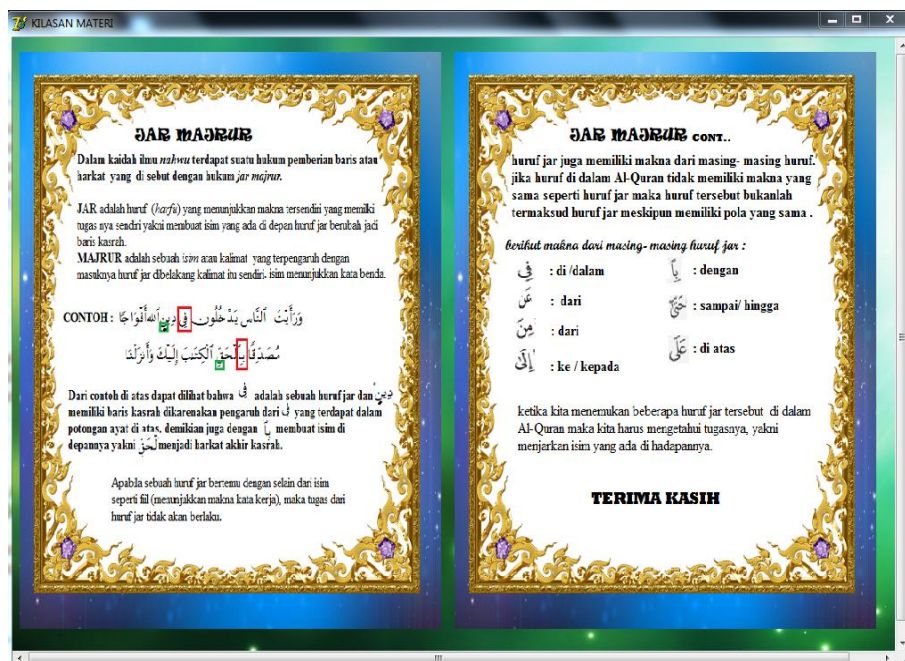


Fig 6. Ulasan Materi Form

This form serves to provide a little basic learning of the law that is in the Jar Majrur, so users can find out the function and purpose of the jar majrur it self. Material review contains material about the jar letters used in the application.



5. Conclusion

The conclusions of this study are:

- a. jar letter system uses Pierce similarity, the best test results obtained jar fi letter patterns that have an accuracy rate of 90% in its detection and low test results there are jar ila pattern patterns have a detection rate of 70%. Because the jar fi letter pattern tends to have a different shape than the other letter patterns, while the jar ila pattern has a similarity between the letters and some other letters.
- b. The similarity factor of each letter in the Quran becomes one of the weaknesses in this system.
- c. The jar letter system uses Pierce similarity which requires a threshold value in detecting letter patterns, this threshold value is called sensitivity. This value serves to limit the range of the pattern to be detected

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