Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF TAJWID AL-QURAN DETECTION MOBILE APPS FOR ANDROID PLATFORM

NUR AZWA SYAZWANI BINTI ALIAS

Bachelor of Electronics Engineering Technology with Honours

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I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Technology Engineering with Honours

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DEDICATION

I dedicate my dissertation work to my family and many friends. A special feeling of gratitude to my loving parents, Alias Setapa and Hayati Alias whose words of encouragement and push for tenacity ring in my ears. My sister, Aliya and my brothers, as they never left my side and are very special. They always there for me when I am down. Thank you for always encourage and cheer me up. I also dedicate this dissertation to my many friends who have supported me throughout the process. I will always appreciate all they have done.

ABSTRACT

The use of smartphone now no longer merely serves only for communication but with the existence of smartphones that offer a variety of interactive application, it is also beneficial for education field. Smartphone can be use as learning platform as it can help even child learn at a young age by surfing the internet or install an application as e-learning platform such as Google Classroom for online classes and Duolingo to learn new language. These kind of application can help children in enhancing their minds and make them to think with creativity. Reciting Al-Quran with correct tajwid is a compulsory for Muslim including adults and children as it could interpret false meaning of Al-Quran verses if it recited wrongly. Usually, there is a teacher who can teach them while listening and highlighted their mistakes during recitation. However, it is required the teacher to present to teach them or they must attend a religious class to learn the tajwid law. To overcome this issue, a mobile application is developed where it detects the tajwid and provide an information regarding the detected tajwid. Pattern matching function is used to detect the image of tajwid. The users can use this application for the learning process together with their family at home. In this project, an interactive mobile application that able to detect tajwid on mushaf and able to provide tajwid information is successfully developed.

ABSTRAK

Penggunaan telefon pintar sekarang tidak lagi hanya berfungsi untuk komunikasi tetapi dengan adanya telefon pintar yang menawarkan pelbagai aplikasi interaktif, ia juga bermanfaat untuk bidang pendidikan. Telefon pintar boleh digunakan sebagai platform pembelajaran kerana ia dapat membantu anak belajar pada usia muda dengan melayari internet atau memasang aplikasi sebagai platform e-pembelajaran seperti Google Classroom untuk kelas dalam talian dan Duolingo untuk belajar bahasa baru. Aplikasi seperti ini dapat membantu kanak-kanak dalam meningkatkan minda mereka dan membuat mereka berfikir dengan kreativiti. Membaca Al-Quran dengan tajwid yang betul adalah wajib bagi orang Islam termasuk orang dewasa dan kanak-kanak kerana dapat menafsirkan makna salah dari ayat Al-Quran jika membaca dengan salah. Kebiasaannya, ada guru yang dapat mengajar mereka sambil mendengar dan menyoroti kesalahan mereka semasa berzikir. Namun, guru perlu hadir untuk mengajar mereka atau mereka mesti mengikuti kelas agama untuk mempelajari hukum tajwid. Untuk mengatasi masalah ini, sebuah aplikasi mudah alih telah dihasilkan untuk mengesan tajwid dan memberikan maklumat mengenai tajwid yang dikesan. Fungsi padanan corak digunakan mengesan imej tajwid. Pengguna boleh menggunakan aplikasi ini untuk proses pembelajaran bersama keluarga di rumah. Dalam projek ini, aplikasi mudah alih interaktif untuk mengesan tajwid pada mushaf dan dapat menyediakan tajwid maklumat telah berjaya dibangunkan.

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LIST OF ABBREVIATIONS

API	-	Application Programming Interface
Cm	-	Centimeters
CSS	-	Cascading Style Sheets
GPS	-	Global Positioning System
HTML	-	Hypertext Markup Language
iOS	-	iPhone Operating System
MFMC	-	Mel-frequency Cepstral Coefficient
MFMC-VQ	-	Mel-frequency Cepstral Coefficient-Vector Quantization
NFC	-	Near Field Communication
OS	-	Operating System

CHAPTER 1

INTRODUCTION

This chapter describes about the project background, problem statement, objectives, and scope of work in developing mobile application of tajwid Al-Quran detection based on android platform.

1.1 Background

In the era of globalization, variety of technology have been developed to please everyone and some of the technology has become a daily necessity in their lives. Smartphones is becoming increasingly popular among us as it has advanced computing and connectivity features as compared to a regular mobile phone. According to Statista websites, there are 27.53 million of smartphone users in Malaysia in 2018, 28.98 million in 2019 and 30.41 million of users in 2020. As for 2021, it is estimated that the number of smartphone user in Malaysia will reach 30.41 million and it will reach 33 million of users withthe increasing population growth in 2024. Relatively, around 90% of Malaysians spend times about almost 7.5 hours on internet and almost 2.5 hours on social media daily (Statista, 2021). Besides, smartphones allow users to install advanced application based on phone platform such as Symbian, Android, iOS or Windows Phone. Other than that, smartphones also can be used as an operating system that can provide a platform for the development of mobile application. Smartphone contain a lot of interesting application that can help us in carrying out daily activities orderly. For example, there are application that help us in managing our time by setting a reminder and more.

Today, smartphone not only important to students as well as working people but to

all generations of society no matter young or old. Smartphone can be used as a learning platform as they can use it to do research by surfing the internet or install an application that can help them in completing their work. The science of law is a science that related to the holy book, Al-Quran. So, there are a lot of importance and benefits of learning the science of tajwid as it can avoid people from reciting Al-Quran with wrong law of tajwid which it can lead to false meaning of Quran verses. Sometimes we do not have enough time to attend classes to study Al-Quran and its law of tajwid. However, that is not a reason to be lazy in learning it.

There are many mobile applications that have been developed to help users in learning tajwid. This application is suitable to help users in learning law of tajwid. This app can also be used by people who are just started to learn the science of tajwid. In conclusion, this project is going to develop a mobile application that is based on android application that can detect the tajwid by scanning the Quran verses. Other than that, this app can store the information of law of tajwid provided that has been scanned earlier and users are able to view and refer to the previous information.

1.2 Problem Statement

Nowadays, making mistakes in reciting Quran with wrong tajwid always happen to majority of Muslim people whereas it is prohibited as it can lead to mispronunciation and mistranslation where it can change the actual meaning of Quran verses. Meaning of some verses can be changed if there is a slightly differences in their recitation. Many people nowadays they know to recite Al-Quran, but they do not know the proper way in reciting it with correct tajwid. Therefore, it is compulsory for everyone to learn on how to recite Al-Quran properly without mistakes and correct tajwid.

Usually, people attend a class where the teacher called ustaz or ustazah will teach

them directly how to recite Quran properly with correct tajwid. They also will point out the mistake that occurs when they recite the Quran verses wrongly and fix their recitation. It is called as face-to-face learning method as the teachers can directly teach them and fix their mistakes in class. But not everyone can afford to attend the class or hire the teacher to teach them as it consumes some cost.

With the advancement of technology now, there are many various types of technology that can help everyone to learn reciting Quran with correct tajwid by using online platform. Therefore, this problem can be overcome by developing a mobile application that can detect tajwid and display the corresponding tajwid law and its correct pronunciation.

1.3 Project Objective

The objectives of this project are:

a) To design a feature in mobile application that capable to detect tajwid by using pattern matching method.

b) To develop a mobile application based on android platform that has interactive features of learning tajwid Al-Quran.

1.4 Scope of Project

The scope of this project are as follows:

a) This project is developed for Al-Quran character (~) use only.

b) This project only can detect one type of law of tajwid which is Mad Jaiz Munfasil (~).

c) This apps can help users detect the tajwid image by scanning the Quran verses and show the result obtained based on tajwid that has been scanned.

d) The result displays the image preview, tajwid detected and its data which are

laws of tajwid, length of harakat and way of recitation.

e) The users can view the all the information regarding the tajwid in learn tajwid page.

f) It is an application that is based on android platform.

1.5 Thesis Outline

This thesis is constructed as follows:

Chapter 1 introduces the project which will be described in thisreport. It is the project background. This will explain the introduction of the project, which includes the introduction, the report of problems, the aims, and the scope of work of the study. As for Chapter 2, the review of theories is briefly explained in this chapter, experimental works and some findings that had been made during past research related to the current project. The research also will be summarized. Chapter 3 describes the approach and plan for meeting the targets in greater detail. Thischapter will cover the theory of control and will develop the application process. The methodis included for each phase and the flow chart for the entire project. Chapter 4 shows the result of the experiments the presented in the figuresand the study results; it also discusses about the drawings and graphs. Lastly, the consequences of this experiment and the project priorities to be accomplished are outlined inchapter 5. This chapter also points out a range of suggestions for future growth and progressof development. Suggestions for potential inventors are also being created for future study.

CHAPTER 2

LITERATURE REVIEW

This chapter describe about the relevance of this project with other research to provide better research and avoid unnecessary repetition of the problem areas on this study.

2.1 Mobile Application

Mobile application is application software that was designed to run on a mobile device like a smartphone, laptop, or computer. There are various sorts of the mobile application that has been developed on a mobile device. Mobile applications are different from the integrated software systems that are generally found on many personal computers as mobile applications got to work with different constraints that like their desktop. Mobile devices have a spread of screen sizes, memory capacities, graphical interfaces where the developers must accommodate all of them to the users because it is moveable, easy to use, and may be accessed anywhere and anytime the user wants (Islam and Mazumder, 2010). The mobile application has grown rapidly because it provides users with tons of services and qualities by using it.

2.2 Type of Mobile Application

The development of mobile applications is a process where software applications are created to run on mobile devices. Therefore, the process involves creating installable software in bundles which are code and binaries, it also implementing backend services such as the data can be accessed by using an API and the application will be testing on targeted mobile devices. There are many types of approaches uses in building mobile applications which is native mobile application, cross-platform, hybrid, and progressive web.

A native application can be used to write in programming language and the frameworks are provided by the platform and it can run the application directly on the operating system of the device such as Android and iOS. As for cross-platform applications, they can be written in a variety of programming languages and frameworks. However, they will be compiled into a native application that can be running directly on the operating system. Meanwhile, for hybrid mobile application, it is built with standard web technologies such as JavaScript and CSS. Different from a native application, hybrid mobile application work on a web container that provides a browser runtime and bridge for native devices. A web application offers an alternative approach by skipping application store and application installations as it is a web application that utilizes a bunch set of browser capabilities for user experience. As it is web-based, there is no need for developers to customize to a platform where it helps in cutting down on development costs. This is because the web application is designed by using HTML and JavaScript that used to create a web.

2.3 Mobile Application vs Web

Mobile Applications are built for a specific platform such as iOS and Android OS where the apps are installed via an app store like the play store. They also have access to system resources such as cameras and GPS functions. Mobile apps can run on mobile devices themselves. Mobile apps are faster than web apps as they can be used without having an active internet connection. It is also safe and secure as the apps must be approved by the app store in the first place before available in the app store. They are also more advanced in terms of features and functionality. Today, there are many popular mobile apps such as Instagram, Twitter, and Facebook as social media apps, meanwhile Mobile Legends, PUBG, and Free Fire for game apps.

In other words, a web application must be accessed via an internet browser such as Google and Internet Explorer. It also needs the web apps to have an active internetconnection to run the apps. This application does not need to be downloaded and installed because it can be viewed through the mobile devices used by the user. It also looks and functions a lot like mobile apps as it is an emerging trend where some browser advancementallows web apps to act and function more like mobile apps. Nevertheless, there is no standarddevelopment kit in building web apps, unlike mobile apps that must follow provided standard software development. They are also easy to maintain as they have a common codebase regardless of mobile platform, and the apps can be updated by themselves, unlikemobile apps where the user is required to update them regularly.

2.4 Mobile Operating System

Nowadays, each smartphone has its operating system produced by the manufacturer to ensure the compatibility of the device and it can support the devices. It is called a mobile operating system. There are many mobile operating systems that available today. Two operating systems commonly used in every smartphone are Android OS and iOS. These two mobile operating systems have different approaches.

Android is owned by Google, and it is powered by Linux kernel which it uses in a wide range of devices. Android is an open-source operating system that is in rapid development in the market (Hammershøj, Sapuppo, and Tadayoni, 2010). It has unlimited access to anyone that wants to develop an application as it has a little restriction on its licensing where the users can benefit from it. Android has some of the best features including the ability to customize its home screen with a variety of widgets and apps to easier access. It also supports NFC which is ‘near field communication’ which allows the devices to communicate with other compatible devices around the users.

As for iOS, it is owned by Apple, and it has multi-tasking operating that can be found in Apple's iPhone, iPad, and iPod. Apple is known for its strict quality control which it can guarantees that the apps and hardware can work perfectly without any problem occurs in the future. It also owns a brand mapping. Apple has its drawbacks, but they cannot support software called Flash and the users are locked into Apple because its operating system works on Apple products only.

2.5 Software Development

Software is a set of instructions or programs that tell a computer what to do as it makes computers programmable. There are three basic types of software which are system software, programming software, and application software. System software is functioning as operating systems, disk management, hardware management, and other necessities operational. Meanwhile, programming software provides programmers tools to create code such as debuggers, text editors, linkers, compilers, and others. As for applications software, it functions as an application that can help users in performing their tasks. For example, data management software, security programs, and media players. It also refers to mobile applications and web that people used to shop on Lazada or Shopee, post pictures or videos to Instagram, and use Facebook to socialize with their friends.

In addition, it also helps in speed up the development of the appliance. It providesa visible development environment and makes the method of developing the software much easier. It also provides features like hardware compatibility in workflow design. Many applications development software can develop apps for desktops, mobile devices, and web browsers such as android studio, python, and xamarin.

Android Studio is a software that can be used for android application development and it can integrate its code editing and its developer tools. Android Studio supports

programming languages such as Java language, Kotlin, and C++ where it can be written in the source code. Android Studio uses Windows, macOS, Linux as its operating system based on the desktop platform.

Python is a well-known software that can be used in various mobile application development areas as its programming language can be used in many major operating systems. It can be used to build mobile applications for Android, iOS, and Windows. Kivy and BeeWare can be used in developing a cross-platform mobile application which they are supported by both Android and iOS by using Python software.

Xamarin is a Microsoft software which is safe to use against unexpected service termination, technology updates and security threats. Xamarin is a mono framework that allow full use of device capabilities to the programmers, and it is easy to build, deploy, and test by using C++ programming language that is known to almost every programmers. Other than that, it also able to use in enterprise or social authentication, offline sync and push notification feature.

2.6 Previously Proposed Techniques to Detect Tajwid Al-Quran

Several techniques on tajwid Al-Quran detection have been proposed in the past. Firstly, (Ibrahim, Rahim and Ahmad, 2019) proposed to develop an automatic tajwid rules recognition by using image processing technique and it can assist the user on a proper recitation of Al-Quran. The image processing technique prototype is using the K-Nearest Neighbour classifier and Euclidean distance. K-Nearest Neighbour classifier is widely used in text classification as the algorithm is simply easy to interpret meanwhile Euclidean distance is used to find the differences between the two distances of the prototype. From the study, the result shows that the image processing technique that has been proposed for tajwid rules recognition is successful. The technique used can recognize the tajwid rules but not

accurately. However, in this study, the prototype cannot recognize all the tajwid rules, but it only can recognize the Idgham rule which is Idgham Maal Ghunnah and Idgham Bila Ghunnah.

Table 2.1: Table of Result Recognition Accuracy

Tajweed Rules	Letter	No of Testing Images	No of TRUE Recognition	Accuracy Percentage
Idgham Maal Ghunnah	Ya "ي"	30	28	93.33
	Wau "و"	30	22	73.33
	Mim "م"	30	28	93.33
	Nun "ن"	30	29	96.67
Idgham Bila Ghunnah	Ra "ر"	30	20	66.67
	Lam "ل"	30	25	83.33
			Mean	84.44

In another study, (Alfaries *et al.*, 2015) proposed to develop a device that automatically can find and annotate the letters that embody tajwid rules in verses of Al-Quran. In this study, the prototype used Natural Language Processing (NLP) technique to extract tajwid letters in the Quran verses and General Architecture for Text Engineering (GATE) as it is an open-source language processing software where it is used in NLP technique in extracting Quran verses. From the study, the result shows that the developed tajwid system is automatic can extract and annotate the tajwid rules. However, due to differences in the format of Quran verses, the system cannot recognize Uthmani verses in Al-Quran, but it only can recognize Ima'ei script format in Al-Quran.