Toward Designing and Modeling of Quran Learning Applications for Android Devices

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Abstract: This paper describes a project focusing on developing application software that is entitled as "*Noor Al-Quran for android devices*". The project aims to proliferate the learning of Holy Quran using latest technologies for Non – Arabic speakers. In this paper, two phases of project have been described. The first phase emphasis on requirement analysis which provides three levels of analysis: monitoring existing Holy Quran applications, identification of Features in proposed application and determining the available documents of database. While the second phase covered software engineering and technical part which can be categorized into three broad sub-phases: designing & modeling, setting up logical and physical databases and developing the business logic. Designing & modeling phase has accomplished the designing and modeling needs required by the app to form the basis of designing and linking them using Android programming, which include designing the use cases, modeling through UML diagrams and designing the mobile user interface prototypes. Setting up Logical and Physical Data Bases phase has included gathering App's data and facilitating them in SQLite and other format compatible enough to be used as underling database or data source. Developing the business logic phase comprised of initiating the process of hard coding the program logic using Android SDK and APIs on the data and designs provided by the above two phases.

1.0 Introduction

The research "*Noor Al-Quran for android devices*" aims to develop a mobile Qur'an App for *android* compatible smart phones. Specially intended for Non-Arabic Speakers, Reverted Muslims (people new in Islam) and Physically challenged inhabitants (by providing audio features for blinds and sign language translation). It has been observed, that people are adopting latest technologies to access their favorite app to enhance their Islamic knowledge in their busy and spare time. The idea behind developing this software is to help such users to access quranic resources and learn Holy Quran on the move i.e. at their convenient time and place.

Initially, this application will be designed to run on android supporting mobiles devices because as stated *"Most major mobile service providers carry an Android device. From Q2 of 2009 to the second quarter of 2010, Android's worldwide market share rose 850% from 1.8% to 17.2%. On 15 November 2011, Android reached 52.5% of the global Smartphone market share"* [1]. However, this project can be extended to support other mobile operating systems and different devices in future.

As understanding of Holy Quran is obligatory on all human kind, and is not limited to specific people or specific region more precisely Arab world, every effort must be taken to help Non-Arabic speakers to understand the word of their Creator using authentic resources . Moreover, in the busy routine of daily life, an individual will hardly find time to learn Arabic language and then understand Quran, but still they have desires to know about their Creator and His commands given in His book. This application attempt to quench the thirst of such audience by providing easy access to Digital Quran in a form of an application in their mobile phones.

Noor Al-Quran for android devices intends to bring new striking features combined with the existing ones that are available in other Quran software in the android market, it attempts to provide complete Quran learning solutions for non-Arabic speakers. Pioneering features that distinguishes it from other Quran software are audio tafseer (initially, in English), root words with meaning (initially, in English), Quran Translations in multiple languages (we propose to support 25 languages), sign language translation (Juz Amma), Option to recite set of verses for memorization etc.

The rest of this paper is organized as follows. Section 2 provides a brief review of Holy Quran applications on smart phones. Designing and modeling of Noor Al-Quran Application is outlined in section 3. A few results are presented in section 4. Finally,

section 5 presents concluding remarks and highlights outcomes from this research.

2.0 Review of Holy Quran Applications on Smart Phones:

A smart phone is a single compact device that is designed to take care of all user handheld computing and communication needs. The ability to conform the device to do things the way user likes, makes it distinct from other traditional cell phones that offers limited features. There is tremendous growth in usage of Smart phones in various aspects ranging from communication to entertainment and education. Smart phone have emerge as magical tool for all aged learners, making the learning material easily accessible any time at fingertip with lowest or no cost at all [2, 3, 4,5,6,7] .

Mobile learning has show positive impact on acquiring Islamic education, study and feedback has shown that over 40% of the people who had never read the Quran started reading it because it was on their mobiles, available in their language of choice and a click away [8]. myQuran app was featured during Ramadan on CBS News regarding how Muslims are adopting the latest technology by using their favorite app to enhance their Islamic knowledge [9].

App Stores of Nokia, Black Berry, iPhone, Android have launched many Quranic Apps which enables the user to download Holy Qur'an in audio-visual form in many languages including Arabic text, Quran recitation, Translation and Tafseer in different languages. Some of the popular apps such as *Quran In Urdu S60* for Nokia mobiles, provides quran in arabic text with its meaning in Urdu language with multilingual user interface and Tajweed rules in a very simple way [10]. *uQuran* from Black Berry offers the full Quran in the beautiful Uthmani font with an easy to use and intuitive user interface. It also offers verse by verse translation and recitation along with easy to manage and view bookmarks [11]. *Quran Tafseer* in Apple itunes contains five tafsir books in Arabic including Tafsir Ibn Katheer, Tafsir At-Tabari, Tafsir Al-Baghwi , Tafsir As-Saady, Tafsir Al-Moyasar [12].

Quran Android for Android devices provides Quran text, with full English translations, page navigations, full screen mode, toggle for Arabic and English Surah names, lock screen orientation, searching, and the size of the translation text [13]. myQuran is a unique and powerful application that enables us to study the Quran at many levels with quranic root words [14]. Quran Study workbook is designed to work for Apple devices. It provides Quran root word with their detailed description. However such a feature (Root words and there meanings) is not yet seen in Android devices. Therefore the proposed research aims to develop an Android app. that would

(a)   App Store:

provides root words in Quran and their meanings in English in addition to derivations and how many times these words exist in Quran. This facilitates a learner with an excellent insight into understanding of the Holy Quran, hence learning Quran's vocabulary becomes easy.

For instance, there are almost 2000 root words in Holy Qur'an if an individual learns 10 words in a day, by 6 months all 2000 words will be memorized [15]. The Classical Arabic of Quran is one of the most versatile and dynamic language [16]. To understand the Qur'an one needs to learn Quran's Arabic words with its root meanings. It is much easier for Non-Arabic speakers to remember one root word with its meaning, which enables them to know the meaning of many words which comes from the same source [17, 18]. For example the root **kaaf-ta-ba** has the basic meaning of marking, inscribing or writing. The root may be conjugated in simple past tense (perfect) verb forms such as:

kataba	-	he	wrote
katabû	-	they	wrote
katabat	-	she	wrote

katabnâ - we wrote and many more that comes from Kaaf-Ta-Ba

2.1 Monitoring existing Holy Quran Applications:

Various similar applications were examined for different devices such as:
(a) App Store
(b) Black Berry Store
(c) Ovi Market
(d) Play store

Applications for each device were selected based on number of languages it is translated in, additional features and consumer ratings as on latest by January 30, 2013 available on respective web sites. Among the numerous applications found in each store, the mention below are apps selected for monitoring features available in existing application.

On scrutinizing the above applications for different devices, following facts are found:

(i) Applications in App Store have Holy Quran script in Arabic, multi-language translation, tafseer in Arabic, English and Urdu in text format. So far searched applications were not found to provide audio tafseer and video translation.

(ii) Blackberry application have restricted features, Holy Quran is in Arabic and English script, translation is in English, Bahasa, Indonesia, English, Indonesian, Melayu and Frenchnot available, and the examined ones did not include rootwords, audiotafseerand video translation.

Table 1: App Store Rating for Quran Applications

App Store	Quran script	Translation	Root words	Tafseer	Audio recitation	Audio tafseer	Video translation	Additional features	Consumer Rating
Quran Majeed	Arabic	English **Audio translation** in English Urdu	No	No	Yes	No	No	Option to display side by side translation Multiple lang	4+
Quran Al-Kareem	Arabic	English French	No	Arabic Eng	Yes	No	No	Letters pronunciation	Not available
Quran Tafsir	Arabic	Urdu	No	Yes	Yes	No	No		Not available
Quran Pro	English Albanian and etc	English, Albanian, Azerbaijani, Bokmål, Norwegian and etc	No	No	Yes	No	No		Not available
Quran Reader HD	Arabic	Arabic, English, French	No	yes	yes	No	No		2.1

(b)   Black Berry Apps world:

Table 2: Black Berry Apps Rating for Quran Applications

BlackBerry App World	Quran Script	Translation	Root Words	Tafseer	Audio Tafseer	Video Translation	Additional Features	Price	Rating
Quran	Arabic Bahasa Indonesia	Bahasa Indonesia	No	No	No	No	Navigation to Sura&Aya. Save and load bookmark Sura&Aya.	Free	3.5
Quran Reader	Arabic	English, Indonesian, Melayu, French	No	No	No	No	Bookmarks Search Quran in Arabic and translated language	Free	4
Quran Mojawed	Arabic + English	No	No	No	No	No	Tajweed Audio Quran search for using simple words.	Free	4.5
Quran Navigator	Arabic	Yes	No	No	No	No	Translations of Quran in more than 30 languages, which can be viewed under each aya's.	Free	4.5

(i) Ovi Store have holy Quran in Arabic & English script, translation in English, Urdu, Sindhi and Roman Urdu, the monitored application did not include tafseer in any language, audio recitation, rootwords and video translation

(ii) Play Store applications have holy Quran in Arabic, English and Indonesian script, multi-lingual translation, the applications in Play Store did not include rootword, audio recitation, audio tafseer and video translation.

Therefore, based on the so far gathered facts it can be concluded that there is lack of full fledge apps with reliable and authentic data to cater the growing needs of users to access Holy Quran in their busy.

(c)   Ovi Store:

Table 3: Ovi Store Rating for Quran Applications

Ovi Store	Quran Script	Translation	Root Words	Tafseer	Audio Tafseer	Video Translation	Additional Features	rating
Urdu Quran	**Arabic**	Urdu	No		No	No	Video Quran 40+ reciters	4
Tajweed Quran	Arabic	No	No		No	No	Audio Quran Audio Tajweed	4
Recited Quran S60	Arabic	English, Arabic, Farsi, French & Urdu	No	No	No	No	English, Arabic, Farsi, French & Urdu interface	3
Mobile Reciter Yaseen	Arabic	English	No	No	No	No	Option to recite a verse or set of verse multiple times to help memorization	4
Search Quran	English	English, Urdu and Roman Urdu			No	No	Search using English, Urdu or Roman Urdu	4
Sindhi Quran		Sindhi	No		No	No	Audio Quran	3

(c)   Play Store:

Table 4: Play Store Rating for Quran Applications

Play Store	Quran Script	Translation	Root Words	Tafseer	Audio Tafseer	Video Translation	Additional Features	Price	Rating
Audio Pack (Mishary Alafasy)	Arabic	English	No	No	No	No	Audio of each ayat recited by Mishary Rashid Alafasy	Free	4.5
Warsh Quran	Arabic	English, Malay	No	Yes	No	No	-Tafseer al Maisar in Arabic - Search English Keywords -Automatic page turn with the recitation.	Free	4.5
Al Quran (Al-Zikar Indonesian)	Arabic + Indonesian	Albenian, Azerbaijan, Englilsh and etc	No	No	No	No	Surah information: Ayahs, Rukus Quran Audio Topic Index and Glossary of Terms	Free	4.5
The Holy Quran	Arabic	English	No	No	No	No	Once installed you need no Internet connection	Free	5
iAndroid Quran	Arabic + English	Malay, Indonesian, Turkish, Norwegian and etc	No	No	No	No	20 reciters	Free	4.5

As discussed above, after reviewing similar applications available in the mobile application

market, the team decided the following features to be included in the proposed App. These features are categories under two heads

(i) **Essential:** The features that are required to achieve the goal of the proposed project are listed under this column. Therefore these features will be part of app core functionality.

(ii) **Desirable:** The additional features that will extend the capabilities of the proposed application project and that will make it more valuable are listed as desirables. However, the inclusion of these will be constrained on authentic resources provided by King Fahad Complex and availability of time to program them in the code.

3.0 Designing and Modeling of Noor Al-Quran for Android Devices:

The First Phase is Scope Definition in which the problem statement was defined followed by the Problem Analysis Phase where the system objectives where identified. The Requirement Analysis Phase

comprised of three major task that formed the bases of Software Engineering. The Software Engineering Phase involved many subtask that relate directly to the technical aspect of projects such as:

1. Designing The Look n Feel in the form of prototypes screen and their dependencies
2. Documenting Use Cases
3. Identifying the Classes and Object, Their relationship based on the project needs
4. Designing Algorithms

3.1 Designing The Look n Feel in the form of UI Prototypes Screens and their dependencies:

After an intense process of research and discussion, the research and the programming team came up with screen models shown in fig. 1. Care has been taken to make the UI user friendly by making the App UI in *Two* languages (Arabic and English) to facilitate Arabic and Non-Arabic audience's ease of use and swift navigation switching among features.

Figure 1: Screen Models for Noor Al-Quran

A User can select the Language of choice in the home page, and then select an action of interest by clicking on any one of the four major features (Recitation, Translation, Root Word, Tafseer).

Context menu have been designed to help the user to navigate from one feature to another with a single Tap.

3.2 Documenting Use Cases:

A detail use case for each possible interaction type that may encounter during the product lifetime is developed, these use cases are determined by pre-condition and post-conditions. Pre-condition must be true for a particular use to be initiated which is followed by synchronized description of actions by the actor and response from the system for successful execution of use case. Post-conditions indicate the state of system after completing a desired use case, in case of unsuccessful execution alternate course of action is listed for example to play audio translation of selected group of ayah, if the required audio file is not available on the device, system is supposed to generate a meaningful message and suggest the user to either download the required audio clip or 'Cancel' the current use case. Mention below is a list of use case that is finalized for the application:
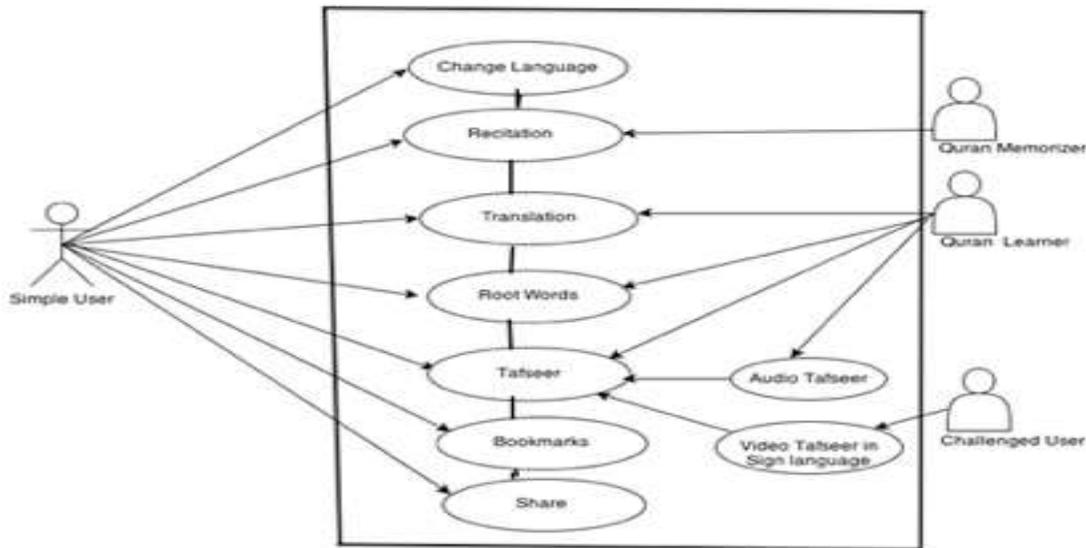
Figure 2: Use Case for the basic functionality of Quran Learning Software.
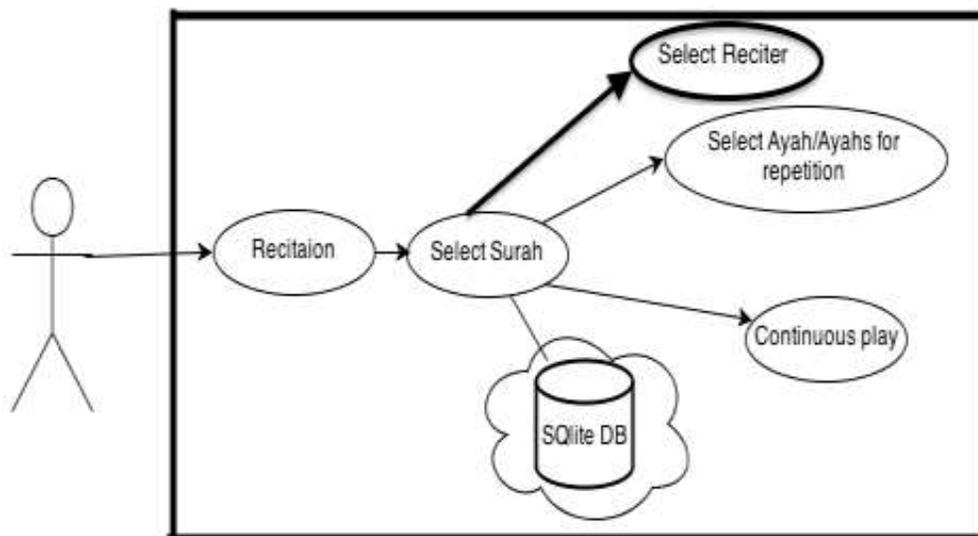
Figure 3: Recitation Use Case where the user can select the surah with repetition/continuous play of Ayah
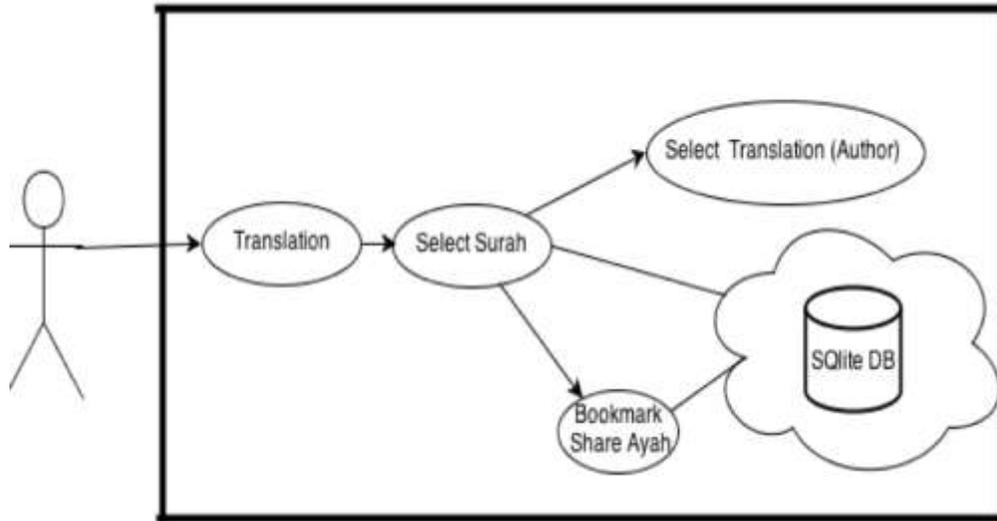
Figure 4: Translation Use Case where user can select the surah with available list of Translation in English
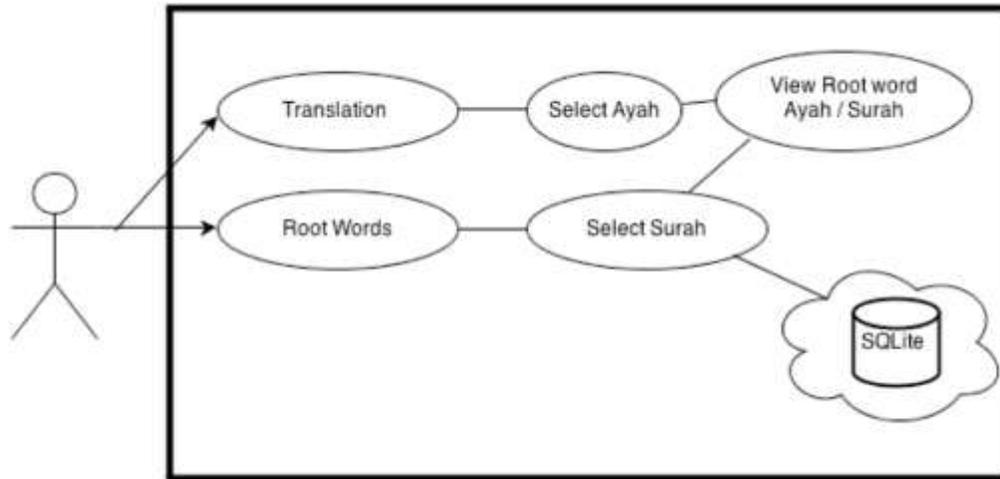

Figure 5: Root Words Use Case where the user will select a surah to view its root words:
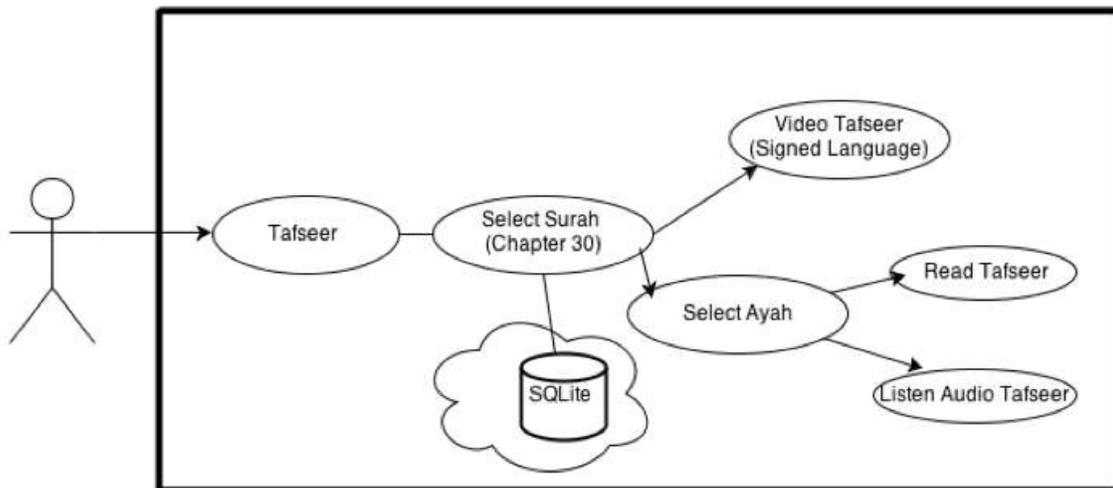

Figure 6:Tafseer Use Case where user will select a surah from chapter 30 to view/listen/ read Tafseer.

3.3 Designing Algorithms:

Algorithms were used as a technique to device problem solving needs of the proposed App. It provided help in understanding and modeling how the App must behave in response to the user action and to initiate the coding in systematic approach.

Algorithms were written at two levels of *Functional Specifications* to cover the overall functioning of the "Quran Learning Software for Android Devices". They are:

    a. Algorithm at App Level

    b. Algorithm at Specific Level

3.3.1 Algorithm at App Level:

App Level algorithms included the sequence of steps involved to carry out App design, App behavior, App performance and to answer Memory related concerns, which are as follows:

    i. Algorithm for designing App Look n Feel, App behavior while considering Performance issues.

    ii. Algorithm for setting up App database and to connect the UI with respective database

Figure 7: Algorithm for designing App Look n Feel, App behavior while considering Performance issues.

Start
Gather and arrange App objectives to serve the targeted Audience
Design the App's various screen
i.   Link the screen
ii. Make the User Friendly Navigation
Find out the appropriate Android APIs to create efficient UI with best User Experience
If (the screen needs to access the database)
Link each screen with appropriate table in the database
Observe the performance issues and the memory usage of the app
Optimize the performance and Memory usage by applying alternate resource solutions
End

Figure 8: Algorithm for setting up App database and to connect the UI with respective database.

Start
Create database helper class
Create database through Android API in read/ write mode in SQLite format
Open database
Read/Write values in it
Every time when there is a change in the database schema upgrade versionID of database
Host the database in the server
Link the database helper class with db Adapter
Access the database using JSON object
Use PHP at the client end (mobile app) to access the back end
Display the retired data in the form of Custom list view

3.3.2. Algorithm at Specific Level

Algorithms at the specific level included designing problem solving steps for creating each specific screen of app, which are shown in the following figures:

Figure 9: HOME SCREEN.

Start
Create Icon
Create the Launcher in four sizes(ldpi, mdpi, ldpi, xdpi)
Create the Launcher and connect it with Icon
Create the Splash Screen to display for 1000 milli seconds
Create 1 toggle button widget with two states
ON   :Arabic
OFF :English
For each language, create a different locale in String.xml in resource
If (toggle state==ON)
Change the UI setting to Arabic by calling Arabic String.xml

Else
Change the UI setting to English by calling English String.xml
Create 4 button for major app features, assign each button to handle an individual feature

B1=Recitation
B2=Translation
B3=Root Word
B4=Tafseer

If (B1 is clicked)
Open recitation database helper class   // Recitation Adapter Class
Open Quran recitation page

If (B2 is clicked)
Open translation database helper class   // Translation Adapter Class
Open translation page

If (B3 is clicked)   // Root Word Adapter Class
Open Root Words database helper class
Open Translation page

If (B4 is clicked)
Open Tafseer database helper class   //Tafseer Adapter Class
Open Tafseer recitation page
End

Figure 10: Recitation Adapter Class.

Start
Initialize RecitorID, SurahID, RecitorName, Mode of Playing
Fetch the Surah using the Surah ID obtained from the user click in the Quran recitation Index page
Fetch the Recitor Name from the dropdown based on user selection
Link the audio with the ayah
If (Mode of Playing==single ayah repetition)
X = number of times
For (i=0;i<=x;i++)
{
playVerse(VerseID);
}
Else
Fetch the Start VerseID and End VerseID of the range from the user and the number of repetition times
For (i=0;i<=x;i++)
{
playVerse(Start VerseID, EndVerseID);
}
If the back button of the device is pressed then Exit

Figure 11: Translation Adapter Class.

Start
Initialize VerseID, TranslationID, SurahID, TranslationName
Fetch the Surah using the Surah ID obtained from the user click in the Quran Translation Index page
Fetch the Translation Name from the dropdown based on user selection
Link the Translation Text with the ayah
Display the contents in the Listview
If the back button of the device is pressed then Exit

Figure 12: Root Adapter Class.
Start
Initialize VerseID, SurahID, RootText,RootID
Fetch the Surah using the Surah ID obtained from the user click in the Quran Root word Index page
Fetch the Root words text from the Rood word table based on user selected Ayah
Display the contents in the Listview
If the back button of the device is pressed then Exit

Figure 13: Tafseer Adapter Class.
Start
Initialize VerseID, SurahID,Tafseer Video, Tafseer Audio,mode
Fetch the Surah using the Surah ID obtained from the user click in the Quran Tafseer Index page
If (mode== Tafseer Video)
Link the vedio from the server
Else
(mode== Tafseer Audio)
Link the audio from the server

Fetch the Tafseer text from the Tafseer table based
Display the contents in the Listview
If the back button of the device is pressed then Exit

4.0 Findings and Results:
The results achieved so far in the Technical Aspect of the project are as follows:

1. Use Cases: Various Use Cases have been designed to make sure good user experience and that the system behaves as expected

2. UML Diagrams: The mentioned technique is used to model the system's classes, objects their interrelated dependencies and behaviors

3. UI Designs prototypes: Based on the UML diagrams, the user interfaces have designed using Photoshop and Pencil software for the following to form the bases of developing UI through coding:
   a. Icon
   b. Launcher Screen
   c. Home Screen (in English, Arabic)
   d. Index (in English, Arabic)
   e. Major Features Screen (such as Recitation screen, Translation screen, Root Words screen, Tafseer screen(Video, Audio and Text)
   f. Preferences (App Settings)

4. Physical Data Bases: Database schema have been designed for the following data sources this includes :
   a. Root Words Database
   b. Quran Verse Text Data Base

5. Coding the UI screen using Android APIs: This comprises of the following:
   i. Developing UI programmatically
   a. Home Screen (in English, Arabic)
   b. Launcher Screen (Splash Screen)
   c. Index Screen (in English, Arabic)
   d. Major Features Screen (such as Recitation screen, Translation screen, Root Words screen Tafseer screen using Video and Text)
   ii. Connecting the corresponding UI with Underlying Database
   a. Index Screen (with Surah Databse)
   b. Major Features Screen (such as Translation screen with Translation Database, Root Words screen with Root words Databse)
   c. Linking Tafseer in sign language with video (hosted by King Fahad Complex for Quran Publication)

6. Developed the App with limited features set: The miniature of the app has been developed with limited features such as Recitation page (with out Audio), Root words page, Translation page, Video Tafseer page.

Below is a sample screen shots of the completed work shown in Fig. 14.

Figure 14: Screen Shots from Noor Al-Quran

5.0 Conclusion:

Smart phone are becoming the center of our lives. These devices are bringing immediacy and an availability of the Internet that has changed and transformed the way people access information. Therefore there is utmost need to utilize this fast growing technology in propagating the teachings of Quran. The proposed research "*Noor Al-Quran for android devices*" is an attempt to make learning and understanding Quran easy for Non-Arabic Speakers.

The project is progressing at a satisfactory pace. We have achieved a number of milestones as reported above. Currently we are trying to complete the missing databases with authentic data. This has been a challenge, that is, finding data such as Root Word, Audio recitations, and tafseer from authentic sources in a form that can be readily input to the databases. We are trying to collect the required data in any form that we can get and then convert these into the desired format. This is a time consuming job. As an example, we are still trying to find recording of an authentic Tafseer in audio form in acceptable sound quality. As a stop gap measure, we are trying to get the recording done for a few surah to use as sample input to test our algorithms. Of course, this would mean that sound quality may not be of the desired standard.

On the successful completion of this project, the Android smart phone users will be able to : download and use a full fledge *Virtual Learning Environment* for Holy Quran comprising of authentic resources and prominent features, understand The Holy Quran and learn its vocabulary by learning root words along with their meanings and translation in English. (a feature especially designed for Non-Arabic Speakers), explore translation in sign language for Juzz A'ma (a feature especially incorporated in the app for deaf audience), gain profound knowledge about Quran by listening to Authentic Tafseer of each ayah (initially Tafseer Alsadi) and memorize Quran versus by listening and repeating the recitation of specific ayah, along with the translations and word meanings and other available features.

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