Intelligent Tool for Mufti Assistance

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\textbf{ABSTRACT}

In the Islamic legislation, the Fatwā consists in the exhibition of a legal opinion in respect of the Islamic precepts. In this paper we focus our interest on reasoning modes in legal domain and more exactly in Islamic legislation field. Our approach consists in solving a new problem by reusing the solution of a similar problem already met, and stored in a memory of cases. The interpretative case based reasoning is a process of assessment of situations or solutions in a previous experience context. It is naturally daily used. Indeed, judges in their courthouse interpret a new situation in the light of case already met (case of jurisprudence). In the following, we are interested in applying this style of reasoning in the Islamic legislation field as a tool of information retrieval which can be used during the process of Fatwā generation.

\textbf{Keywords:} Islamic application, Islamic legislation, Expert System (ES), Case Based Reasoning (CBR).

\section{1. Introduction}

In the Islamic legislation, the Fatwā consists in the exhibition of a legal opinion in agreement with the Islamic precepts. Fatwā is a legal statement in Islam, issued by a muftī or a religious lawyer, on a specific issue. Fatwās are asked for by judges or individuals, and are needed in cases where an issue of fiqh is undecided or uncertain. Lawsuits can be settled on the basis of a Fatwā (Alghazali, 1992).

We propose an Expert System conceived to give Fatwās for the new situations, by using the Fatwās of the past situations. It is not able to generate a new Fatwā from the scratch, but it reuses the Fatwās, by imitating an imam. In order to be able to ‘reuse’, the system organizes its knowledge in cases which are collected in a memory said case-base. Then, it performs an inference process to find and reuse the appropriate Fatwā and its argumentation.

To make this paper easier to read, all basic concepts corresponding to CBR paradigm are presented in section 2. The section 3 surveys briefly the domain of Islamic legislation. The proposed Expert System is presented in section 4, Followed by an example. We conclude in section 5 by exposing limits of our work, possible extensions and future work.
2. Case Base Reasoning

Case-Based Reasoning (CBR) is an approach to develop Expert Systems that are able to retrieve and reuse solutions that have worked for similar situations in the past. CBR imitates human remembrance and reuse of old solutions to handle new manifestations of a problem. The idea of CBR is intuitively appealing because it is similar to human problem-solving behavior. People draw on past experience while solving new problems, and this approach is both convenient and effective, and it often relieves the burden of in-depth analysis of the problem domain (Pal & Shiu, 2004). This leads to the advantage that CBR can be based on shallow knowledge and does not require significant effort in knowledge engineering when compared with other approaches (e.g., rule-based).

1. Every single case consists at least of a problem description part, called the problem, and a solution description part, called the solution. These two basic ingredients are usually enriched by an administrative part including, e.g., a case number, an explanation or justification part that provides more information about the step from the problem to the solution, a context description part, and an evaluation part that contains information about the quality and reusability of the case.

2. Problem solving with CBR now proceeds as follows: A new problem is posed and is described as the problem part of a new case, sometimes also called the query. Then, old cases containing problems that are similar to the new problem are retrieved and the most suitable solution among retrieved solutions is suggested to become the solution of the new problem. This solution is then tested in reality which may lead to a revised solution worth to be stored as a new case. This last step is a kind of incremental learning that enables CBR systems to adapt to changing environments rather smoothly.

3. There exist two styles of the CBR (Kolodner, 1993): the problem solving style and the interpretation style. In the problem solving style, a solution to the new problem is proposed by reusing the solution of the extracted case. This stage is followed by an adaptation, adjustment of the earlier solution to the new situation; then a stage of critique: process of assessment of the new solution. In the interpretative style, cases are used to evaluate or to justify new situations, such as a jurist using preceding cases as arguments to new situations. There is an assessment when no accurate method is available. We can also interpret situations whose borders open-ended. In interpretative style, a basic interpretation (or a wanted result) is proposed, based sometimes on excerpts, imposed sometimes by the outside (ex: when a customer requires of his lawyer a certain result). This stage is followed by the justification, process of creation of an argument for the proposed solution; what is achieved by comparison and opposition of the new situation to the previous cases. The interpretative case based reasoning is a process of assessing situations or solutions in a previous experience context (Rissland & Skalak, 1989). We can find three tasks for which the interpretative CBR is used (Kolodner, 1993): the justification, the interpretation and the projection. In the justification, we look for the reason or the proof of the correctness of an argument, a position or a solution. In interpretation, we try to place a new situation in a context. The projection means forecasting the effects of a solution.

3. Islamic Legislation Domain

In the Islamic legislation, the Fatwā consists in the exhibition of a legal opinion according to the Islamic precepts. The delivery of a Fatwā constitutes the function of « Mufti ». It is based and must always respect in the first place the Holy QU-RĀN and the Sunna of the prophet (Karadaoui, 1975; Karadaoui, 1976; Zaidan, 1997).
A Fatwā (Arabic: فتوى) is a legal pronouncement in Islam, issued by a religious law specialist on a specific issue. Usually a Fatwā is issued at the request of an individual or a judge to settle a question where fiqh, Islamic jurisprudence, is unclear (Ibn Abd Essalem, 2000). Because there is no central Islamic priesthood, there is also no generally accepted method to determine who can issue a Fatwā and who cannot, leading some Islamic scholars to complain that too many people feel qualified to issue Fatwās (Elfaci, 1993).

The process of generating a Fatwā from the scratch is very elaborate. Mufti respects a general inference rule:

« The basic statement is allowance »:
الأصل في الأشياء الإباحة

It means that Harram judgment must be argued with juridical text or by analogy, according to Holy QU-RĀN and Sunna of the prophet. It is emerging from the Muslim believes who consider that judgments is the authority of ALLAH and only him.

From this rule, we can deduce that the Hallal area is very large regarding to the Harram area which is very restricted (Fig. 1). The frontier between the two could change when varying the context: Time, place, person asking question … (Alghazali, 1992).

![Frontier between Hallal and Haram](image)

**Figure 1:** Frontier between HALLAL and HARAM

The Mufti is said jurisprudent (مجتهد). However, there are several types:

- The absolute jurisprudent (المجتهد المطلق), his Fatwā is directly based on the « texts » (النصوص) according to this order: the holy QU-RĀN, the Sunna of the prophet, conclusion of the Jurisprudents (أقوال الفقهاء) and by analogy (القياس).
- The jurisprudent adopting a legal school (مجتهد على مذهب): who follows the rules and fundamental principles of the imam of the legal school which he adopts (إمام المذهب) or can also use the verisimilitude (الترجيح).
- Specialized Jurisprudent in a domain of Islamic legislation: He must deliver some Fatwās in this domain only.
- Specialized Jurisprudent in certain problems of Fikh: It is possible for him to expose some Fatwās only in this type of problems.

In what follow, we will see how the mufti could be intelligently assisted in his work.

4. The proposed Approach

We propose the use of CBR paradigm to in the construction of an Expert System which gives Fatwās for the new situations, by using the Fatwās of the past situations. It is not able to generate a new Fatwā from the scratch like an absolute jurisprudent, but it reuses the Fatwās, by imitating an imam. In order to be able to reuse, the system organizes its knowledge in cases which are collected in a memory said case-base.
4.1 Knowledge representation

A case is a contextualized piece of knowledge representing an experience. It contains the past lesson that is the context of the case and the context in which the lesson can be used. Schank in (Rougegrez-Loriette, 1994) defines three types of case:

- Ossified cases assimilated to a general rule, that are not associated to lived experience, proverbs are an example of it,
- Paradigmatic cases. These cases are less general than the first. They are joined to a set of situations,
- Stories constitute some unique cases. They are very detailed, what makes them exploitable for various utilizations.

A case is constituted of descriptors, also called dimensions, distributed in three categories: the description of the problem, the solution and issues of the solution. The description of the problem includes the context of the case. The solution is the solution of the problem or the reaction to this description (for example, the deliberation of a courthouse, the taken decision, etc.). It can also describe the used reasoning. The exit of the case is the description of the context after the implementation and execution of the solution. This part of the case is generally omitted and the knowledge is reported on the other stages of the reasoning. More the representation of cases is rich; more cases can be used for the different goals.

In the context of the proposed tool, the case contains two parts:

- Description of the situation: it is constituted of a question and its context.
- The result is an answer to the question and the arguments of this answer.

The problem description will contain (see fig. 2):

- Type of the action done (examples are to <to eat, to drink, to buy, to offer, to perfume with, to dress, ...>),
- Product name (examples are <Banking Products, Foods, Drinks, Clothes, ...>)
- Type of the product: <Banking Products, Foods, Drinks, Clothes, ...>
- Characteristics: <with Ribaa, Alcoholic, Harmful for health, ...>
- Exception (الإستثناء) (examples: <for medication (pure), for medication (mixed), intense thirst, intense hunger, compulsion, none>)

The answer will contains the judgment (الحكم) حلال، حرام، يجوز أو لا يجوز and the arguments supporting the answer (الإسناد).
The reasoner uses cases stored in a case base. This one is supposed representative of all problems susceptible to be put to the system. More it contains case; more the case selected for the reasoning will be similar to the new case. The worked out solution will be therefore better. But more the base increases, and more time is long. It is why techniques of organization of the memory and algorithms of research are especially important in this reasoning.

In the proposed CBR system, cases are stored in a case memory organized associatively in order to speed up the extraction process.

We propose a new vision of the retrieval problem that is based on constructing a problem neighborhood (Nouaouria, Boukadoum, Proulx, 2014). The retrieval of applicable cases can be formulated as the extraction from the search space of a sub-space of cases that are of an optimal reuse in the context of the problem to solve. We call this sub-space the neighborhood of the target problem. In our approach, it is obtained by a Particle Swarm Optimization (PSO) search strategy1. We start from the flat memory structure of the case memory and construct a nested structure with two types of nodes: value nodes and case nodes. A value node, or Information Entity node, represents a particular value for a problem attribute (see fig. 3). It is linked to all case nodes where it occurs. The case node points to the case base location where the whole case is stored. In Figure 2, for example, IE2 and IEa pointing to case node #1 mean that Case #1, which is pointed by case node #1, has IE2 as first attribute value and IEa as second attribute value.

The particularity of the proposed structure is that we reach a case by its contents (the principle of associative memories). Also the structure could easily and automatically be built by simply parsing the case memory and constructing lists of value nodes and case nodes during a pre-treatment stage. Another feature is that no prior sub categorization of cases relative to sub domains (Foods, Banking ...) is needed. All the sub case bases are seen as a whole case base managed by the same inference engine

1 A detailed description of PSO Search Strategy is given in (Nouaouria, Boukadoum, Proulx, 2014).
4.2. Proposed Architecture
The architecture of the system (see fig. 4) will include globally five modules: Neighborhood Computing module, Associative access module, adaptation, validation and storage modules.

As input, it will receive a description of the situation and it will furnish an answer with its arguments as output.

The problem of research is to find one or several similar cases to the problem to solve. Generally, it is the problem of the research of the useful case to the reasoning. Utility and similarity are not necessarily synonymous. For example, the HYPO system searches for cases that are «different» of the input problem. The proposed Expert System aims to extract identical or most similar cases.

![Figure 1 System Architecture](image)

**Figure 1 System Architecture**

The Associative Access module will use the neighborhood computed before to retrieve the closest case to the input. Similarity measurement is based on heuristics of the domain since descriptor values are symbolic.

Cases retrieved could be of two types: paradigmatic cases corresponding to a set of situations (ex: المشروبات الكحولية) which have larger range of applicability; and story cases corresponding to specific situation (ex: coca cola drink) which are applicable only if the input situation is identical to the situation in the retrieved case.

The answer of the retrieved case could be adapted if information about exceptions occurred. For example: the answers changes from (حرام) to (يجوز) in case of العطش (حراش) or التداوي (تجوز). So, arguments will be adapted by using heuristics like:

```
If (exception = العطش or التداوي) and (product-type = alcoholic)
    Then begin
    Answer ← (يجوز);
    Arguments.ayat ← ayat_number;
    Arguments.hadith ← hadith_number;
    Arguments.hikma ← hikma_number;
end
```
Where, ayat_number, hadith number and hikma number are entries in corresponding tables.

The validation step is manually handled by an expert of the domain. The storage is the machine learning aspect of CBR. The new solved case could be stored in the memory after its validation by the expert (here the MUFTI) through a specific interface. It allows the memory to be richer and thus more efficient during further session.

4.3 Illustrative Example.
We are now going to illustrate a work session of the Expert System by an example from the sub domain of drinks (المشروبات).

As input of the question, we can see (fig. 5):

- The kind of question which can be: (ما حكم؟ ما حد؟)
- the action, like: (شرب، تعاطي، إهداء)
- the product like: (فانتا، خمر)
- type of product like: (الفواكه، الدخان)
- features like: (تسكر، مضرة للصحة)
- exceptions like: (النذاري، الإكراه)

Figure 5 : Input question

When clicking on the button (بحث) we obtain the similar cases in fig. 6.

Figure 2 : Similar cases

With the button (حل) we obtain the answer in fig. 7.
When clicking on the button (الاستنادات), we obtain the arguments supporting the answer in fig. 8.

5. Conclusion and Perspective

Latter developments in Artificial Intelligence beg the question of whether models of case based legal reasoning are relevant to Islamic legislation.

Due to the sacred nature of Islamic legislation domain, we have started a first work (Nouaouria, Atil, Laskri, Bouyaya, Amari, 2006) with the major restriction of the field. The application field was limited to drinking (& smoking). This restricted area permitted us to well prototype the domain and to browse kinds of difficulties we could encounter. EL BAYANE was in fact limited to a sub domain, but it has reached the objective we aimed to by sketching the feasibility of such a tool.

For the proposed Expert System, we maintain the restriction of the role of assistance. We must precise that at any time we had the intention of substituting the work of an absolute jurisprudent, who really generate Fatwās from the scratch. We can say that the proposed tool assists Mufti in generating Fatwās from second principle. It could be also, seen as an information retrieval tool not only for mufti but for any user having questions in the field especially in non-Islamic countries. The interface offers facilities to express the user request accurately.

In the other side we extended the scope of the initial work by proposing a generic model working for multiple fields (Drinks, Foods Banking ...) and all in the same memory model.

Our orientation in the future will be to enlarge the scope of the tool via the web media.

References
