A Programming Approach for the Digital Quran Applications

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Abstract— The advent of online digital Quran and an increase of online Quran learners worldwide, have resulted the invention of number of IT (Information Technology) applications that ease the retrieval of knowledge from the Quran, being the major source of authentic and un-altered Islamic knowledge. In this paper, we describe a cloud-based programming approach, which aims at providing a unifying framework for building Quran related applications. The proposed approach includes design and development of APIs for all necessary components for searching, reading, annotation, building mobile applications and social networks around the central theme of Quran. A salient feature of the proposed API is the ability to retrieve Quranic verses in Arabic using search phrases in languages other than Arabic. In this paper, we describe the core components and design patterns of the proposed API with emphasis on key design criteria. These criteria aim at providing the necessary scalability and performance on the one hand, and quality assurance of the Quranic text on the other. In addition, a prototype application that leverages the API along with test results is also presented.

Index Term— Digital Quran, Cloud computing, API, Portal

I. INTRODUCTION

Over the years, a variety of Quran related applications and software have been developed to cater the needs of online and offline users. These applications have been enhanced with multimedia contents with the advancement of technology. With the wide availability of Internet, users are now able to browse a great number of websites and learn about Quran, Hadith and other Islamic literature. Most of these applications and websites are built from scratch, which increases the development and testing time. In this work, we present a unifying framework to facilitate the development of a wide variety of Quranic applications, both for web based (like Quranic portals) and device/mobile based (like iPhone & Android apps) applications. This is done through an application programming interface, popularly known as API, which provides a wide variety of functionalities like searching, reading, etc. Our API can reduce the time for development of different Quranic applications. In addition, the users of the proposed API can rest assured about the quality and accuracy of the Quranic text retrieved through the interface. This feature is very important, as any application on Quran must ensure the accuracy of the Quranic text it displays. Otherwise, the authenticity and validity of such a system will be undermined greatly.

Another salient feature of the proposed API is the ability to retrieve the Quranic verses using search phrases in languages other than Arabic. We describe a general framework where searching Arabic verses of the Quran using search strings in any other languages become possible. This enables the application developers to build Quranic applications in various languages with minimal changes in the central Quran database. Moreover, the same algorithmic base can be utilized for applications using multiple languages with minimal changes in the application interfaces.

II. INVESTIGATION

Before we present framework in detail, we briefly discuss a summary of some published work in research and development on digital Quran, and an account of existing software tools, applications and web portals, which are commercially developed. We identify the key functionalities provided through the investigation that serve as the preliminary functionality requirements for our framework.

A. Literature survey of published work in research and development on digital Quran.

Most recent notable work in the area of Quran studies using the cutting edge technology, e.g., ‘Drupal [1, 2]’, is done by the same authors who are presenting this paper. In their published work in [3], [27] the main objective of research and development deals with the design and development of a complete and comprehensive online cloud-based Quran portal. The portal and its applications makes all the reading and resource sections accessible to the audience whether users are using laptops, PCs, mobile, tablet, or personal digital assistants.

A notable work in the area Quranic applications is presented in [4]. This work is about ‘Cross language information retrieval (CLIR)’. It presents semantic technique on queries for retrieving more relevant results in CLIR, that concentrate on the Arabic, Malay or English query(s) translation (a dictionary based method) to retrieve documents according to query(s) translation. Along the same research and development theme, the authors in their work in [5] have designed and developed a system, called ‘E-Hafiz’, which is based on an idea that Tajweed rules were used to train learners how to recite Quran. To achieve this, the authors have used the Mel-Frequency Cepstral Coefficient (MFCC) technique, in which the features of recorded voices are extracted using MFCC and compared with experts’ voices, stored in the database. In yet another notable work [6], authors provide a
novel diacritic-less searching approach to retrieve from the Quran, the relevant verses that match a user’s query through automatic query expansion techniques. This study [7] shows how to use the formal methods for Natural Language Processing in a Quranic search system (QSS). In this work, Z notation is used for expressing the formal specifications of the three search techniques: text-based, stem-based, and synonyms-based systems which are used in a QSS. The QSS allows the user to search about keywords in the holy Quran and retrieve the relevant verses. In this study [8] the authors propose an Ontology assisted semantic search system in the Quran domain. The system makes use of Quran ontology and various relationships and restrictions. According to it, this will enable the user to semantically search for verses related to their query in Quran. The system has improved the search capability of the Holy Quran knowledge to 95% accuracy level, as claimed in this study. Score of other researches have also reported the achievements of their work along the same research ideas of Quran applications, but it is beyond the scope of this paper to report all these.

B. Literature survey of tools, and applications on Digital Quran

Among the most notable commercially developed software, the Quran Mobile software [9] enables users to read the Quran in Arabic alongside its translation on users’ portable devices. This software does not require any Arabic support on portable devices. The Quran and Hadith portal site [10] is maintained by Alim.org, a social network site, which focuses on various Islamic contents, including tafseer (explanation of Quran), hadith, Muslim history, etc. It also provides tools for studying Islam and memorizing the Quran. There are a number of sections available on this site. The Quran section is interactive and a user can listen to his/her favorite Qaris (the reciter of the Quran), specify repetition sequences, view tafseer for specific ayah (verse of Quran), change Arabic fonts, participate in discussions pertaining to specific ayah or surah (chapter of the Quran).

Transliteration is defined as the representation of letters or words from one language in the corresponding characters of another language. The Quran Transliteration site [11] helps non-Arabic speakers to read and recite the Holy Quran. In this site, users can read the translation of the whole Quran in different languages with Arabic and Roman colored text. Al-Mudarris Quran Software [12] can be used for basic recitation of the Quran, memorization of the verses, reading and learning translation of the meanings of Quran in different languages, and researching the Quran with additional tools like bookmarks and notes. In addition, verses can be copied and used in presentation software and documents. Fig. 1 shows a screenshot of Al-Mudarris Quran Software.


In addition to aforementioned software tools and web portals, there are a number of Quranic applications designed for portable devices. We mention some of these applications below. The Palm Quran Software [16] is a complete Holy Quran in Arabic on the Palm Pilot. Pocket Quran [16] software comes with features like display with ‘Othmanic’ typeset with Naskh and Koufi fonts, horizontal and vertical Quran display, search capabilities including search for all ‘word root’ derivatives, and word highlight. Pocket Islam [16] contains Hadith in Arabic with tashkil (diacritical marks), prayer table, prayer schedule with Azan, Qibla according to user location and position of the sun. Quran Reader [16] software allows users to read the translation of Holy Quran with the feature of saving and retrieving bookmarks, as well as browsing to a particular verse inside a Surah. Noble Quran [16] software includes a transliteration, surah introductions and English translation. Quran Viewer [16] has Quranic commentary, transliteration, index, glossary, and search option. It supports plug-in Quran translations allowing translations into multiple languages. Quranic verses can be compared in any installed language. Other features include computer generated Mushaf pages of the original sacred Arabic text, as well as an advanced manuscript viewer. Quran Trans [16] software is a collection of three translations of the Holy Quran.

Quotation [16] software enables users to search for verses by word, part of word, group of words, root or stem and copying.
resulting verse(s) or a part of them with reference to the Surah and the number of the verse. iQuran III [17] software for iPhones and iPod touch phones offers Quran in the Uthmani font along with color coded tajweed (pronunciation), verse by verse translation and recitation. The Quran Recitation [18] software provides features like audio files compressed in AMR format for reduced storage requirements. QuranExplorer.com [19] web portal features audio translation. The Quran Majeed [20] software provides services of online search, facilities to read Quran in Arabic, Urdu and English and the facility of bookmarking. Figure 2 shows screenshots of Quran Majeed. The Zekr Quran [21] is featured with searching, navigation, recitation, and commentary allowing customization, with translations in many languages. Fig. 3 shows a screenshot of Zekr Quran Software. The Al-Anvar [22] software is an open source freeware with searching, commenting tool, indexing and grouping, add-ons for different translations and commentaries in many languages, online and offline recitation etc. The Quran Android [23] is a free, open source application that provides index, downloadable audio recitations, ayah bookmarking, ayah share, various translations and tafseer. For memorization of Quran, ‘Verse by Verse Quran’ [25] provides users with access to the Quran in MP3 format separated into individual verse. As regard to developing Quran related applications, Complete Quran Site Code [26] is developed with Global Quran API in Java Script, is available online, where developers can use it with their own layouts.

Fig. 2. Screenshot of Quran Majeed Software [20] with search option

Fig. 3. Screenshot of Zekr Quran Software [21].
I. PROPOSED METHODOLOGY

In this section, we describe the basic concepts behind the proposed design and development methodology, namely the Quran API and Quran Search API. We identify the key components and phases while searching the Quran text. The search algorithms are discussed in general terms, followed by a description of the implementation of the API using available tools. Figure 4 summarizes the classification of various applications based on the text of Quran. As can be seen in this figure, most applications depend on some sort of search (either based on words or verses, or roots of the words) on the Quran text. Based on the search results, transliterations (in multiple languages), translations, explanations of the verses, recitations etc. can be retrieved. In this work, we present a cloud based programming interface that facilitates this searching phase of Quranic text. This can reduce the development time for Quranic applications by providing accurate search results in multiple languages. In addition, searching can be done in the transliteration space, making it possible to raid development of entire Quranic application in languages other than Arabic.

![Fig. 4. Summary of classification of various applications based on the text of Quran in proposed methodology](image-url)

A. THE QURAN API

The Quran API aims to create a centralized database of Quran, wherein third party applications or websites can be browsed. The API can boost the creation Quran based tools and result in innovations in the field at a faster pace, as it drastically reduces cost of building Quran based tools. It is also expected that this can enable various applications to use reliable and correct digital Quran text in their applications or websites. The main features of our Quran API are listed below:

- Seek the Quran text through API.
- Ability to compare ayah and check for error.
- Get Quran data using API.
- Get the meaning of an ayah.
- Search Quran by entering parameters, such as, ayah number, surah name, etc.
- Ability to see the result in a format of choice, like plain text, json etc.
- Inter-Language search, you can search in English and get the Arabic for it.

B. The Quran Search API

The API for searching the Quranic text is designed to provide the functionalities like:

- Searching Quran by a word or an ayah (full text search).
- Searching by using filters, like in selected surahs (chapters of the Quran) or within some ranges of ayah (verse) range.
- Searching in translations and transliterations.
- Searching for commentaries, articles and translation of Quran.
- Ability to search ayah based on topics.

The Quran search API has a pluggable architecture. Translations or transliterations of the Quran text can be added with this API with ease using an interface to import. Right now the format followed by Tanzil [24] is supported. Once various translations/ transliterations are imported into the Quran database, the search data can be re-indexed to include the newly imported data. The search box used in our system is intelligent and multilingual. People can search in the language of their choice provided that the translation of that language is already imported into the site already. There are no separate selection or input based on different language.

The API facilitates people to search for ayahs in Arabic using their own language, visually shown in Error! Reference source not found.. To the best of our knowledge, such cross-lingual search is the first of its kind for Quranic text. For
example, people don’t need to know the Arabic word أمي (means ‘my mother’) to search about ‘mom’ in the Quran text. They could search ‘mom’ in English or the equivalent word in Urdu or Arabic, or even in Urdu transliteration. They will be instantly presented with the results in Arabic. The same is true vice versa; an Arabic search could bring up English results. The most interesting part of this is that, a new language can be added and all the features works with that language instantly. This feature can also can help users to search for Quran audio in their preferred language.

The Quran search API has been developed on top of the Drupal APIs [1, 2], extending the core functionalities using the contributed modules. The complete Quran data is stored as an entity within Drupal. The metadata, such as Meccan/Madinan etc., are stored as fields attached to this entity using the core Drupal field API. Using of entity instead of core node saves a lot of unwanted weight in the database. It also allows more flexibility in the longer run.

Ayahs of the Quran are stored in MySql powered Drupal Instant software. MongoDb is used to store cache and block for better performance. A new entity type is created for the purpose with the meta-data. Quran data taken from Tanzil Quran Project [24] is fed into our system as an entity. Once it is done, we have the flexibility of using various Drupal APIs, such as Search API, and Field API etc. While importing the text is parsed and added as an entity.

C. Unique Features of Search API

A robust and unique feature of our API, as discussed briefly earlier, is the ability to search in the translation/transliteration space. This search process is illustrated in Fig. 5. The basic idea is to maintain a central index for the ayahs and surahs of Quran. For each ayah, one or more translations (either in native language or in transliterated form) is stored. Such indices of the Quranic text create the central database where any search word (in Fig. 5, the search string is ‘father’) is referred to. The search is then carried out in the indices using the preferred language (the language of the search string). The resulting ayahs are then retrieved from API, along with the desired translations or explanations.

Such a framework for searching Quranic text offers several advantages. First, Quranic applications can be developed in any languages desired with a minimal effort on creating the indices. For a new language, all is needed is to amend the indices with translations of the ayahs in that particular language. The core search API remains same and can be used for searching in any language. Second, the development time for Quranic applications can be greatly reduced, as the main focus will now be the implementation of the interface, rather than the core search API. Third, applications developed using the proposed framework can be useful to people of various languages, as the core functionalities of the application will remain same for various languages, with a minimal change in interface for each language.

In the following sections, we describe the some implementation details of the proposed search framework for Quranic text. The implementation is done with state of the art tools, keeping in mind the ease-of-use and compatibility of the API for most of the application developers.
D. Implementation of Search API

The Quransearch API is implemented using the core Drupal search functionalities and then is extended with the contributed modules like Search API, Facet API, Search API DB, Facet API Filter/Range and Views. This way we have the flexibility to extend the search using any other technology like Apache Solr. Fig. 7 shows the architecture for the search functionalities. To handle filters in the search functionalities, following two cases have been taken into account: [27]

Case 1: Users can search by first entering some Arabic Text, say “Bismillah” and then add a surah filter, like Fatiha and then can set an ayah range (say from ayah 1-3). Then the search will be done for the string “Bismillah” in the Surah “Fatiha” and between ayahs 1-3 of that surah.

Case 2: By default if you set a surah filter, the Meccan/Madani filter will reflect the change. For example, if you have filtered to search only a surah revealed in Mecca, then the filter to choose to Meccan/Madani will be blurred until you cancel the surah filter.

Search API is implemented over Views module. It exposes the search to public; applications, websites or any similar systems can request various surah or ayah using the API with the option to use the filters. Each returned ayah object from the search API will have the following fields: Surah Number, Surah Name, Ayah Number, Ayah Simple Version, Ayah Enhanced Version.

The search feature is categorically exposed as API; an external application or a website can request the API site for various ayahs of Quran with certain options and filters, which in turn can be used to create various tools of Quran related topics. API Service call backs can be used with multiple interfaces in future like REST, XMLRPC, JSON, JSON-RPC, SOAP, AMF, etc. This allows the portal site to provide web services via multiple interfaces while using the same call back code. In current implementation, JSON is the format that API returns result. This is done with the help of Views module. Using the Drupal Services module it is possible to serve multiple formats mentioned above. The API is also plugged into Drupal’s built in roles and permission system, which gives a fine grain control over what is available and what is not. Each user is given authentication to the API request. Formats for authentication are shown in Fig. . [27]

```
a.{surah}/detail
This would return the meta data of the requested surah.
  e.g., 'http://api.Quranproject.com/36' would return the metadata of 36th surah.

b.{surah}/{ayah}
The will return the metadata of an ayah, including all the fields we have in our database.
  e.g., 'http://api.Quranproject.com/36/1 would return first ayah from the 36th chapter.

c.{surah}/range/{N-N}
The will return short metadata of an ayah between a specified range.
  e.g., 'http://api.Quranproject.com/36/range/1-10 would return ayahs 1 to 10 from the 36th chapter.
```

Fig. 7. Authentication formats while using the implemented Quran API.

Coding of the Search API module

This module provides a framework for easily creating search on any entity known to Drupal software, using any kind of search engine. For site administrators, it is a great alternative to other search solutions, since it already incorporates faceting support and the ability to use the Views module for displaying search results, filters, etc. Also, with the ‘Apache solr’ integration, a high-performance search engine is available for this module.

There is a screencast available, showing off some of this project’s features. (Note, however, that it doesn’t represent the current development state – e.g., facets can now be used with the database search, too.) Figure7 shows a screenshot of Search API.
Sura

Surah No. (Example: 2 for Surah Baqra.

Ayat

Limit to specific aya.

Page

10 Ayah is loaded at a time. Type no. of page to offset.

Submit

Coding for API and Search (Loading Ayaths from a Surah):

This will return an json object of the first 10 ayaths from the surah. Figure 8 shows a piece of code which aims to send a request for the second surah (that is Al-Baqara); it returned the json object, viewed here using json viewer tool.

Code for loading ayaths from Quran by Pages:

Each request object will only return 10 ayaths, so in order to get more ayaths, you will have to pass the pagination parameter as shown in the code below.

This returns the json object (viewed below using the json viewer tool) as shown in figure 8.

Normal View of the returned json array

Fig. 7. Screenshot of Search API

Fig. 8. A small code to show API Search (loading Ayaths by pages)

Fig. 9. A small code to show API Search for loading Ayaths from Surah 2.

Fig. 10. A screenshot of the normal view of the returned ‘json’ array
Code for how to get a specific ayath?

To get a specific ayath, one has to send a request with some parameters, which works like this. The first parameter is the surah number and second parameter is the ayath number. This will give an ayath object that looks like below.

```json

```Fig. 11. Screenshot of API Search to get a specific ayath

E.Result Section

Fig 12 illustrates the Quran portal based on the API described in this work. Users can search the Quran text by surah, ayah of the surah or a word in the Quran. Error! Reference source not found. illustrates the search results based on the surah in the Quran.

As discussed earlier, one the major features of the developed API is the ability to search in the translation space and the results are the Arabic verses from the Quran. One such example is illustrated in Fig 13 In Fig 13, the search is carried out using the word ‘father’ (in English); however, the results of the search included the Arabic verses of the Quran that contains the Arabic equivalent of the English word ‘father’. In addition, the translations of the resulted verses can be displayed in several languages, with an option to transliterate the translations.

Fig. 13. Result of Quranic text search by surah (chapter) in the Quran portal

Fig. 14. Result of search using a word in English that results in Arabic ayahs with the meaning of the ayahs in Urdu transliteration.

In addition to the above mentioned core functionalities, several finer level options for searching the Quran text are also developed. These include: search filters based on selected surah, searching either Meccan or Madinan surahs, search

F.Future Works

As this project is in progress it can be enhanced

More filters can be added to make search engine more better research is in progress.
Mushaf section can be developed with transliteration section in it

Personalization to users

Memorizer can be developed as a section in the project

G. Scope of Project

The scope of this project is to provide users more knowledge about QURAN and search the related information the user wants using the search engine

Other features

Kids Section – this section is specially designed for kid’s. it contains articles, stories, videos etc for kids

II. CONCLUSIONS

This paper presented a detailed account of the work achieved on digital Quran applications. The Quran Search & API mainly focus to make search of Quran more compelling and rich. Instead focusing on search based on roots and other such details and dependency on one language, the proposed cloud programming approach aims to simplify and bring cross language search to digital Quran. We aim to push the limits further with encouraging innovation beyond what has already been done in this space of Quranic applications. The developed API, with the support for multiple languages and transliterations indexed, aims to reach the global audience and to those who understand a particular language but can’t write that script. Similarly, the API aims to create a safe way for developers to build tools around Quran without fearing of errors or cost involved. It also eases the expertise to program logics of complex searches in Quran. Developers can focus on their idea on Quran, instead of building these complex algorithms.

It is worthy to note that this is paper is our one of the first outcomes of funded research and development project. It is still in its progressing stages, and in near future, we plan to publish many other outcomes of the work on various other related applications, e.g. knowledge retrieval using cross language information, translation and transliteration of Urdu language, Quran memorizer and reciter, social networking, Quran propagation and preaching, adding and updating bookmarks for learning purpose, and self-evaluation of Quran learners/users. In future work, we also look forward to address the portability issue. This will help users to access these applications using any portable and non-portable devices.

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REFERENCES


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