



## E-Tarteel : Visualizing Quranic Tajweed Rules

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### ABSTRACT

Qur'an is the most important and priceless heritage for the Muslims. Since it is a very meaningful reference to the Muslims, the Muslims are urged to understand and practice the teachings of Qur'an. There have been a variety of Qur'an applications that have been developed to help Muslims to recite the Qur'an online. The purpose of this research is to develop the Qur'an tajweed self-learning application named E-Tarteel which is able to guide the new Qur'an learners who want to learn reciting the Qur'an in a proper pronunciation in tajweed. E-Tarteel is a web application that uses the various types of tools and frameworks for developing the interactive e-learning tajweed where it is able to provide the self-learning for the student to learn tajweed by themselves. In E-Tarteel, the Tajweed categories that have been covered is the noon saakin rules, that is izhar halqi, ikhfa hakiki, idgham maal ghunnah, idgham bila ghunnah, and iqlab. This Tajweed engine works when the first Arabic character noon (ن) or tanween meets any character of Tajweed category and it will create the colored text of correct Tajweed. Hopefully the development of E-Tarteel will be able to be the new approach in assisting Muslim to understand and learn Tajweed during reciting Qur'an since the application can be accessed anywhere. Moreover, this E-Tarteel is suitable to be one of courseware for school teachers in assisting student to explore and learn Qur'an in interactive way.

**Keywords:** Tajweed category, web application, visualization, coloring technique.

### 1. INTRODUCTION

Qur'an is the ultimate reference to the Muslims. Its revelation is very unique due to the fact that it was revealed in stages. Qur'an recitation has a set of rules, known as Tajweed to ensure proper pronunciations, reading and interpretations of the Qur'an and it is an obligation upon Muslims to recite it in a correct way. Qur'an learning starts with learning Tajweed, which means learning how to pronounce and recite it correctly. As a Muslim, it is a must to learn the proper pronunciation when reciting the Qur'an for getting the exact meanings of the Quran verses. Nowadays, the development of Qur'an reciting technology in Muslim community is the issue that must be emphasized. Currently in Malaysia, even though most students in school learn to recite Qur'an during the class, however many students still are not able to recite the Qur'an with tarteel properly. Considering this issue, the purpose of the project is to develop the Qur'an Tajweed self-learning application named E-Tarteel which is able to guide the new Qur'an learners who want to learn about reciting the Qur'an in a proper pronunciation in Tajweed. Varieties of Qur'an applications have been developed to help Muslims to recite the Qur'an online. Among those applications have been using the multimedia content together with advanced technology are those using the web application framework. Such applications can be more interactive for Muslims so that to use them

through the web and can easily recite the Qur'an. They offer multiple interactive ways for reciting. The objectives of this project are:

- i. To identify the rules of Tajweed categories involved in Qur'an.
- ii. To propose a system design for retrieving the Tajweed category in Qur'an based on character recognition techniques.

The rest of the paper is organized as follows: Section 2 gives the related works in the field of automatic Tajweed recognition for Qur'an tarteel, Section 3 exposes the methodology used during the development to achieve the aim of the paper. Section 4 represents the system prototype that adapts selected techniques under the stemming algorithm to apply the Tajweed rules under noon saakin family to produce the result for suitable Tajweed for individual ayah. Section 5 demonstrates the testing technique to find bugs while Section 6 shows the results obtained. Finally Section 7 gives the conclusions, while Section 8 discusses future works.

## **2. RELATED WORKS**

### **2.1 Qur'an Tajweed Rules**

The Holy Qur'an consists of 114 chapters of varying lengths, each known as a *sura*. Each sura is formed from a number of ayahs or verses which originally means a sign or portent sent by God. The number of the ayahs aren't the same in various Suras. The Qur'an was revealed in the Arabic language and has been translated to other languages. Qur'an education is an obligation to every Muslims (Tarriq, 2012). It is the responsibility of parents and teachers to help new generation to learn Qur'an to become a true Muslim and a better human being (Noh and et, 2013). According to Qur'an learning process, it started with learning Tajweed, which means learning how to pronounce and recite it correctly. Tajweed is the rules which refer to the correct pronunciation while recitation of the Qur'an. The meaning of Tajweed is to make well, make better or improve. The Qur'an has a set of rules that will guide to recite a proper Tajweed, to make sure the meaning when reciting the Qur'an is not different meaning that will create a sin. In the past few years, many quranic applications and software have been developed to fulfill the need of users in Islamic information. Based on Hasan and Suhul (2013), their research found through the analysis of the errors in recitation among students that students' ability to implement the rules of Tajweed is generally very low. According to Tabaa et al. (2013), the process included during reciting the Qur'an properly need extensive and frequently practice sessions to help the Muslims to improve their recitation. They need an extensive training time until the trainee reaches the proper degree of proficiency.

### **2.2 Qur'an Tajweed**

Tajweed is the rules which refer to the correct pronunciation while reciting the Qur'an. The meaning of Tajweed is to make well, make better or improve. The Qur'an has a set of rules that will guide to recite a proper Tajweed, to make sure the meaning when reciting the Qur'an is not distorted to a different meaning that will create a sin. There are some Tajweed rules that focus on noon saakin or tanween and mim saakin. (Zameer, 2013).

Table 1: Tajweed rules for noon saakin/tanween categories

Tajweed Rules		Meaning	Letters
Noon saakin or Tanween	Izhar hakiki	Noon sound is pronounced very crisp and clearly without any ghunnah when followed by letters	خ غ ح ع ه ء
	Idgham	Idgham only applies between two words and not in the middle of a word. It is divided into: -Idgham without gunnah Noon sound is dropped when followed by letters	ر ل
		-Idgham with gunnah Noon sound is dropped and also has a ghunnah if it is followed by letters	ي ن م و
	Iqlab	Noon sound is converted to a Mim sound, with a ghunnah	ب
	Ikhfa	the Noon sound is suppressed (the tongue does not make full contact with the roof of the mouth) and has a ghunnah	ص ذ ث ك ج ش ق س د ط ز ف ت ض ظ

Table 1, shows the Tajweed rules for noon saakin/tanween. Noon saakin refer to whenever there is tanween or a sukun sign on a noon. There are four ways it should be pronounced depending on the letter that follows the noon saakin. This is the basic Tajweed rules that will be focused on this application for creating a Tajweed e-learning web application.

## 2.2 Stemming Techniques

Text classification is one of the important and widely known applications in data mining field. Text classifications need stemming techniques to reduce the high dimension of features space character techniques. Wahbeh et al.(2011) , mentioned a lot of research which addressed the problem of text classification for many languages such as English (Zaghloul, Lee, & Trimi, 2009), Chinese (He, Tan, & Tan, 2000), Arabic (Al-Harbi et al., 2008; Al-Shargabi et al., 2011; Kanaan et al., 2009) . According to Al Shammari (2008) and Sembok et al. (2011) in Wahbeh and et al. (2011) , stemming techniques has some benefits such as it is able to reduce the size of index terms and it also able to reduce various word forms to common roots in a way to improve retrieval effectiveness.

## 2.3 Arabic Text Recognition

The Arabic text recognition is the techniques that have been used for creating differentiation between two Arabic characters and create the result of it. The method used is classification of Arabic extraction method. The extraction method uses stemmer algorithms that are predefined rules to remove the affixes (prefix, infix, and suffix) from the word to extract the root. This category allows a good information retrieval without providing an analysis. In Figure 1, shows the stages in Arabic extraction for Tajweed classification involved in the system. This algorithm checks the letter of any word in the ayah and if a match is found, the color of the related characters will be changed to the system color format for the category of Tajweed.

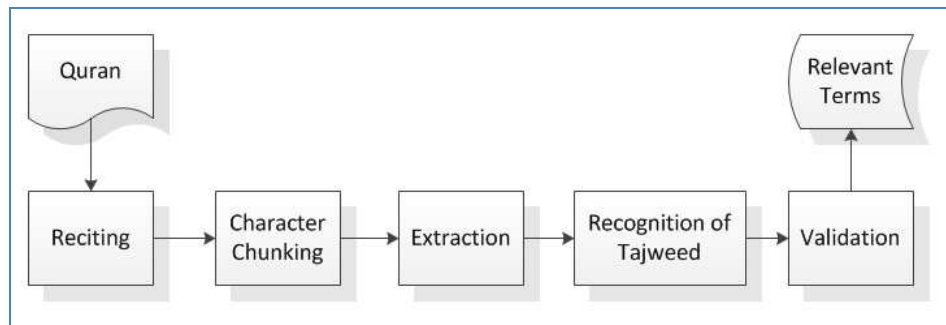


Figure 1 : Stages in Arabic extraction for Tajweed classification

### 3. PROJECT METHODOLOGY

In this research, the researcher is using an agile development which is about producing the simplest, quickest, most basic website and then rapidly evolving that website based on feedback from real users and their demonstrated needs. This system is designed and developed with PHP that can provide a data access interface to the data. It provides the possibility to develop the application with a powerful Web data access. This system uses MySQL as the back-end database which has a powerful data managing and solving capacity with a higher security performance.

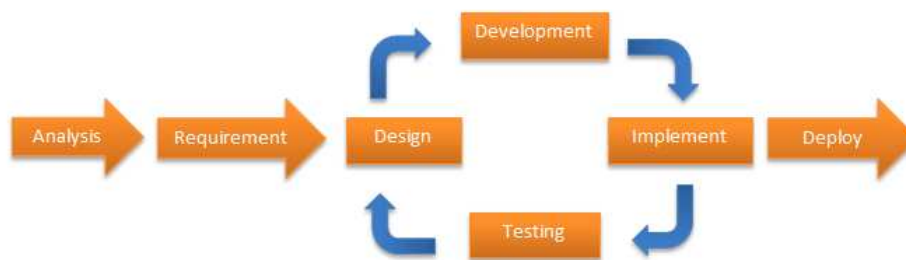


Figure 2 : Agile Development Model

Figure 2 represents the key activities in this development to gain the requirement from the application domain covered in analysis and design phase. All information will be documented in the Software Requirements Specification (SRS) and the system should be developed according to SRS. After both functional and non-functional requirements have been specified, fast design phase will take place where the interface, architecture, and test plan design UML diagrams. In prototype cycles (design, development, implement), once the requirements have been approved, prototype being developed where the desired functions implemented in the system. Each prototype development will be tested with stakeholder so that it meets the specified requirements. It will go through the same phase in design, development and implementation until the system is really advanced. The requirements may change from time to time, therefore development must adapt to the changes to the system that can meet users' satisfaction. Testing phase is done once the application has been fully developed. Test cases will be designed before the test and document named Test Software Design (PCB) will be generated. The last phase is development, hence cycle is complete. The purpose of workflow execution is to produce broadcast products, and deliver software to end-users.

#### 4. IMPLEMENTATION

E-Tarteel has been developed by implementing the design model and it consists of two users which are: student and admin. The system has developed the Tajweed character recognition that has been applying the classification of Arabic information extraction methods. By implementing the stemmer algorithms, that use affixes which are prefix, infix and suffix, creates a result by changing the Tajweed from black text to coloured text. All the Arabic characters has been stored in database . Figure 3 shows the flow of E-Tarteel Tajweed engine. This method is applied using HTML decimal Unicode and Java Unicode of the arabic character using the stemming algorithm .This Tajweed engines worked when the first Arabic character noon (ن) or tanween meets any character of Tajweed category and it will create the colored text of Tajweed. The difference between all noon saakin/tanween Tajweed category is the color that guide the user to differentiate the Tajweed pronunciation. While the user recognizes the Tajweed colored, the Tajweed information tooltip can be pop up when the user mouse is over to the colored Tajweed. The system prototype has been developed successfully and it is functioning well during unit testing and integration testing. This application has been well developed and tested in user acceptance testing and it fits according to the user requirements.

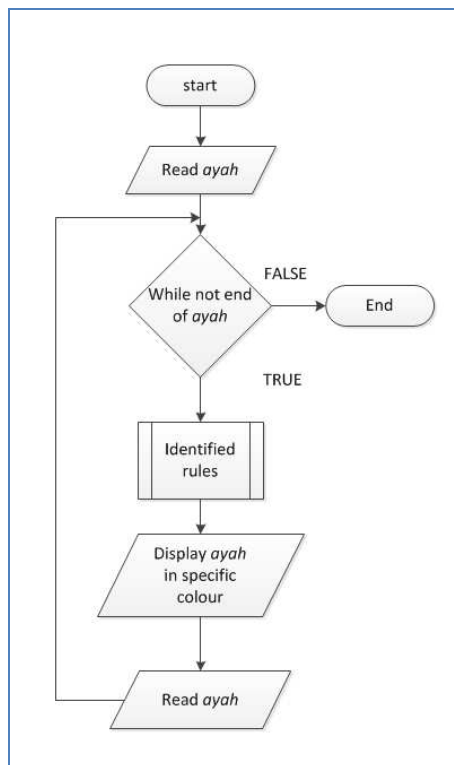


Figure 3 : Flow of E-Tarteel for Tajweed engine

## 4.1 Proposed System

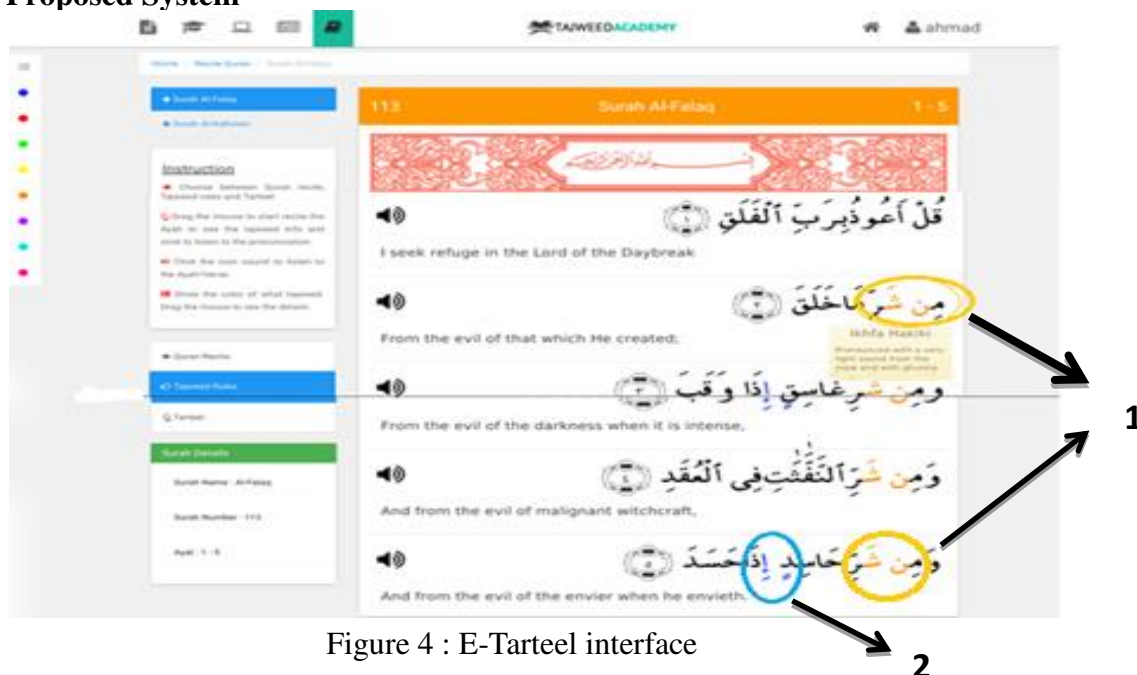


Figure 4 : E-Tarteel interface

Figure 4 shows E-Tarteel interface for surah Al-Falaq. In this surah, in ayah five, it contains two different types of Tajweed, namely Ikhfa Hakiki and Izhar Halki. The system will help the user to pronounce correct Tajweed when the user click the coloured Tajweed (1), a portion of ayat will play correct pronunciation for Ikhfa Hakiki Tajweed rules. When the user clicks the coloured Tajweed (2), another portion of ayah will play correct pronunciation for Izhar Halki. The system will play the audio of the ayah when the user clicks the sound icon on each ayah of the surah. Table 2 shows the info of colour code for each rule in noon seeking Tajweed family to be referred during the user recitation of the surah.

Table 2 : Tarteel Tajweed Rules Coloring Category

Colour	Rules
Blue	Izhar Halqi
Red	Idgham bila ghunnah
Green	Idgham maal ghunnah
Yellow	Iqlab
Orange	Ikhfa' Hakiki

## 5. TESTING

Unit testing test cases are prepared to ease the control of each individual module that is tested. The test cases will contain all related requirements, post conditions and pre conditions and the test steps along with its expected results and actual results and also the amendments that must be made.

Table 3 : Summary of All Test Cases

No.	Test Case	Expected Behaviour	Actual Behaviour	Result
1.	Practice level of Tajweed	Display the beginner, intermediate, advance level exercises	As expected	PASS
2.	Recite Qur'an tarteel	Display surah Al-Falaq and Al-Kafiroon	As expected	PASS
3.	Tajweed character recognition in tarteel	Display the coloured Tajweed in the surah	As expected	PASS
4.	Tajweed information tooltip	Display the Tajweed information at the bottom of the coloured Tajweed	As expected	PASS
5.	User click the sound icon	Play the ayah audio in the surah	As expected	PASS
6.	User click coloured Tajweed	Play the Tajweed pronunciation audio in the ayah	As expected	PASS

Table 3, shows the summaries of all test cases that have been conducted during the evaluation process with the respondents that are from the UniKL MIIT. Test cases have been created during this session. During the testing session, all issues found were fixed by the developer and the reconfirmation test has been conducted by internal team members. Issues are considered solved when the result of testing is passed.

## 6. RESULTS AND ANALYSIS

In usability testing, by using the given evaluation form for 20 respondents consisting of Universiti Kuala Lumpur MIIT students have tested the system individually and in groups. This section discusses the findings according to construction presented. We used the 1 to 5 point Likert Scale (strongly agree , agree , not sure , not agree and strongly disagree) respectively. In the analysis, we simplified it to 3 points for better readability. Figure 5, shows the overall system complexities that are based on the questions in the evaluation form. There have been 62% of evaluator that strongly agree and 33% of evaluator who agree. That means that the overall project is good and gains our satisfaction upon the overall system complexity. There were only 5% of evaluators who were neutral about the overall system complexity. This measurement also included the perspective of user interface which was easy to understand, system flow is clear, system functions were perfect and the system was attractive and well designed.

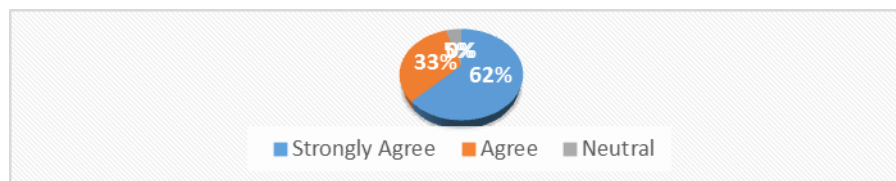


Figure 5 : Overall System Complexity



## 7. CONCLUSIONS

In conclusion, E-Tarteel is a very good tool for every Muslims to use, whether the user wants to start learning Tajweed or to the advanced user who wants to recite Qur'an with the Tajweed information and coloured Tajweed. Abdou, et al. (2006) in Tariq et.al (2012) introduced the design and development process of engaging multimedia application for encouraging learners, while performing the Tajweed. They explained that learning process becomes easier for students to learn the Tajweed using an attractive learning technique such as coloring technique to visualize the rules of Tajweed category such as noon shaakin involved in selected surah in Qur'an. The Tajweed rules addressed the effect of applying stemming algorithm and Arabic text recognition techniques that have been used for checking each suitable Tajweed rule between two Arabic characters and result are created by displaying color for each type of Tajweed involved between the character in each ayah. This research supported the information from the previous research by Abdul Fattah (2011) in Azmil Hashim et al(2015) which mentioned that the factors of learning process during reciting Qur'an are important because few points need to be considered when conducting teaching process, mainly; time factor, situation, special occasion, students' readiness, teaching approach, students' thinking competence, content suitability and teaching method which is suitable to ensure that the teaching process can take place smoothly and effectively.

## 8. FUTURE ENHANCEMENT

For future enhancement, this project could be applied to visual impaired community to help them to recite Qur'an Tajweed using this interactive way. Moreover, this E-Tarteel also is suitable to be one of courseware for school teacher in assisting students to explore and learn Qur'an with interactive way. Hopefully the development of E-Tarteel will be able to be the new approach in assisting Muslim to understand and learn Tajweed during reciting Qur'an since the application can be accessed anywhere.

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## REFERENCES

- Ahsiah, I., N. M. Noor, and M. Y. I. Idris. "Tajweed Checking System to Support Recitation." 2013 International Conference on Advanced Computer Science and Information Systems (ICACIS)(2013).
- Auhood Alfaries, Manal AlBahlal, Manal Almazrue, Amal Almazrue IWAN Research Group "A Rule Based Annotation system to extract Tajweed Rules from Quran", IT Department, CCIS, (2010).
- Hassan, Surul Shahbudin Bin, and Muhammad Azhar Bin Zailaini. "Analysis of Tajweed Errors in Quranic Recitation." *Procedia - Social and Behavioral Sciences* (2013): 136-45.
- Hashim, A., Saili, J., & Noh, M. "The Relationship between Pedagogical Content Knowledge and Qur'an Tajweed Performance among Students KKQ in Malaysia".(2015) *Procedia - Social and Behavioral Sciences*, 1530-1537.
- Ibrahim, Noor Jamaliah, Mohd Yamani Idna Idris, Zaidi Razak, and Noor Naemah Abdul



- Rahman. "Automated Tajweed Checking Rules Engine for Quranic Learning." Multicultural Education & Technology Journal Multicultural Ed & Tech Jnl (2013): 275-87.
- Mohd Aderi Che Noh, Amjad Hussein, Othman Ghani and Asmawati Suhid, "The Study of Quranic Teaching and Learning: A Review in Malaysia and United Kingdom," Universiti Kebangsaan Malaysia, Malaysia University of Wales Trinity Saint David Lampeter, Malaysia Universiti Putra Malaysia, Malaysia (2013), ISSN 1990-9233
- Noh, Mohd Aderi Che, Ab. Halim Tamuri, Khadijah Abd. Razak, and Asmawati Suhid. "The Study of Quranic Teaching and Learning: United Kingdom Experience." MJSS Mediterranean Journal of Social Sciences (2014).
- Tariq Mssraty, Qais faryadi, "Teaching the Quranic Recitation with Harakat: a multimedia based interactive learning method", International Journal Scientific and Engineering Research Volume 3, issues 8, August 2012.
- Tabbaa, Huda M. Arfan, and Bassel Soudan. "Computer-Aided Training for Quranic Recitation." Procedia - Social and Behavioral Sciences (2015): 778-87.
- Wahbeh, Abdullah, Mohammed Al-Kabi, Qasem Al-Radaideh, Emad Al-Shawakfa, and Izzat Alsmadi. "The Effect of Stemming on Arabic Text Classification." International Journal of Information Retrieval Research (2011): 54-70.
- Zameer Ahmed Adhoni, Abdul Ahad Siddiqi "A Programming Approach for the Digital Quran Applications", 1310105-9494-IJECS-IJENS (2013)