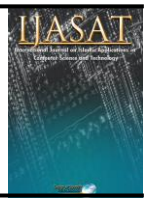

An Interdisciplinary Approach to Understand and Interpret the Religious Legislative Sources

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Abstract

This paper presents an interdisciplinary approach which allows us to understand and interpret the religious legislative sources. Its main objective is the analysis on ontologies. This approach will be applied on ontologies representing the knowledge in the Arabic religious legislative sources to help decision makers in the field of El-fatwa.

Keywords: Ontology, Natural language processing, information retrieval, semantic search, Religious studies, interdisciplinary approach, decision-making systems.

1. Introduction

The last decade is referred as the era of information and the period of knowledge, where web technologies play a crucial role in diffusing knowledge across the world. The huge explosion of information presence on the internet that is constantly increasing and the absence of semantic information require systems which can make intelligent processes on this content. The semantic Web was born to deal with these problems by proposing semantic tools to extend the web contents and allow machines to perform tasks and act on the Web itself.

The semantic side is described by ontologies to provide a formal description of concepts, terms or relationships for any domain, then allowing a better manipulation and understanding of the available information. Ontologies are described as "an explicit specification of a conceptualization" [1]. Ontologies are popular in the fact that they can be used in any domain, based on an intuitive reasoning, thus they could not find more fertile ground than the natural language processing [2].

The natural language processing is a particular domain of the artificial intelligence, whose main objective is to exploit the wealth of the natural language. The automatic processing of the Arabic language is considered difficult, because of the morphological and structural characteristics, such as the several meaning and irregular forms of certain words. That's why; the automatic processing of Arabic presents a set of challenges compared to other languages. Despite Arabic is spoken by more than 300 million people in over 22 countries, the ontologies for the Arabic language are almost non-existent, and a big part of these works are very limited compared to the evolutions of other languages in this field. Among these works we can quote the works presented in [3]-[4].

Our project turns around all these issues, in fact, it concerns the creation of ontologies for representing the Islamic knowledge, to finally develop a tool capable of analyzing this knowledge, the ultimate goal is to assist the muftis and facilitate their job.

This problems and limitations are more prominent when we talk about the Arabic holy text (Qur'an), which is considered as the most accurate text that presents superiority and perfection of the Arabic language [5]. The Qur'an contains many classical words and writing styles which are very different from modern standard Arabic. It is especially important to preserve the correctness of words in this sacred book. Although, recently researchers have intensive efforts in this area of research, however, most of the existing works focus on certain Surah or chapter of Qur'an with simple queries. This is due to the lack of powerful morphological analyzers of classical Arabic.

The paper is organized in the following sequence: First, you can find the introduction and the problematic of our work, followed by the state of the art where we will present what is in relation to this study. At the end and before the general conclusion, there is the part; presenting our project and the proposed methodology.

2. Problematic

The idea is to help decision makers in the field of El-fatwa, basing on an ontology specifying the maximum knowledge described by the legislative texts of Islam. Nevertheless, the knowledge modeling techniques from an Arabic corpus and the technical analysis of knowledge contained in ontologies are sparsely studied, which requires a deep epistemological research. Even more, the application of such studies on Qur'anic texts is very limited. A new work in this area certainly brings benefits to the Islamic world and the Arabic world in general, as well as a huge support for the progress of the modern science in all its fields.

The main goal of our project is to present an interdisciplinary approach, which allows us to understand and interpret the Islamic legislative sources.

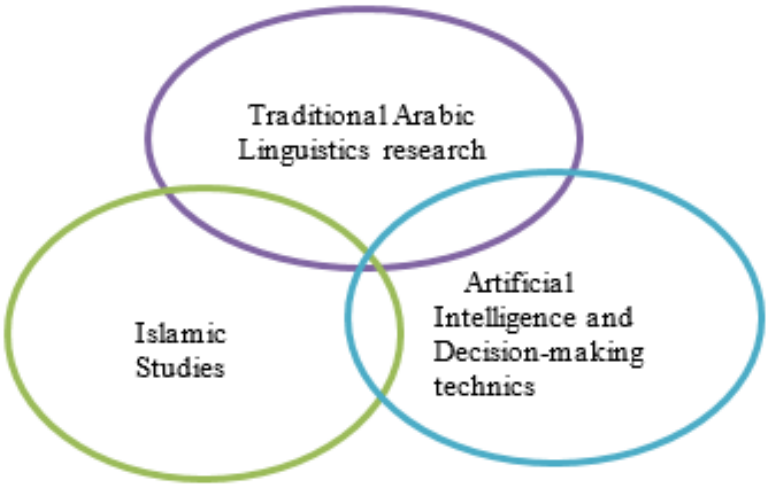

Figure 1. Problematic and approach for our project

3. State of the art

3.1. Computation

3.1.1. Semantic web

The semantic web is a distributed heterogeneous system. It has two goals, the first being to improve its usability as a medium for collaboration and the second to ensure that its contents can be understood by machines which cannot read and understand web pages like humans. To make web pages understandable by machines we need to add additional semantic information to the existing web. Tim Berners-Lee, who invented the WWW and has worked on the Semantic Web, states that the latter "is not a separate Web but an extension of the current one, in which information is given a well-defined meaning, better-enabling computers and people to work in cooperation." [6].

The semantic web is characterized by its strong representation of information which provides a description of its content in machine-readable form. In other words, the current Web is transformed from being machine-readable to machine-understandable. Numerous tools and applications of Semantic Web technologies have recently become available. [7] [8].

3.1.2. Ontology

The word “ontology” is used with different meanings in different communities. The most radical difference is perhaps in the philosophical sense; concerning "the study of being as being, which means the study of the general properties of what exists". And the computational sense, which appeared since the early 90s, and refers to a set of vocabulary to describe the conceptualization of a particular domain [9]. In 1993, T. R. Gruber offered the first definition that introduces the notion of ontology as an “explicit specification of a conceptualization” [1]. In 1997, Borst defined ontology as a “formal specification of a shared conceptualization” [10]. This definition additionally required that the conceptualization should express a shared view between several parties. Also, such conceptualization should be expressed in a (formal) machine readable format. In 1998, Studer et al. [11] merged these two definitions stating that: “An ontology is a formal, explicit specification of a shared conceptualization”.

By analogy, the term is used in computer and information science, where an ontology is composed of a set of concepts both hierarchically organized and structured by the relationships linking these concepts in a given domain for the purpose of information exchange and knowledge sharing. Over the past few years, several ontology definition languages have been introduced, citing: RDF(S), SHOE9, OIL10, DAML11, DAML+OIL12, and OWL which is the newly released standard recommended by W3C13. [12][8].

3.1.3. Decision-making systems:

The concept of DSS was introduced in the early 70s. The DSS presented a new philosophy that discovers the potential of computers to support decision making. There was confusion in the interpretation of the concept of DSS and the origin of this concept is as follows [13]:

- ***Decision:*** Focuses on decision making in a problem situation rather than simple information extraction, processing or reporting.
- ***Support:*** Determines the role of computer in aiding with no mean to replace the decision maker; and
- ***System:*** highlights the integrated nature of the global approach

New ways of computer-assisted decision-making have emerged following the progress in computer technology where different definitions of DSS were introduced [13]:

- Little (1970) defines DSS as a “model-based set of procedures for processing data and judgments to assist a manager in his decision making”
- The definition proposed by keen and Scott Morton, states that "decision support systems couples the intellectual resources of individuals with capabilities of the computer to improve the quality of decisions. It is a computer-based support system for management decision makers which deals with semi-structured problems”
- Mann and Watson state that "a decision support system is an interactive system that provides the user with easy access to decision models and data in order to support semi-structured and unstructured decision-making tasks"
- Sprague and Watson define a DSS as "computer-based systems that help decision makers confront ill-unstructured problems through direct interaction with data and analysis models"
- Turban st al. define a DSS as “a computer-based information system that combines models and data in an attempt to solve semi-structured and some unstructured problems with extensive user involvement”.

3.1.4. NLP

Natural Language Processing (NLP) is a field that examines the use of computers to understand and manipulate natural language texts or speech. NLP researchers study the knowledge of understanding and using natural language to develop tools and techniques that make computer systems competent to understand and manipulate natural languages.

The basics of NLP exist in multiple disciplines such as computer science, linguistics, mathematics, electrical and electronic engineering, artificial intelligence and robotics, etc.

NLP applications include a number of fields of study, such as machine translation, natural language processing and text summary, multilingual user interfaces, speech recognition, and so on. Several researchers have articulated the immense need of a thorough research to facilitate multi- and cross-lingual information retrieval, including the treatment of multilingual text and Multilingual User Interface systems to take full advantage of the WWW and digital libraries.

The implementation of the computer programs that understand natural language has three major problems: the first problem is the thought process, the second is the representation and meaning of language input, and the third is the knowledge of the real world. [14]

3.2. Traditional Arabic Linguistics

The Arabic script-based languages share in different degrees an explosion of homograph and word sense ambiguity. Dealing with such a problem represents a real challenge to NLP systems [15].

Resolving ambiguity in NLP requires representation not only of linguistic and contextual knowledge but also of domain knowledge. Ambiguity in Arabic is enormous at every level: lexical, morphological and syntactic. Another serious problem is tokenization [15].

It is extremely common in Arabic to find a token that can function as an entire sentence in English.

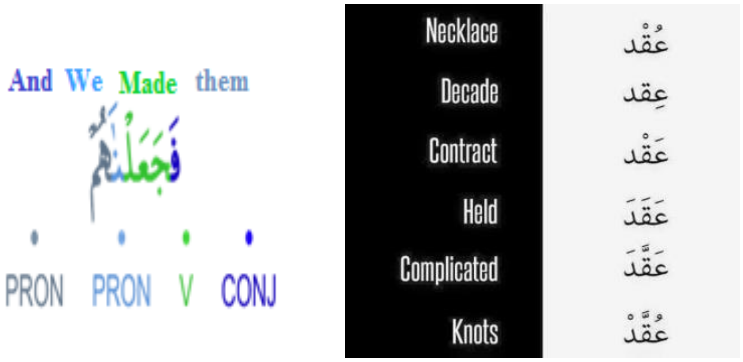

Figure 2. Examples of the Arabic language difficulties: in the right side; the problem of agglutination, and in the left side; the tokenization problem [16]

3.3 Islamic Studies

3.3.1. Qur'an

Being the verbal noun of the root word qara'a (to read), 'Qur'an' literally means 'reading' or 'recitation' [18].

The miracle of the Qur'an (or "I'jaz") is the belief that no human speech can match the Qur'an. It is considered as the top of linguistic perfection with its expression was worded in the shortest of forms without loss of clear meaning. Also, it is characterized by a unique structure using a beautiful word and kind insinuation, easiness of construct and correctness of ordering.

That it included knowledge from the smallest of particles to cosmic facts the Arabs and Mohammed (peace be upon him) did not know in general, also what it included about the science of Shari`ah and how to deduce laws and the ways to logical argumentation [al-hujaj al-`aqliyyah] (inimitability of Qur'an) [17].

Qur'an contains knowledge related to social and legal matters, as well as scientific knowledge. This knowledge will be very useful for the world in general, where modern science reflects our daily lives.

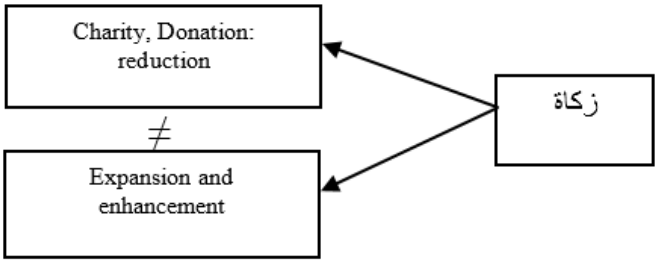

Figure 3. Examples of Qur'anic Text difficulties: One word can have several meanings, which are opposite to each other

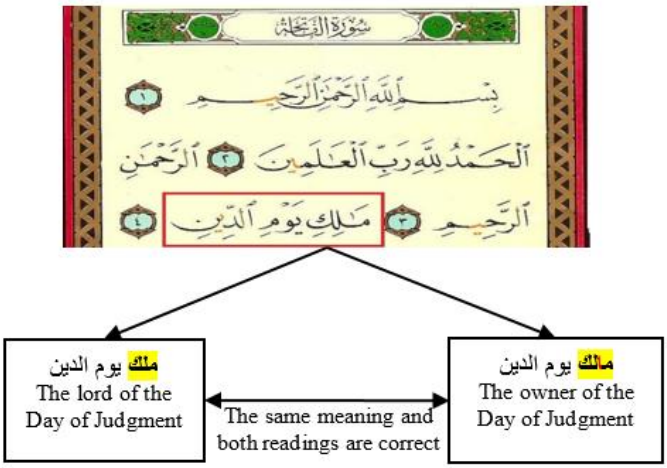

Figure 4. Examples of Qur'anic Text difficulties: One word can have more correct readings, which does not alter the meaning of the verse

3.3.2. Jurisprudence « Fiqh »

Linguistically, Fiqh involves having in-depth knowledge. Also fiqh is to have the knowledge of decisions of all Islamic laws which are extracted from the 4 Islamic legislative sources (presented in Fig5). As an example, the Faqih would know the decisions concerning inebriation; besides, he should know how and where this decision was extracted [19].

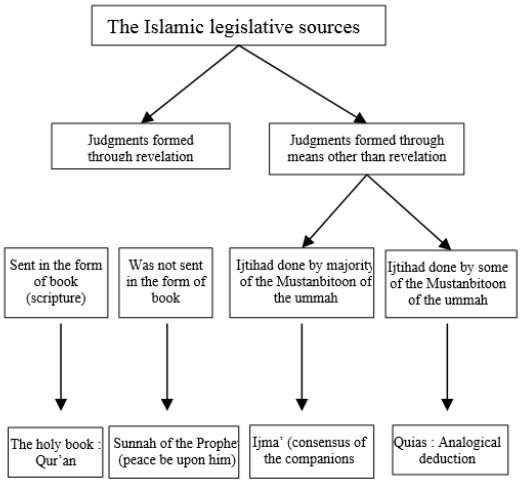

Figure 5. The Islamic legislative sources

3.3.3. Sources of Jurisprudence « Usul El-fiqh »

It's the theoretical bases relating to the methodology which contains indications and methods used to extract Islamic judgments from the 4 Islamic legislative sources (presented in fig4). It is a textual theory which formalizes the reading of Qur'an according to a certain number of principles of immanence and rules of classification [19] (principles of jurisprudents).

In order to facilitate the comprehension of the Islamic sources structure, the Arabic grammar rules are used to define the meaning which is very important since no decisions can be deduced except when the content of this sources is well understood [18].

Since the decisions are established according to Usul El-fiqh, a variation of Usul El-fiqh can pull various decisions. This is one of the reasons why it could exist more than a decision on certain questions there. The final product of Usul El-fiqh is Shariah (or Fiqh).

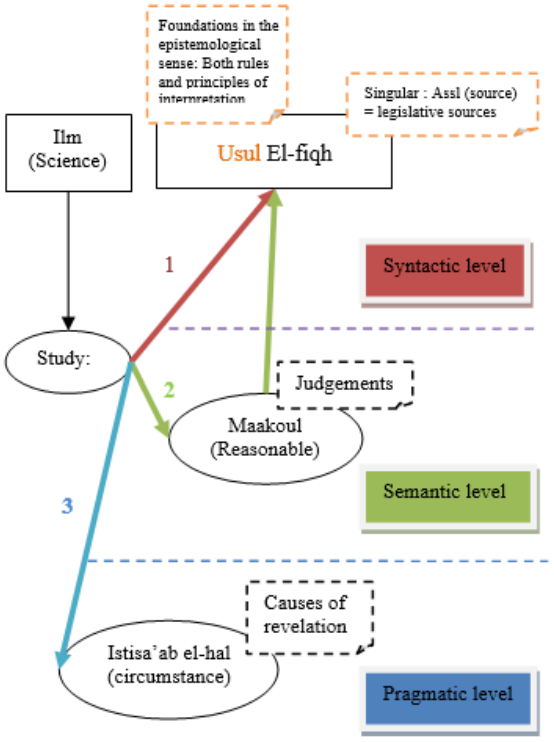

Figure 6. Work of Charles Sanders Peirce and Charles William Morris since the 40s compared to the logic of the foundations of Usul El-fiqh used in the ninth century.

4. Methodology

The first step will be the creation of the Islamic ontologies using a thematic classification. In this context, we opt for the reuse of existing work if possible; in order to focus on the second step which is the real challenge of this project.

Since the Islamic legislative sources contain both proof and proven [17], then understanding the meaning means the competence of retrieving proofs and religious dictum considering the way it is read and the way it is understood.

The next step is to create a tool that can analyze the knowledge presented in the ontologies created in the first step. This tool must extract the Islamic judgments for problems that require reasoning. To make this happen, we suggest being inspired by the methodology elaborated by ULAMA Usul El-fiqh in the 9th century. This methodology provides the techniques needed to read and reason properly on Islamic texts.

Therefore, the results of our tool will be Islamic judgments, which are based on a logical and semantic interpretation, taking into consideration all the Arabic language rules.

Finally, to evaluate our tool, we will do a little comparison between our results and the judgments of Islamic jurisprudence to determine the efficiency and reliability of our results.

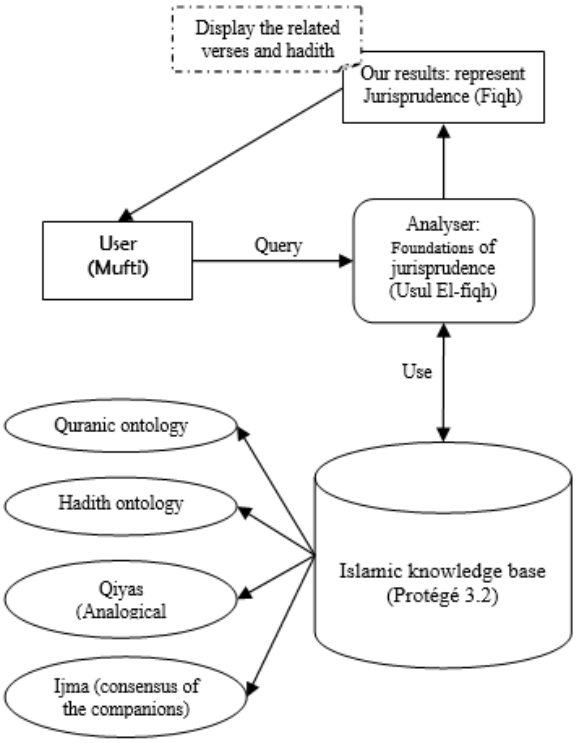

Figure 7. Presentation of the methodology

4.1 Research plan

The work of our project is divided into two major axes:

a. The first one consists of the construction of the ontological model representing the four legislative sources of Islam. Diverse problems are put at this stage, but since many works (some presented in this paper) are done in this domain, they give us the methodological frames for this process.

b. The second axis consists in the analysis phase of the ontology built to supply an answer to a given question. Indeed, the absence of a system which can analyze on ontology and supply a result leads to design a complementary tool for Protégé 3.2 to reach the aimed goal.

5. Conclusion

We think ENNOUR is a good environment to serve the Holy Quran. We also think that the aimed software will be of a great interest to read and listen to the Holy Quran. Thanks to its search engine, it allows to make simple searching or study in depth the secrets of the Holy Quran. One of the strengths of our application is that it allows the synchronization of the text with the recitation. Moreover, while listening, it is possible to search for words or phrases and to ask for interpretation or translation of the verses to English and French. Finally, we thought about conceiving others applications with the same interface oriented towards learning to read and memorize the Holy Quran.

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