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Semantic-based Ontology for Malay Qur'an Reader

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ABSTRACT
The Quran has been translated into various languages around the world by Muslim experts. One of them is in Malay. There are numerous applications built to facilitate the retrieval of knowledge from the Malay Qur'an. However, there are limited resources and tools that are available or made accessible for the research on Malay Qur'an. Furthermore, there are several issues that need to be considered when dealing with Malay Qur'an translation; such as ambiguities of words, lack of equivalence words between Malay and English or Malay and Arabic, and different structures of word, sentence, and discourse in these two languages. Therefore, this research summarizes the search techniques used in existing research on Qur'an. Moreover, this paper also studied the previous research conducted on Qur'an Semantic Search and Quran Ontology-Based Search focusing on Malay Qur'an. This review helps the research in addressing the general problems and limitations in Malay Qur'an that influence its accessibility. This research proposed the research framework for new semantic based ontology for Malay Qur'an. The final outcome will be an accessible tool that can help a Malay reader to understand the Qur'an in better ways.

Keyword: Qur'an; Malay Qur'an; Semantic Search; Ontology; Semantic-based Ontology

1. Introduction

The Qur'an is fundamental to all Muslims because it contains comprehensive guidance to Muslims in all aspects of life. Muslims are required to read and learn the meaning of Qur'an in languages they understand to obtain rewards by Allah and to efficiently help Muslims to perform their daily routine. The Qur'an has been translated into various languages around the world by Muslim experts. As for Malay readers, there are countless available Malay Qur'an translations. The main aim of the availability of Qur'an translation is to allow the reader to understand the Qur'an in clearer ways. However, there are a few issues regarding the Malay Qur'an translation such as ambiguities of words, lack of word equivalence between Malay and Arabic or Malay with English, and different structures of word, sentence, and discourse in these two languages (Tabrizi & Mahmud, 2013). Besides, (Othman & Wahid, 2011) claimed that standardization of different versions of Malay Qur'an was challenging due to the need of alignment by meanings. Different versions of Malay Qur'an surfaced due to the manner translations were made, which could likely be from a secondary source for some of the texts. Standardization issues could be reduced if the translations were made from the original texts with the references to other authentic sources like Hadith or Tafsir.

Nowadays, people are looking for the easiest ways to learn the Qur'an. Many Qur'an search applications have been built to facilitate the retrieval of knowledge from the Quran. There are two approaches that can be exploited for searching and retrieving information from the Qur'an: a semantic-based and a keyword-based technique. The semantic-based technique is a concept-based search tool that retrieves results based on word meaning, or concept match, whereas the keyword-based technique returns results based on letters matching word(s) queries (Alqahtani & Atwell, 2016). The majority of Qur'an search tools employ the keyword search technique.

There has been limited research on Malay Qur'an. Most research focused on information retrieval (Bash, 2015; Othman & Wahid, 2011; Wahid, 2014), morphological analysis such as

stemming (Yunus, Zainuddin, & Abdullah, 2010a, 2010b) and ontology development (Bash, 2015; Yahya et al., 2013; Nazri et al., 2008).There are very limited resources and tools that are available or made accessible for computer linguistic analysis of Malay Qur'an. In conjunction with that, this research will investigates the use of semantic-based ontology as one of techniques that can improve access to the knowledge in the Malay Qur'an and enhance the retrieval of information for Malay reader. The final outcome will be an online tool that can help Malay readers to understand Qur'an in better ways.

2. Literature Review

In this section, we will discuss the structure of the Quran, the current Qur'an application, related works on Malay Qur'an, Semantic Search, review on the previous work on semantic search on the Qur'an and Semantic Ontology, Ontology Matching and Multi-language Ontology.

2.1 Structure of the Qur'an

The Qur'an is a central religious scripture of Islam which Muslims believe to be revelation from God, Almighty Allah. Qur'an means reading and recite. Muslims believe the Qur'an was verbally revealed by God to Prophet Muhammad through Archangel Gabriel over 23 years beginning in 610 CE. There are many different names given to this Holy Scripture. Muslim believe there are various names of the Qur'an such as 'Koran', the Qur'an, Al-Qur'an, 'Kitab', 'Kalam' and many more. The Qur'an is divided into 114 chapters (Suras) of varying sizes, where each chapter is divided into verses (Ayahs). There are 6,234 verses in the Qu'ran. The Qur'an chapters (Suras) are classified into Meccan and Medinan. According to Islamic belief, The Meccan suras are chronologically the earlier chapters (suras) of the Qur'an that were revealed any time before the migration of the Prophet Muhammad and his followers from Mecca to Medina. While Medinan suras or Medinan chapters of the Qur'an are the latest 24 suras that were revealed at Medina after Prophet Muhammad hijra' (migrated) from Mecca.

2.1.1 Related works on Malay Qur'an Research

(Hasmy at al., 2015) proposed stemming and thesaurus to search and retrieve relevant Malay translated Qur'an documents based on user natural query words. A stemming algorithm is an automated procedure that reduces words with the same stem to a common form, usually by removing derivational and inflectional suffixes from each word. For example, the words study, studies, studied, studying, student or studious are reduced to the root word study. Grouping these words into common form will increase retrieving relevant documents against a given query. The authors stated by using stemming, the efficiency of document retrieval is increased since the size of index files is reduced by 50% as a result of grouping many morphological word variants into a single stem word. Based on the experiment, the combination of stemming and thesaurus methods retrieved 60.22% and it proved to be more effective in retrieving more relevant documents compared to other methods such as extract match, stemming, or the thesaurus.

On the other hand, (Yunus et al., 2010a) presented Stemming Semantic Query (SSQ) as a new approach to improve the retrieval of verses for Qur'an documents results. The authors compared the semantic results and stemming semantics result using three different languages i.e. English, Malay and Arabic. This research found that the semantic approach with stemmer contributed to better performance of retrieving more relevant and related Qur'an documents. Furthermore, (Yahya et al., 2013) proposed a semantic search for the Qur'an based on Cross Language Information Retrieval (CLIR). In this research, they evaluated a CLIR approach based on domain ontology that used Quranic Arabic concepts by (Dukes, 2013) for

disambiguation of the translation of a given query and enhancing dictionary-based query translation.

2.2 Semantic Search

Semantic search is an application of Semantic web showing significant potential for improving the performance of retrieval. Semantic search is a data searching method in which a search query aims not to only find keywords, but as well as to determine the intent and contextual meaning of the words a person is using for search. Semantic search provides more meaningful search results by evaluating and understanding the search query and finding the most relevant results in a website, database or any other data repository (technopedia.com). Compared to traditional search engines, semantic search engines tend to understand the meaning of the query terms and retrieve the matching documents based on that meaning. This might be achieved by adding semantic tags to the documents in order to structuralize and conceptualize the object within documents(Alqahtani & Atwell, 2016). The main goal of semantic search is to deliver information in a meaningful way rather than having to sort through lists of documents bound by loosely-related keywords.

2.2.1 Related Works on Qur'an Semantic Search

Many desktop and Web applications have been developed to retrieve knowledge from the Qur'an. The techniques used to retrieve information from the Qur'an can be categorized into two types: semantic based and keyword-based (Alqahtani & Atwell, 2015). Semantic-based search techniques are concept-based and retrieve results by matching the contextual meaning of terms as they appear in a user's query. Keyword-based search techniques return results according to the letters in the word(s) of a query.

(Shoaib et al., 2009) proposed a relational model for semantic search in Qur'an using the WordNet relationships. This relational model creates the taxonomy of the related terms in Surah Al-Baqarah (Chapter 2 from the Qur'an). The model facilitates performing a subject search for Qur'an readers and provides a framework capable of retrieving related verses from the Qur'an. This model of semantic search showed 80% accuracy. However, during the retrieving process, some irrelevant verses are also retrieved. In this paper, the authors also discussed the problem of the current keyword based searching and the issues related to semantic search in the Holy Qur'an. This research has contributed to the improvement of semantic search in the Qur'an. In the future works, authors intend to extend this work that can eliminate irrelevant verses. After 4 years, the researchers have once again proposed a new research on ontology based semantic search. (M Tarawneh & E Al-Shawakfa, 2015) presented a new hybrid method called Al-Baheth Searcher of Quran Text using the combination of syntactic (keyword) and semantic based approach to index and search the Holy Qur'an text.

(Nassourou, 2011) presented a methodology of reconstructing Qur'an's chronology based on machine learning techniques. A hybrid statistical classifier have been employed, in order to get the plausible dates of revelation in accordance with the traditional Islamic scholars and western orientalists chronologies. After one year, the author again produced a new technique to categorizing the Qur'an. (Nassourou, 2012) proposed a new algorithm using machine learning techniques for categorizing the chapters in the Qur'an. In this research, the author used SVM and naïve Bayesian as functional classifiers. The categorization model of the chapters was based on the phases of the messenger ship of Prophet Muhammad. (Adhoni & Al Hamad, 2013) developed a cloud-based Qur'an portal using Drupal technology. In their work, the authors build the portal which can be used to search the Qur'an in more than one language. Quran Arabic by (AlMaayah et al., 2014) developed WordNet for Qur'an by creating semantic

connection between words in order to get better understanding of the meaning of Quranic Words. This study focused on Classical Arabic of the Quran rather than the modern standard Arabic.

2.3 Ontology

Gruber defined ontology as an explicit specification of conceptualization (Gruber, 1993). A common goal developing ontology is to share common understanding of the structure concepts between people and software agents, and permit reuse of domain knowledge (Gruber, 1993). Ontology consists of four components; concepts, relations, axioms, and instances.

2.3.1 Related works on Qur'an Ontology-based Semantic Search

(Ullah Khan et al., 2013) describe ontological work for searching the concepts from the Holy Qur'an using the semantic search technique. In this research, the authors proposed a new framework that describes the semantic search. This framework can be applied to any Islamic document. This research uses living creatures including animals and birds mentioned in Holy Qur'an as the sample domain. Unfortunately, this research is not very clear in explaining the final result and how the framework can improve the current ontology based semantic search in Holy Qur'an. (Uthayan & Mala, 2015) suggested a new querying mechanism for information retrieval which integrates the ontology queries with keyword search. This research proposed a new hybrid method based on matching extracted instances from the queries and information field. Besides, (Ta'a et al., 2013) developed an ontology to represent and classify the knowledge of Qur'an using thematic approach. Thematic or theme-based approach focuses on themes within a story to give narratives a sense of direction and purpose (Hargood, Millard, & Weal, 2008). This article just focuses on the themes of Qur'an as describes in Syammil Al-Quran Miracle the Reference: Qur'an, 'Akhlak' and 'Iman'.This Qur'an ontology help user to understand the Qur'an in a systematic way. (Alrehaili & Atwell, 2014) reviewed the past approaches or works related to computational ontologies based on nine (9) criteria: Qur'an Text, Coverage Area, Coverage Proportion, Underlying Format, Underlying Technology Used, Availability, Concepts Number, Relations Type, and Verification Method Used. Table 1 below summarize these criteria;

Table 1 : Summary of criteria based on review by (Alrehaili & Atwell, 2014)

No	Criteria	Previous Work
1.	Qur'an Text	(Ullah Khan et al., 2013), (Saad et al., 2010) and (Ismail et al., 2015) built ontologies using English translation of Qur'an. (Yahya et al., 2013) and (Yunus et al., 2010a) used Malay translation of Qur'an as a sources for built the ontology.
2.	Coverage Area	(Ta'a et al., 2013) covered on the themes of Qur'an as describes in Syammil Al-Quran Miracle the Reference: Qur'an, 'Akhlak' and 'Iman'. While (Ullah Khan et al., 2013) used living creatures including animals and birds mentioned in Holy Qur'an as the sample domain ontology.
3.	Coverage Proportion	Entire Qur'an: (Muhammad, 2012) in his PhD thesis used all the chapters in the Qur'an. Some parts: There was no research conducted cover the some part of the Qur'an. Specific Topic : Most of the research covered specific topic such as (Shoaib et al., 2009) just focusing on the chapter 2 of the Qur'an.
4.	Underlying format	(Yahya et al., 2013), (Ta'a et al., 2013) and (Ullah Khan et al., 2013) used OWL to build the ontologies. (Yauri et al., 2014) used RDF/XML format.
5.	Underlying technology used	(Ullah Khan et al., 2013) used protégé and SPARQL.

6.	Availability	N/A
7.	Concepts number	(Dukes, Atwell, & Sharaf, 2010) defined 300 concepts in the Qur'an.
8.	Relations Type	(Shoaib et al., 2009) showed the synonyms relations. (Saad, Salim, & Zainal, 2009) shows meronyms (partOf).
9.	Verification Method Used	(Saad et al., 2009) and (Saad et al., 2010) used domain experts as the method of verification. (Dukes et al., 2010) and (Muhammad, 2012) used Ibn Kathir as the method of verification.

Presently, most of the studies were carried out only to extract information from a single ontology. There is a lack of studies focused on matching from multi-lingual ontologies. Most ontology matching systems are designed by assuming that the entities of both source and target ontologies are written in the same language (English, for instance). With the increasing number of distributed resources, services, and applications on the web, multi-lingual ontology matching is likely to become essential.

2.4 Malay Language

The Malay language is part of the Austronesian language family and it is widely used in Singapore, Indonesia, Brunei and Malaysia by over 270 million people, each country with its own variation. The two main variations are Bahasa Melayu (also referred to as Bahasa Malaysia) and Bahasa Indonesia. Both these languages may sound similar but do differ quite a bit to the learned speaker. As with any language, Malay has evolved from its original form and modern Malay speakers might not recognize Old Malay. Many words in Malay have been adopted and adapted from other languages, the earliest being Sanskrit, and later on it was heavily influenced by other languages as well including Arabic, Tamil, Hindi, and English.

3. Research Framework

Figure 1 below is a framework for a new semantic search algorithm based on ontology. The algorithms contributes to better performance in retrieving more relevant results from Malay Qur'an. The design of this framework is adapted based on the framework proposed by previous research (Alqahtani & Atwell, 2016;Uthayan & Mala, 2015;Yahya et al., 2013;Hamed & Aziz, 2016). This framework divided into four (4) processes: (1) Pre-processing, (2) Ontology Construction, (3) Natural Language Analyser, and (4), Semantic Analysis. Each processes has its own task.

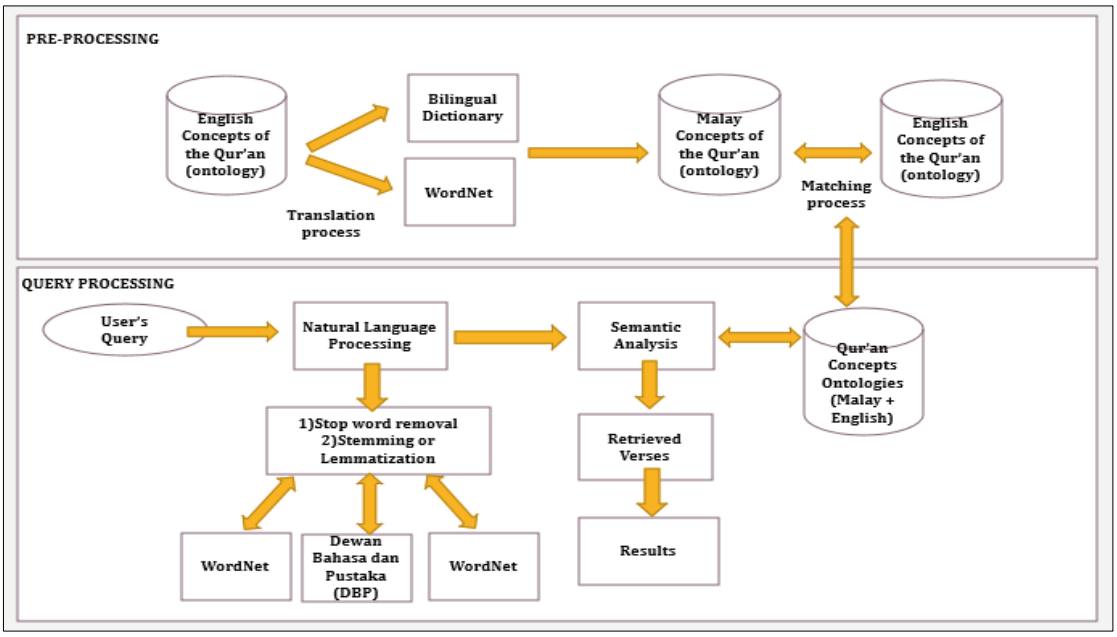

Figure 1: The proposed framework for a new semantic based ontology for Malay Qur'an

(1) Pre-processing

In the pre-processing stage, the available concepts of the Qur'an will be used as resource such as (Abbas, 2009) and (Dukes, 2013). All list of concepts will then be translated to Malay since the current list of concepts exist now is just available in English. The translation process will use the available resources like WordNet and Bilingual Dictionary. This process is important to get the right meaning for each concept. After that, the validation process will be conducted with Qur'an Malay expert to ensure the translated document is correct.

(2) Ontology Construction

In this stage, we will do the alignment process between Malay Qur'an Concepts and English Qur'an Concepts as show in Figure 2 below. The main aims to do the alignment process is to overcome the limitation in the existing ontologies. Before the process of the alignment, we need to develop Malay Qur'an concepts using Protégé. Then, all the ontologies will be normalized to get the standard format.

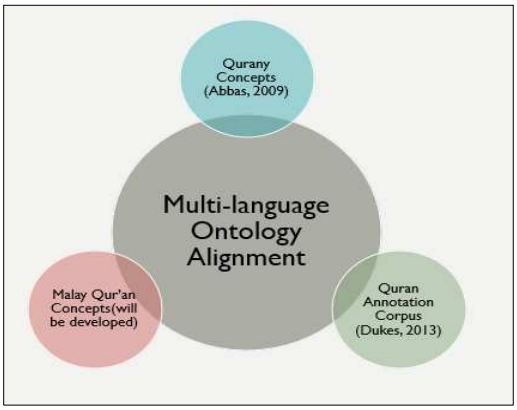

Figure 2: Ontology alignment with the three (3) Qur'an Ontologies

(3) Natural Language Processing

A query will go through several processes in Natural Language Processing stage. The figure 3 below shows the processes that will involve on query processing.

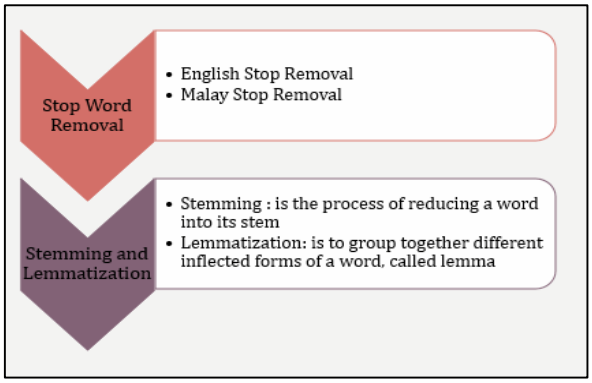

Figure 3: The processes in Natural Language Processing stage

(4) Semantic Analysis

Semantic analysis deals with the meaning of words and sentences, the ways that words and sentences refer to elements in the world. In this phase, semantic analysis maps the analysed words in the Natural Language Processing to the concepts in the Qur'an ontologies. At this time, it will search in Qur'an ontologies by using SPARQL to find the concepts related to the analysed query and return the results.

4. Searching for Synonyms in English and Malay Languages

The aims of this experiment is to compare number of retrieved and missed verses retrieved using synonyms in English and Malay languages. In this experiment, we want to see the similarities and connection between the verses from both English and Malay translation of the Qur'an. We used the popular English translation of the Qur'an of Abdullah Yusuf Ali and Malay translation of the Qur'an from International Islamic University Malaysia (IIUM) as data set. For this initial stage, the translation of Surah Al-Baqarah, the largest chapter of the Qur'an has been taken as a sample text. All the data stored and retrieved using Oracle 11g. In this experiment, we have chosen the concepts of Afterlife which is الجنة 'Jannah' and Hell. According WordReference.com, 'Jannah' means heaven or paradise and in Malay language, it is called as 'syurga'. After that, the next process is to get relevant verses of each word. Therefore, we have checked manually by using three sources such as the Tafsir Ibn Khatir (reference: www.qtafsir.com, online), the list of concepts of (Abbas, 2009) and the thematic index from Uthmani Malay Version of the Qur'an (reference: text book). This thematic index has classified verses of the Qur'an according to the themes in the Malay language. The list of concepts of (Abbas, 2009) has classified the verses according to the Qur'an in English**.** Then, we check again the verses that appear on the thematic index with online Tasfir of Ibn-Khatir to verify the relevance of these verses. Finally, these verses will be classified as relevant. Table 2 shows the number of retrieved, relevant and missed verses retrieved using keyword search for the concepts of 'Jannah' in English and Malay.

Table 2: Comparison between Relevant, Retrieved and Missed verses using keyword search

Language	Keyword	Total No. of Relevant Verses	Retrieved	Missed
Malay	Syurga	12	10	2
English	Heaven	15	11	4
English	Paradise	11	1	10
English	Hell	18	1	17
Malay	Neraka	18	16	2

Based on the results on table 2, there is a big difference between the number of retrieved and relevant verses in English words for Paradise and Hell. For word Paradise and Hell, only one

verse had been retrieved by the system where the relevant was 11 and 17. Besides, for the word 'syurga', the difference between relevant and retrieved is 2. After that, we analyze each relevant and retrieved verses. This analysis process is to find the other word or similar word used by both English and Malay translation of the Qur'an that represent the concepts of 'Jannah'. Results (see figure 4) show the other words used to describe 'syurga' in English terms are as Hereafter, The Garden, Paradise, and Home. In this case, The Garden is most widely used and has high similarities with 'syurga'. Surprisingly, there are no connection or relation between the word 'heaven' and 'syurga'. This is surprisingly unexpected because Malays normally used the word 'heaven' to describe 'syurga'. However, in this Malay Qur'an translation, the word 'heaven' has been translated as 'langit' (sky). So, it is not matched with the verses that contains the word 'syurga'. In this scenario, when the user using heaven as the keywords, they will get irrelevant and incorrect verses.

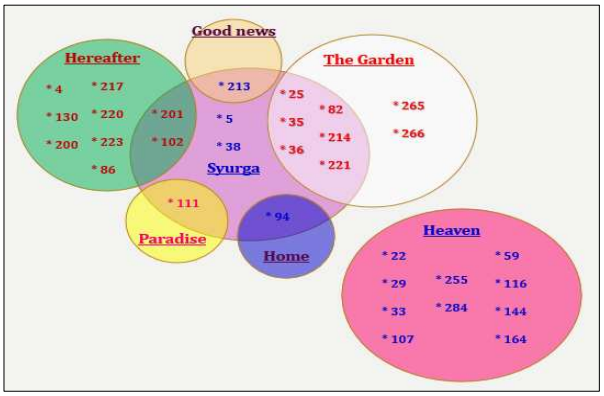

Figure 4: The other words used to describe 'syurga', heaven and paradise

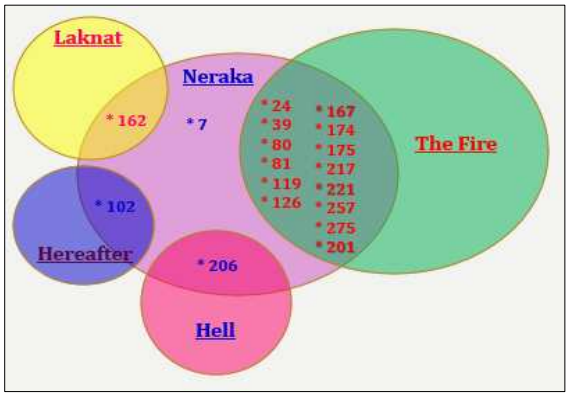

Figure 5: The other words used to describe 'neraka' and hell.

The other concepts of Afterlife is Hell. The word hell is often used to describe 'neraka'. However, the analysis results turned out differently (see figure 5). The most widely word used in this translation is 'The Fire'. Out of 18 verses, 14 were found used this word. In this case, when user submit the query using the word hell, he or she will get only one verse (verse 206).

As for the conclusion of this experiment, we found some findings such as: (1) The translation plays a vital role in providing true and correct interpretation in every respect-verse in the Qur'an. If not, it can cause confusion, especially the translation with two languages such as English and Malay. The widely spoken words must be checked regularly with the authorizing body whether it is right to be used and whether it is used in a correct meaning. (2) The keyword based search alone is not enough to provide accurate and relevant results. It requires a combination of semantics and it takes from several sources that are authentic such as Tafsir Ibn Khatir. (3) The lack of word equivalence between Malay and English is one of the problems derived from this experiment.

Conclusion

This paper summarizes the search techniques used in most existing research on Qur'an. Additionally, this paper also studied the previous research conducted on Qur'an Semantic Search and Quran Ontology-Based Search focusing on Malay Qur'an. This review helps the research in addressing the general problems and limitations in Malay Qur'an that influence its accessibility.

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