An Application of Multimedia for Basic Arabic Learning Using Fisher-Yates Shuffle Algorithm on Android Based
Wawan Gunawan*, Herry Derajad Wijaya
Faculty of Computer Science, Universitas Mercu Buana-Indonesia

DOI:10.21276/sb.2019.5.7.6 | Received: 01.07.2019 | Accepted: 09.07.2019 | Published: 30.07.2019

*Corresponding author: Wawan Gunawan

Abstract

Indonesia is the largest Muslim country in the world followed by India in second place and Pakistan in third place [1], so that the majority of the population should understand the Arabic so that they will be able to read the Qur'an properly and correctly. The daily conversation learning process using Arabic we will use the android media application with the Multimedia Development Life Cycle (MDLC) research method and the Fisher-Yates Shuffle algorithm to perform a random process of problem training. At the stage of storyboarding using Belsamic Mockup tools, while collecting materials for images, sounds, text can be obtained free of charge or by ordering to other parties in accordance with the design made in the previous stage.

Keywords: Learning Application, Arabic, MDLC, Fisher Yates Shuffle, Android, Multimedia.

Introduction

Indonesia is the largest Muslim country in the world followed by India in second place and Pakistan in third place [1], so that the majority of the population should understand the hijaiyah letters so that they will be able to read the Qur'an properly and correctly. Understanding the letters of hijaiyah will then be followed by the learning of Arabic language so that later we can translate the meaning of the Qur'anic language, so that at least we will understand the content contained in the verses in each letter of the Qur'an [2].

Studying hijaiyah is one of the first steps to reading the Holy Quran. The ability to learn reading the hijaiyah letters requires a good strategy, therefore the choice of the right method or media of learning has a large contribution in improving the ability to read the hijaiyah.

Current technological developments can enable us to solve these problems by doing learning anywhere and anytime [3]. One of them is the use of mobile phones that are installed learning support applications, so that the content needed by users can be accessed easily.

The learning process is equipped with multimedia facilities that are able to combine text, images, and audio in one device can make it easier to learn the hijaiyah letters that are presented in one application, especially if presented with an attractive and easy to learn[4]. So that there is a need for an introduction system that can later help with the presentation that is packaged in smartphone media.

This learning application will give a quiz randomly to find out whether the user has understood the learning presented, so that he will continue to sharpen understanding to user.

The formulation of the problem in this study are
- How to make an application that is able to facilitate hijaiyah letter learning effectively and efficiently.
- How to pronounce hijaiyah with good and true.

Based on the above problems, this study aims to build an android application that can help the learning process of reading hijaiyah letters by adding sound into the application to make it easier in the learning process.

Review of literature

Application

Applications according to Kamus Besar Bahasa Indonesia are computer programs or software designed to do certain tasks. While computer programs are programs that are created specifically to allow computers to perform certain functions [5].
Multimedia

Multimedia can be defined as computer-based products that enhance information communication by combining two or more elements of text, graphic art, sound, animation, video, or interactivity [4].

The use of multimedia in learning media has no significant difference between adults (25-50 years old) and the age of children [4]. Multimedia applications must support all content access and communicate with native speakers or other users to support learning [6].

Nearly 80% of 26 respondents agreed that multimedia is able to attract students’ attention and interest in anticipating the learning process, encouraging active students to understand learning and the images and animations presented can increase students’ enthusiasm in understanding basic level vocabulary [7].

Storyboard

Storyboard is a sketch of a picture arranged sequentially according to story ideas [8]. With storyboards, storytellers can convey story ideas more easily to others, because with storyboards the story maker can make someone imagine a story following the images that have been presented, so that it can produce the same perceptions as the story ideas made.

Android

Android is an operating system issued by Google especially for smartphones and tablets. Android also has a store where there are 1 billion active users. Talking about programming is certainly not separated from the Integrated Development Environment (IDE) that can be used by Developers. By using Android Studio developers can create applications from scratch until publish into the store. Android Studio also has several built-in features that really help developers to maximize the process of creating applications such as Gradle, Code Completion, and integrated with several services from Google such as Firebase [9].

Hijaiyah


Hijaiyah letters that often appear in Iqra 'books that are letters “١” and “٢” bringing the number to 30 characters.

Fisher-Yates Shuffle Algorithm

According to Bendersky [11] Fisher-Yates Shuffle is an algorithm to produce a random permutation from an finite set, the result of randomizing this algorithm has the same probability [11].

Fisher Yates Shuffle (taken from the name Ronald Fisher and Frank Yates) or also known as Knuth Shuffle (taken from the name Donald Knuth), is an algorithm to produce a random permutation from a finite set, in other words to randomize a set. If implemented correctly, the results of this algorithm will not be biased, so each permutation has the same possibility [12].

The basic process of the Fisher-Yates Shuffle is almost the same as taking cards one by one from a stack of cards until there is nothing left. The Fisher-Yates Shuffle algorithm is considered as an objective and optimal method by many people to produce truly random permutations from finite sets [13].

Then the algorithm used by the author is the Fisher-Yates Shuffle algorithm that is applied to the question quiz to display random questions.

Research Methods

Data Collection Method

The data collection method used in this study is:

- Observation Method. Observation or direct observation of the object of research. The observation technique is carried out by structured observation by preparing a list of data and data source needs.
- Literature review method. Methods of collecting data obtained by studying, researching, and reading books, information from the internet, journals, theses, and theses related to Arabic-language applications and daily conversations.

Multimedia Development Life Cycle

Software development for implementation in this study uses Luther Sutopo’s Multimedia Development Life Cycle (MDLC) method which consists of 6 (six) phases.
The phases in MDLC that are systematically arranged are as follows

a. Concept
   The concept stage is the initial stage in the MDLC cycle. At this stage it starts by determining the purpose of making the application and determining the application user.

b. Design
   The concept that is mature will make it easier to describe what should be done. The purpose of the design stage is to make specifications in detail about the project architecture, the appearance and requirements of the project material, and style. The storyboard function is as follows:
   - Can be used to get the approval of the filmmaker or sponsor so that a clear picture is obtained.
   - An approved storyboard can be used as a guideline for implementing the production process.
   - The software that will be used to design the interface is Balsamiq MockUp.

c. Material Collecting
   Collecting material is the stage for collecting materials that are suitable for your needs. These materials include clip art images, photos, animation, video, audio, as well as text that has been made or that still needs to be modified according to existing needs. These materials can be obtained free of charge according to the design made in the previous stage.

d. Assembly
   The assembly stage is the stage of making all multimedia materials. Applications that will be created are based on the design stage, such as storyboards. This stage will use authoring software, such as Android Studio.

e. Testing
   Tests are carried out to ensure that the results of making multimedia applications are in accordance with the plan. There are two types of tests used, namely black box testing and white box testing.

f. Distribution
   This stage is the last stage in the multimedia development cycle. Distribution can be done after the application is declared feasible to use. At this stage, the application will be stored in a storage media such as a CD, mobile device or website. If the storage media is not enough to hold the application, compression on the application will be done.

Application Requirement Analysis
Supporting equipment is the hardware and software used for making this application. The following are the specifications:

### Hardware

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Spesifikasi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Intel Core i3 Processor</td>
</tr>
<tr>
<td>Processor Onboard</td>
<td>Intel® Core™ i3-3110M Processor (2.4 GHz, Cache 3MB)</td>
</tr>
<tr>
<td>Chipset</td>
<td>Intel® HM77</td>
</tr>
<tr>
<td>RAM</td>
<td>2 GB DDR3 (+4GB DDR3)</td>
</tr>
<tr>
<td>VGA</td>
<td>NVIDIA Geforce 705M 1GB</td>
</tr>
<tr>
<td>Display</td>
<td>14”WXGA LED</td>
</tr>
<tr>
<td>Audio</td>
<td>Integrated</td>
</tr>
<tr>
<td>Storage</td>
<td>500 Serial ATA 5400 RPM</td>
</tr>
</tbody>
</table>
**Design System**

UML (Unified Modeling language) is one standard language that is widely used in the world industry to define requirements, make analysts and design, and describe architecture in object oriented programming.

The design of this application uses UML (Unified Modeling Language) which consists from the design of use case diagrams, to design activity diagram, and diagram design sequence.

**Activity Diagram**

The activity diagram illustrates the various activities in the system that are being designed, how each path starts, the decisions that may occur, and how they end. Activity diagrams can also describe parallel processes that might occur in several executions.

In this Activity Diagram the user selects the exercise menu and then enters the start training menu after which the user will work on the questions randomly on Fig. (c) and the user selects the menu about then will appear about the application of the makhorijul huruf learning on Fig. (d).

**Use Case Diagram**

Use Case diagrams explain what will be done by the system to be built and who interacts with the system. Below is the design of use case diagrams from the Android-based letter makhorijul learning application.

The Actors involved in this application are users. Users are actors who use Android-based mobile phones.
Sequence Diagram

Sequence diagrams are used to describe the behavior of a scenario. This diagram shows an example of an object and message (message) placed between these objects in the use case. The main component of sequence diagrams consists of objects written with a rectangular box named. Message is represented by a line with an arrow and a time indicated by vertical progress.

In this Activity Diagram, the user runs the application and then displays the loading screen menu and after that the main menu on figure (a) and user selects the learning menu on the main menu and then selects the Hijaiyah learning menu on figure (b).

In this Activity Diagram, the user selects the exercise menu and then enters the start training menu after which the user will work on the questions randomly on figure (a) and the user selects the menu about then will appear about the application of the makhoriul huruf learning on figure (b).
RESULT AND DISCUSSION

Fisher-Yates Shuffle Algorithm

This algorithm will randomize practice questions to be not sequential or random in the exercise menu.

![Flowchart Fisher-Yates Algorithm](image)

Using the Fisher-Yates Shuffle algorithm will be used at the time of making the application exercise, where several questions will be provided regarding the discussion that has been submitted in this application and presented randomly. The purpose of giving this material is randomly so that users do not memorize the questions presented, but must understand the questions presented with the material presented, because the introduction of this application is the basis of the next stage of Arabic language learning.

User Interface

The splash screen will be displayed when the first time the application is activated is shown on figure 13(a), while the main menu will be displayed if the menu icon is selected is shown on figure 13(b). When the Home menu is selected it will appear is show on figure 14(a), and when one of the exits is selected it will be displayed is show on figure 14(b).

![User Interface Application](image)

one of these letters, it will be displayed is show on figure 15(a) and issued a sound based on the letters hijaiyah.

The initial sound can be repeated by selecting the button, then the user can listen to letters hijaiyah and read the text for the entire letter of meaning based on the selected one is show on figure 15(b).
Storyboard

Fig-9: Storyboard of Arabic

Black Box Testing
Black box testing is a test carried out only to examine the functions of the software and observe the results of execution through test data. If it is analogous to seeing a black box and we can only see the appearance of the outside without knowing what is behind the black wrapper. Just like black box testing, evaluates only from its external appearance (its interface), its functionality without knowing what actually happens in the detailed process (only knowing input and output).

The results for BlackBox testing on the hijaiyah learning menu can be generated as in table 3 below

Table-3: Testing Menu Learning

<table>
<thead>
<tr>
<th>Testing</th>
<th>Input Data</th>
<th>Which are expected</th>
<th>Observation</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Font Exit</td>
<td>Displays the letter hijaiyah according to where the letter exits</td>
<td>Select the sound button and leave the sound</td>
<td>Display</td>
<td></td>
</tr>
</tbody>
</table>

The results of the presentation above, the results for testing Black Box on the main menu can be generated as in table 4 below

Table-4: Testing the Main Menu

<table>
<thead>
<tr>
<th>Testing</th>
<th>Input Data</th>
<th>Which are expected</th>
<th>Observation</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Menu</td>
<td>Display the Main page</td>
<td>Choose hijaiyah menu</td>
<td>Display</td>
<td></td>
</tr>
<tr>
<td>Menu Hijaiyah</td>
<td>Showing hijaiyah menu</td>
<td>Choose hijaiyah menu</td>
<td>Display</td>
<td></td>
</tr>
<tr>
<td>Quiz Hijaiyah</td>
<td>Showing practice questions</td>
<td>Answer practice</td>
<td>Display</td>
<td></td>
</tr>
<tr>
<td>Setting</td>
<td>Display the settings page</td>
<td>Choose the language used</td>
<td>Display</td>
<td></td>
</tr>
<tr>
<td>About</td>
<td>Showing the page about</td>
<td>Showing the page about</td>
<td>Display</td>
<td></td>
</tr>
</tbody>
</table>

White Box Testing

Fig-10: Flow Chart (a) & Flow Graph (b) of Menu
Cyclic complexity of flow charts can be obtained by calculation

\[ V(G) = E - N + 2 \] \hspace{1cm} (1)

V(G) = 7 - 7 + 2 = 2

V(G) < 10 means fulfilling to its cyclomatic complexity, while the set lines generated from independent lines are as follows:

a. 1-2-3-4-5-6-7
b. 1-2-3-4-5-2

**Implementation**

The results of the explanation above will produce an application display for the splash screen when the first time the application is run as shown in figure 18 (a), after the splash screen is finished, the main menu of the application will be displayed as shown in figure 18 (b).

![Fig-11: Implement Splash Screen (a) & Main Menu (b) of Menu](image)

After displaying the application menu, then if we choose the hijaiyah menu, there will be a number of hijaiyah letter learning options based on the location of the letter exit as shown in figure 19 (a). After we have chosen one of several choices for the location of the letter exit, what letters will be included which include those categories which can be shown in figure 19 (b).

![Fig-12: Implement Detil Voice (a) & About (b) of Menu](image)

Next after the above description, then when we choose one of the hijaiyah letters it will be displayed as in figure 20 (a) and immediately emits the sound of the hijaiyah letter. If we want to do an overall test of the letters, we only choose the play button found in the application.
CONCLUSION
As a conclusion from this research can be presented as follows

- The purpose of the research is to build an android application that can help the learning process of reading hijaiyah letters by adding sound into the application to make it easier in the learning process.
- The phases of research methodology are literature reviews, data collection, use case modeling, design and interface reports using the MDLC method.
- This application can help users know the forms and pronunciation of hijaiyah letters which are accompanied by practice questions developed using the Fisher Yates Shuffle algorithm.

Suggestion

- It is hoped that this application will be developed for learning combining basic hijaiyyah or per-word letters.
- It is hoped that this application will be developed by providing knowledge to read the Koran in the form of learning recitation.

ACKNOWLEDGEMENT

Praise be to the presence of Allah S.W.T. who has given His mercy so that the writing of this scientific article is resolved. And I do not forget to say thank you to the extended family of the Faculty of Computer Science, Universitas Mercu Buana, who has provided support in writing this scientific article.

REFERENCES