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## Knowledge representation using semantic network for female related issues from the Holy Quran

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### Abstract

Focusing on the use of semantic network representation, this paper presents an easy way in understanding concepts discussed in the Holy Quran. The Quran is known as the main source of knowledge and has been a major source reference for all types of problems. However, understanding the issues and the solution from the Quran is difficult due to lack of understanding of the Quran literature. The Quran contains many important issues related to the female. Female is one of terms that is very popular in the Quran and has been addressed in the whole Quran through several other terms such as women, lady and girls depending on the issues that being addressed. Technically, to understand the whole concept of female term discussed in the Quran is challenging.

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Thus, this paper discusses on how to understand and represent the concept in an easy way. 16 terms that are related to female, its related surah, verses are identified and represented using semantic network. The strength and advantages of the work are discussed and presented.

Keywords: Knowledge representation, semantic network, female term, Quran representation, female issue;

## 1. Introduction

The Quran contains valuable information and gives answer and solution to many problems facing mankind. It contains 114 *surah* or chapters, and each surah contains verses or *ayat*. In total, the Quran contains 77,000 words and 6200 verses. Scholars on the Quran in the past have been authoring books highlighting various linguistic, stylistic, scientific, rhetorical, and many hidden discoveries from the Quran in various other fields. These have been done through their personal knowledge on the Quran as there were no computational tools available. The Quran is characterized by holding vast information in unstructured and scattered – yet conceptually related - verses. All these features make the Quran an attractive target for finding new information from the Quran in terms of hidden trends, relationships, patterns, coincidences and associations. However, text extraction has been seen as a difficult process because text data are unstructured data. One method that can be used to analyze this type of data is text mining. Examples of research on text mining related to the Quran are grammatical parsing for the Quran (Salih, 2007; Al-Kharrat, 2007; Darwish, 1999), and categorization of modern standard Arabic verb valence based on Case Grammar, as described by Al-Qahtani (2005).

Conceptual graph (CG) and semantic network are popular methods of knowledge representation. A conceptual graph is an abstract formalism for knowledge representation that consists of nodes known as concepts and conceptual relations, which are linked by edges. This structured representation has been introduced by John Sowa in 1976 (Sowa, 2007). At that point in time, CG is used to map natural language questions and assertion in order to build the conceptual schemas in database systems. Generally, CGs have been widely applied in various domain areas, for instance, in artificial intelligence (AI), computer science and cognitive science (Sowa, 2007). The main key idea of using this structured representation is to be able to understand the complex Semantic Description (SD) of any information sources. CG has been a prominent knowledge representation since it is logically precise, readable and computationally tractable.

There are several versions of CGs that have been designed and implemented over the past thirty years. In the 1960s, graph-based semantic representations were popular among researchers, especially in theoretical and computational linguistics. Semantic networks, correlation nets and dependency graphs are some variations of graph representations that rely on different notations. Each of these graph-based semantic representations allows different ways of structuring knowledge. For example semantic network used “*is a*” and “*a kind of*” notation to link two related concepts, meanwhile dependency graph connects different nodes using edges without any explanation on the arc. Regardless of difference in their notations, the early graph-based representation managed to capture the underlying knowledge.

In this study, semantic network has been explored and used to present extracted information related to female terms because representation is easy and structure can be easily understood by a layman. In addition, semantic network in this study is used to present the extracted information related to female terms because of its advantages in representing the concept of knowledge. Specifically, the paper explains how information related to female terms is extracted from the Quran, identifies significant female issues based on the extracted information, and presents the issues using the most appropriate diagrammatic representation of verses in the Quran.

This study is essential in understanding the content of the Quran since it is the main source of knowledge that can be used as guideline for everyday life of the Muslims. It contains valuable information and solution ranging from general to specific issues. Issues related to female are one of

the major concerns that are addressed in the Quran. Female is also being addressed by other terms such as ladies, woman, girls and other terms related to female. Due to the varieties of terms been used in the Quran, identifying and extracting the verses that contain the issues related to female are very difficult tasks. Hence, this study has identified 16 female related terms and the surah and verses that associated with the terms.

The paper is organized as follows: Section 2 explains the semantic network followed by the methodology that has been used in conducting the study in Section III. An example of the extracted text from the Quran is shown in Section IV and Section V explains how extracted information is grouped into issues using semantic network. Summary and suggestion for future work are presented in the last section.

## 2. Semantic Network

A semantic network is one of object-based knowledge representation scheme. It represents knowledge graphically by illustrating the involved objects and its properties together with its relationships. It views knowledge as a graph; with the nodes represent the facts or concepts and the arcs represent the relations or associations between concepts where both nodes and links are generally labeled (Luger, 2009; Hartley & Barnden, 1997; Sowa, 1987). Semantic network in ontology helps to express vocabulary that is beneficial especially for human.

Conceptually, semantic network is represented in a diagram consists of nodes, links (edges) and link labels. Nodes can be drawn as circles or ellipses or rectangles. It represents objects such as physical objects, concepts or situations. Links is drawn as arrows, represents relationships between objects. Link labels specify particular relations. A concept of semantic network is illustrated in Figure 1.

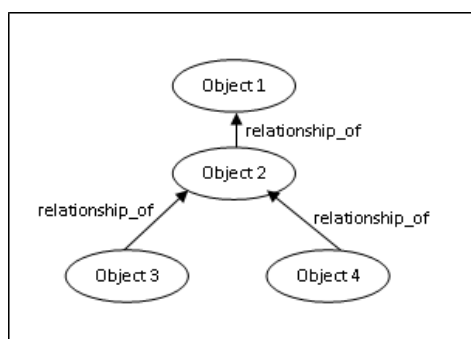


Figure 1. Semantic Network representation

The strength of semantic is that it has the ability to represent default values for categories. For example, Object 2 in Figure 1 is a sub-object of Object 1 and will inherit features of Object 1, which in this case is referred as default value. It also can convey some meaning in a transparent manner. It has been widely used in AI applications as it is easy to translate into PROLOG.

## 3. Research Method

The study has been conducted using four steps as follows: i) identifying the appropriate Quran search engine website, ii) verse extraction, iii) analysis of verse and identification of issue and iv) development of semantic network representation.

SearchTruth ([www.searchtruth.com](http://www.searchtruth.com)), Surah.My ([www.surah.my](http://www.surah.my)), AL ISLAM ([www.alislam.org/quran/search2](http://www.alislam.org/quran/search2)), Guided Ways ([www.guidedways.com/search.php](http://www.guidedways.com/search.php)), and IslamiCity.com ([www.islamicity.com/ QuranSearch](http://www.islamicity.com/QuranSearch)) are several examples of Quran search engines

websites are available on the internet. These search engines support multiple languages such as English, Arabic, French, Indonesia, Spanish, Malay and Urdu. The search engine is selected based on its capability to support search multi-word phrases (Nanba & Morishita, 2008), synonym search (Nadeem-Yasin et al., 2009), morphological search (Atwell et al., 2011), and misspellings (Rachidi et al., 2003). The terms woman, women, and girl have been used to compare the search engines based on the Tanzil Quran text features namely accuracy, searchability, compatibility and flexibility (Tanzil, 2011). The verses are extracted using female related terms after an appropriate Quran search engine website has been identified,

Sixteen female related terms have been identified as follows: women, girl, lady, mother, aunt, wife, sister, daughter, queen, whore, maid, niece, divorcee, maiden, damsel and consorts. Plural and singular forms of the words are taken into consideration in extracting the terms. The extraction of verses had been performed using the search engine provided in Quran website that has been identified. In this study, terms and words are used interchangeably. The verses are analyzed to identify issues and once issues are identified, semantic network representation is developed to represent the issues.

#### 4. Results and Discussion

Surah.My is found to be the most appropriate Quran search engine to be used in this study based on the evaluation of the search engines. Furthermore, an analysis through bizinformation.com.my shows that Surah.My is actively been used in Malaysia. Traffic report shows that the website is active and frequently accessed. This section presents results on extracted verses based on female terms, significant issues based on extracted verses, and an example of the semantic network used to represent an extracted verse.

##### 4.1 Extracted verses based on female terms

Verses are extracted from the Quran based on the 17 identified female terms. For example, 32 verses have been produced from 23 surah when the term “female” is searched. Table 1 shows two examples of the extracted verses based on the term ‘female’.

Table 1. Sample of extracted information

Juzu'	Surah	Verse No	Verse
4	An-Nisaa	11	Allah (thus) directs you as regards your Children's (Inheritance): to the male, a portion equal to that of two females .....
6	Al-Maaidah	38	As to the thief, Male or female, cut off his or her hands: a punishment by way of example, from Allah, for their crime: and Allah is Exalted in power.
24	An-Nuur	32	Marry those among you who are single, or the virtuous ones among yourselves, male or female: if they are in poverty, Allah will give them means out of His grace: for Allah encompasseth all, and He knoweth all thing

\*Source : [www.surah.my](http://www.surah.my)

#### 4.2 Significant issues based on extracted verses

The verses extracted were studied and issues related to the information in the verses were identified. Issues were identified based on selected keywords. Table 2 shows the examples of the extracted verses and related issues.

Table 2. Examples of significant issues

Verse	Issues
Allah (thus) directs you as regards your Children's (Inheritance): to the male, a portion equal to that of two females .....	Inheritance
As to the thief, Male or female, cut off his or her hands: a punishment by way of example, from Allah, for their crime: and Allah is Exalted in power.	Punishment
Marry those among you who are single, or the virtuous ones among yourselves, male or female: if they are in poverty, Allah will give them means out of His grace: for Allah encompasseth all, and He knoweth all thing	Marriage

#### 4.3 Semantic network representation

A verse from surah An-Nisaa' is used to show the semantic network representation as illustrated in Figure 2. The verse which was extracted for the term 'female' is as follows:

“Allah (thus) directs you as regards your Children's (Inheritance): to the male, a portion equal to that of two females: if only daughters, two or more, their share is two-thirds of the inheritance; if only one, her share is a half. For parents, a sixth share of the inheritance to each, if the deceased left children; if no children, and the parents are the (only) heirs, the mother has a third; if the deceased Left brothers (or sisters) the mother has a sixth. (The distribution in all cases ('s) after the payment of legacies and debts. Ye know not whether your parents or your children are nearest to you in benefit. These are settled portions ordained by Allah; and Allah is All-knowing, All-wise” (Holy Quran, Surah An-nisaa', verse 11).

The verse describes the *faraid* system for a deceased, specifically highlighting the portion of inheritance for the deceased children and parents. It also describes the allocation of inheritance in the case of a deceased with no heir. It can be seen from the figure that all facts – physical objects and concept such as 'daughter', 'mother', 'half share' and 'two-thirds share' are represented as nodes. These facts can be considered as topics that can be used as keywords for searching. The arcs in the network describe the relationship of each node and can be used as a link in a situation where we have a number of verses highlighting similar issue.

The *faraid* system is an Islamic inheritance system that deals with various levels of descendents. The issue has been represented and simplified using semantic network. The network has clearly shown the portion of inheritance for the deceased descendents which involve children and parents. This visual information can be used as a quick reference and serve as decision support tool for *faraid* related problem.

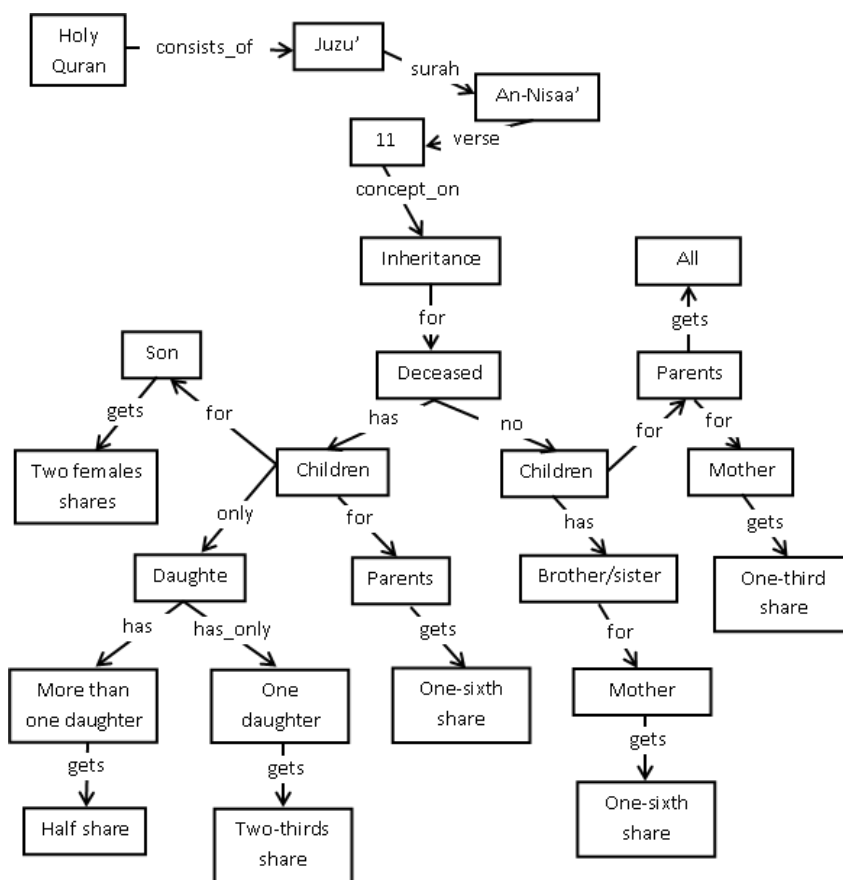


Figure 2. Semantic network for Surah An-Nisaa' verse 11 (4:11)

Various issues are described in The Holy Quran. Several issues are stressed or mentioned a number of times in the Quran to indicate its importance. Having a graphical view of all the related verses on issues in the Holy Quran gives a clearer picture on the issues. This is supported by Sowa (1987) who stated that network notations are easy to read as graphs keep all information about an entity in a single node. Graphs also show related information with links connected directly to the node. Combining the representation of different verses is also easy as it will not affect the structure of existing networks.

## 5. Conclusion

Semantic network has been successfully applied in representing the extracted verses. Understanding the verses has been made easy, thus facilitates the task of grouping verses with common issues. It is also found that, semantic network representation provides a clear and brief overview of the issue that is easy to understand and comprehend.

This study can be extended by applying CG interchange format to represent female issues in the Quran. CG is another object-based knowledge representation which is similar to semantic network but has the ability to produce a simpler graphical representation. The efficacy of semantic network and CG will be further assessed.

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