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Research paper

Musafir Ilmu Apps Development Using Mobile Application Development Life Cycle

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Abstract

The presence of mobile wireless technology has changed the current learning culture environment. Today, smartphone has become an essential device for effective learning. Many mobile apps have been developed covering digital contents for all sorts of disciplines. This paper presents the development of mobile application for Muslims which is focusing on Hijaiyyah pronunciation. This application is named Musafir Ilmu Application with aims to help improve the learning process of Hijaiyyah pronounciation. The Mobile Application Development Life Cycle is employed in the development of the apps. This application has been tested on 32 UiTM students by observation method. Performance of the application is measured using Confusion matrix which calculate the precision and recall rates. The results have indicated the app is an effective learning tool.

Keywords: *Hijaiyyah Huroof, Mobile Application Development Life Cycle (MADLC); MUSAFIR ILMU; Mobile Apps*.

1. Introduction

The term of Makhraj is known as the right position of tongue and movement of mouth when pronouncing the Hijaiyyah Huroof. Most of the Muslims already know how to recite the Quran, but they may not be able to pronounce Hijaiyyah Huroofs accurately. This is because the existing application does not provide the two-way communication in user interface [1]. The researchers are trying to implement signal detection in the application so that it is able to recognize correct pronunciation from user [2].

Mobile application is the application design that is able to run many functionalities features through mobile. The goal of the application is to create an interactive innovation for user. There are many development platforms to develop mobile applications for mobile such as Android phone and iPhone. The applications such as Twitter, Facebook and Instagram are the examples of productivity purpose application. In this study, the researchers develop an application that is unique with the others application. It is called Musafir Ilmu application. Musafir Ilmu application is able to recognize correct pronunciation of Hijaiyyah Huroof and can do chatting with friends if user has registered as a member.

There are some studies on improving and creating new innovation of mobile application. The studies are briefly summarized in the literature review.

2. Literature Review

2.1. Mobile Technology

The mobile is commonly used by the society nowadays. By using this technology, people can get the information through mobile [1]. Smartphone is a target technology device for e-religious application. By providing the e-religious application, people can easily gain the information in depth about their religion profess.

E-religious is mobile application that consists the technologies such as image and video [2]. e-religious is an application that could encourage people to gain the knowledge about the religious. There are lots of applications available in Play Store such as Quran. However, these applications only provide reading and downloading features.

2.2. Mobile Learning

Mobile leaning is the educational technology that allow people to get the learning material through mobile [3]. Nowadays, there are many applications have been developed for people to learn their religious. Firstly, the information is well organized by the publisher. Secondly, the duration of learning about religious through mobile application has reduced and it is also good approach for learning process [2].

2.3. Existing Quran Application

The existing Quran applications allow people to read and listen the recitation from the expert. By using existing applications enable for them to read Quran at anywhere. Even-though these applications have been upgraded their functionalities such as allow user to locate the kaabah and set self-reminder, there is not yet available application to recognize the pronounciation of Hijaiyyah Huroof.

2.4. Voice Recognition

Voice recognition is capabilities of a device to recognize every word that user speaks. The significance of voice recognition is

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simplicity of the user uses the device by using voice only. Classification is the process of categorize the classes using pre-trained model. The difficulties of voice recognition are the device is unable to recognize difference pronunciation that produce by the user. Environment also one of the factor caused the device unable to recognize user's voice [4].

2.5. User Experience

Some people use the application as their resource to get information. However, few of them do not have any experience using the devices like smartphone. The feature that required for user to experience is voice recognition, read the information in digital and using a camera. If the user manages to read Quran in digital, he just brings his smartphone and read Quran whenever he likes. Some people prefer learn Quran using smartphone [5]. Learning Quran in digital is not efficient for them because it is does provide accurate clarification on detecting the Huroof of Hijaiyyah and it just offered user to read Quran in digital. It is give a good impact if the researchers able to provide for them the application that able to detect the Hijaiyyah Huroof for learning purpose [6].

3. Mobile Application Development Life Cycle

The development of application is different from software development. There are many aspects need to be considered to develop the application such as the user interface, the functionality and the security whenever the applications are successful deployed in the stores such as Facebook, Twitter and Instagram.

The researchers use these applications as motivation to create new innovation in the development of MUSAFIR ILMU using Mobile Application Development Life Cycle as in Fig. 1. In order to develop the application for many devices like android and iOS, these life cycles are required to apply rapidly. There are also challenges of the application development to satisfy all the requirements.

The challenges in application development:

1 Different Mobile Operating system with the same application

There are two operating systems that usually used in mobile phone such as Android and iOS. This situation causes the researchers to repeat the development the same application for different OS because Android application can only run in Android devices and iOS can only run in apple devices.

2 Difference programming language for the same application.

iOS application used swift programming language and Android application using java programming language. Cause of the difference programming language, it does not able to use the application in difference device's product like android and apple product.

In this paper the researchers develop the MUSAFIR ILMU application using android application. The researchers need to study the front-end from of any of the existing application and then apply the study on how to make the application that is able to recognize the Hijaiyyah Huroof and also add some related Hijaiyyah Recognition activity for users. There are seventh phases in the mobile application development life cycle: Identification phase (1); Design phases (2); Development Phase (3); Prototyping Phase (4); Testing Phases (5); Deployment Phases (6); Maintainance Phases (7).

3.1. Identification Phase

Data were collected based on the idea provided by the society. In this phase, the existing applications are as references for the developer to develop an application [4]. In this phases, the developer develops the MUSAFIR ILMU application. This application can be categorized into three (3) parts which are the information should be valid and easy for the user to understand, the application able to recognize User Hijaiyyah Huroof and user is able to make conservation with expert using chat messaging. The idea is documented and forwarded to the design phase.

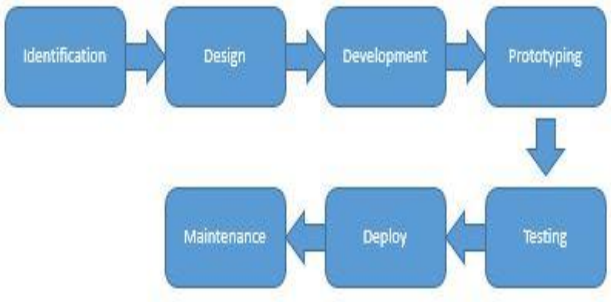

Fig. 1: Mobile Application Development Life Cycle MADLC

3.2. Design Phase

The second phase is the developer needs to design the architecture of the application. The storyboard like Case-Diagram is one of the alternative for them to make it as a references before develop an application [4]. The developer uses the Use-Case Diagram to design the application architecture as shown at Fig. 2.

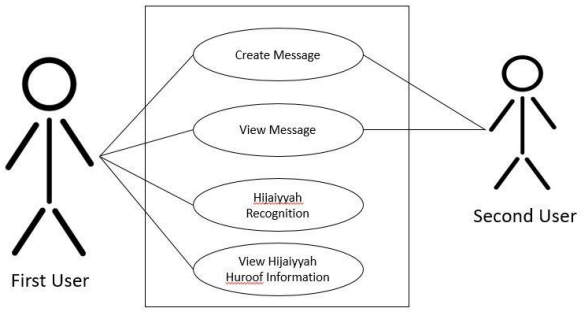

Fig. 2: The Case-Diagram of MUSAFIR ILMU Application

After designing the Case-Diagram, the developer draws application design of the user interface of the application as in Fig. 3.

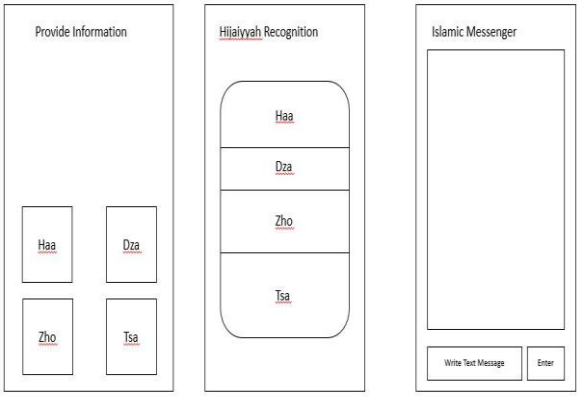

Fig. 3: The Application Activity Design

3.3. Development Phase

The third phase is the developer develops the application based on the design scratch made by the researchers. The application's identical style will become not realistic if the developer uses the

general structure functionality and the object-oriented programming only [5]. In this phase, the developer uses android studio to build the application. The android studio software is able to use programming language of JAVA and C++ or we called it as Software Development Kit (SDK) and Native Development Kit (NDK). Finally, the documentation of the development phase is forward to the prototyping phase.

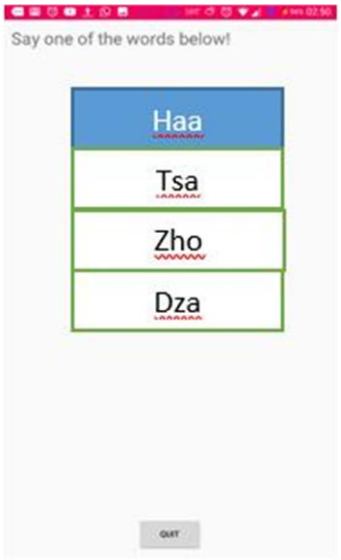

Fig. 4: The Hijaiyyah Recognition Activity



Fig. 5: Provide Information Activity

The Fig. 4, 5, and 6 above show the example of user interface in Musafir Ilmu application. The effectiveness of Hijaiyyah Recognition activity is tested by 32 users. The Musafir Ilmu only focuses on improving the user knowledge in pronouncing the huroofs. Finally, the documentation of the development phase is forward to the prototyping phase.

3.4. Prototyping Phase



Fig. 7: MUSAFIR ILMU logo



Fig. 6: Islamic Messenger

Fig. 7 shows the logo of MUSAFIR ILMU. The application connects to the server which is firebase to monitor the activity of the user when using this application. If there is any error in the application, the user is able to inform to the developer to fix the errors. The documentation is needed if there are any changes made by the developer [6]. In this phase, he needs to fulfil the functionality of the application requirement of the prototype. He creates and tests the application prototype in recognizing the Hijaiyyah Huroof and also he creates the activity that contains the information about Hijaiyyah Huroof. The Card View is applied to make the activity look more interesting when the user interacts with this application. When user touches/clicks/presses one of these Card View, the application will bring the user to another activity to read the information about the one of these Hijaiyyah Huroofs. After the work is done, the documentation is made and forwarded to the testing phase.

3.5. Testing Phase

The fifth phase is one of the important phase of any development life cycle model. This testing phase is important to ensure the application is free from any errors [7]. The Musafir Ilmu Application is tested based on its performance measured by the precision and recall rates using Confusion matrix.

Table 1 shows the confusion matrix of the model. The application has been tested to 32 UiTM students. To understand this confusion matrix, the row of the table represents the precision and column represents the recall of the confusion matrix. The row of the table is known as the input of the class and column known as the output each class. In this case, it represents silent, others, Haa, Dza, Zho and Tsa. This confusion matrix can be produced by asking user to pronounce the Hijaiyyah Huroof, and the application will detect to what the user has pronounced. For example, for huroof haa, the application is able to detect 32 correct of pronunciation from users, however, for huroof Dzo only 20 users manage to pronounce the Huroof and the rest, the application detects the Huroof Dza. This application has been tested to UITM student who were involve in answering the survey. By using this confusion matrix shown in Table 2, the researcher is able to measure the application performance. True Positive is the application correctly detect the Huroof, True Negative is the application correctly reject

the Huroof, False Positive is the application incorrectly detect the Huroof, and False negative is the application incorrectly reject the Huroof. A perfect model will produce zero in the entire entries in the confusion matrix. Below is the formula of precision and recall rates the precision and recall rates calculation of the application.

Table 1: Confusion Matrix of the Application

		Application detect the huroof(output) (recall)			
The huroof of user pronounce to the application (precision) (input)	Class	Haa	Dza	Zho	Tsa
	Haa	32	0	0	0
	Dza	0	32	0	0
	Dzo	0	12	20	0
	Tsa	2	0	0	30

Table 2: Confusion Matrix*:*

$$precision = \frac{True\ Positive}{True\ Positive + False\ Positive} \quad (1)$$

$$Average\ Precision = \frac{Total\ Precision}{Total\ Huroof} \quad (2)$$

$$Recall = \frac{True\ Positive}{True\ Positive + False\ Negative} \quad (3)$$

$$Average\ Recall = \frac{Total\ Recall}{Total\ Huroof} \quad (4)$$

$$Precision(haa) = \frac{32}{32+2} = 0.941$$

$$Precision(dza) = \frac{32}{32+12} = 0.727$$

$$Precision(zho) = \frac{20}{20+0} = 1$$

$$Precision(tsa) = \frac{30}{30+0} = 1$$

$$Average = \frac{0.941 + 0.727 + 1 + 1}{4} = 0.917$$

In future, people need to install this application in order to test the application in their mobile phone.

3.6. Deployment Phase

The sixth phase is the deployment phase. Deployment phase is the next process after develop the application. To ensure the application is able to use like what has been planned by the developer which is the implementation of the recognition in the applications. To obtain the feedback from user, the researchers made the observation during user use this application. The researchers plan to upload the Musafir Ilmu application to the Google Play store for people who interested use this application. The researchers need to follow all the guideline that made by the Google company

3.7. Maintenance Phase

The last phase is the process that will continue repeating until the application has been completely free from bugs. The services of the application include any improvement such as additional functionality and user interface [8]. In this phase, to maintain the application free from any error, the developer needs to see the crash reporting from the users who use this application. By using this tools, he could do the maintenance.

4. User Interface

Fig. 4 represents the detection of Hijaiyyah Huroof from a user. The user needs to pronounce the Huroof to the microphone of his smartphone and the smartphone will give feedback to him by highlighting one of these tabs. For example, if he wants the application to highlight the tab of Haa, he needs to pronounce accurately 'haa'. For the Huroof Tsa, Dza, and Zho, he needs to pronounce 'tsa' , 'dzo', and with 'tsa' accordingly in order to make the application highlight to the tab.

The activity on Fig. 5, the developer applies the cardview so that user could choose which Huroof he wants to pronounce. Card view is the extension of the FrameLayout class that creates the application to produce consistent looks across the platform. Cardview is also known as the widget that has its own characteristic.

Fig. 6 shows the interface for Islamic chat. The activity allows the users to communicate among their friends.

5. Conclusion

This paper discussed Musafir Ilmu, a mobile application for recognizing Hijaiyyah Huroof for huroof haa, dza, tsa, and dzo. Performance of the application was tested using Confusion matrix which calculates the precision and recall rates. The test results suggested that the Musafir Ilmu application able to produce high precision and recall rates as well as able to recognize mostly all user pronunciation of each huroof. Thus, this application could be used as an effective learning tool for Hijaiyyah Huroof at Mahaad Tahfiz school.

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