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Ontology based Similarity for Case Based Reasoning in Islamic Banking

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Abstract

The goal of this article is to present an Ontology based Similarity approach for a Case Based Reasoning system to assist Mufti in the process of retrieving old Fatawa to reuse them or to generate new ones. The system allows the user to ask a question and get the case base to be searched for old Fatawa fitting with the question. The case memory contains Fatawa generated by experts in Fiqh Islamic Banking domain. The question is asked by the user in an assisted mode. The system analyzes the question not only syntactically but also semantically. An application ontology was created for this purpose. This last adds a value to the system by describing the domain knowledge and providing systematized knowledge and machine readable vocabulary of the domain. The proposed system measures similarity between situations by applying the ontology.

Keywords: CBR, Ontology, NeOn Methodology, Protege, Fatawa, Arabic Language.

1. Introduction

In Islamic legislation, a Fatwa consists of the declaration of a legal opinion in agreement with Islamic precepts. A Fatwa is a legal statement in Islam, generated by a Mufti or a religious lawyer, on a specific issue. Fatwa 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 fatwa (Ghazali & El Shafi, 2000).

We propose an Expert System assisting mufti in generating Fatawa for the new situations, by using the Fatawa of the past situations. It is not able to generate a new Fatwa from the scratch, but it reuses the Fatawa, by imitating an imam. In order to be able to 'reuse' previous fatawa, the system organizes its knowledge in cases which are collected in a memory called case base. Then, it performs an inference process to find and reuse the appropriate Fatwa and its argumentation.

Case based reasoning uses similarity measures to identify cases which are more relevant to the problem to be solved. However, syntactic measurement could give fail. A semantic similarity measure will remedy this limitation. A semantic similarity is a function that assigns a numeric value to the similarity between two classes of objects based on the meaning associated to each of the objects (Lin, 1998). To make a good correspondence with the meaning associated to the words, we propose the use of an ontology. Indeed, in order to improve the performance of our system in measuring similarity between situations, an application ontology is designed to

describe the domain knowledge and provide systematized knowledge and machine readable vocabulary of domains.

In the following, basic concepts are presented in section 2. CBR paradigm are presented in section 2.1. The section 2.2 is dedicated to Ontology definitions. The section 2.3 presents the domain of Islamic legislation. An Islamic Finance application Ontology presented in section 3. The proposed System is presented in section4. We conclude in section 5.

2. Basic Concepts

2.1 Case Based Reasoning

The goal of AI is to develop computer programs to do the things that humans usually call "intelligent"(Gaševic, Djuric, & Devedžic, 2009). Case Based Reasoning (CBR) is an artificial intelligence paradigm that solves new problems by retrieving stored records of prior problem-solving episodes (cases) and adapting their solutions to fit new circumstances. Each processing episode provides a new case that is stored for future reuse, making learning a natural side-effect of the reasoning process(Leake, 2003). Case-based Reasoning is also studied within cognitive science as a model of human reasoning: studies show that people use recollections of prior problems to guide their reasoning in a wide range of tasks, such as programming, mathematical problem solving, diagnosis, decision making, and design (Leake, 2003).

This process of Case-Based Reasoning can be very advantageous to a decision maker who knows a large number of cases and has been able to index them so that the most relevant cases come to mind when needed (Amari, Atil, Bounour, &Nouaouria, 2015). Case-Based Reasoning (CBR) is one of the most popular approaches for development of knowledge-based systems that are able to retrieve and reuse solutions that have worked for similar situations in the past. It is considered similar to the way that human being solve problems.

A CBR 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 (e.g., a case number), an explanation or justification part that provides more information about the steps 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.

Problem solving with CBR proceeds as depicted in Figure1: 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 worthy 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(Aamodt & Plaza, 1994).

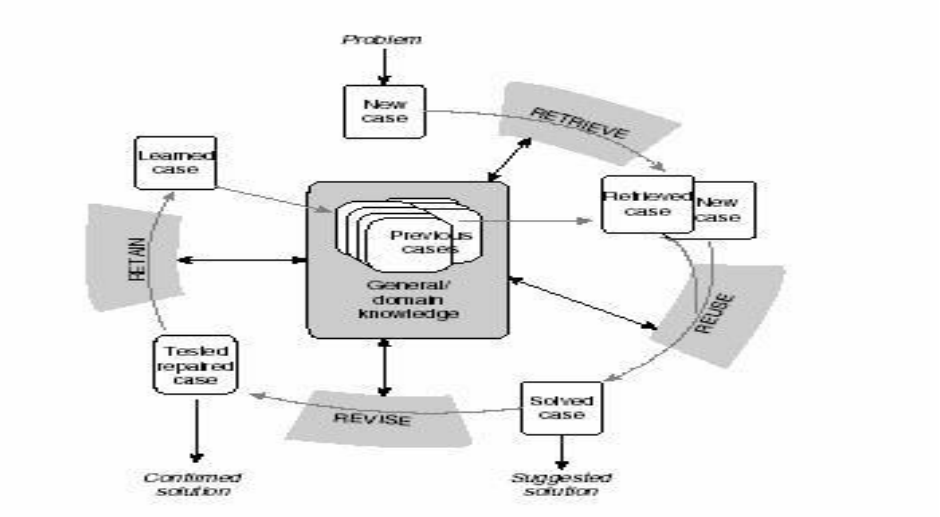

Figure 1. CBR cycle (extracted from (Aamodt & Plaza, 1994))

Cases stored in the case library (*i.e.*, previous cases) are supplemented by general knowledge, which is usually domain dependent. General knowledge takes the form of models or rules or constraints available and used. The case base and the general knowledge constitute a partial domain model with the consequence that in general for CBR the closed world assumption does not hold (Bartsch-Spörl, Lenz, & Hübner, 1999). There exists two styles of the CBR (Smail, 1994): 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: a process of assessment of the new solution. In this style, the CBR can support a variety of tasks of problem solving such as: planning, diagnosis, design, etc.

In the interpretative style, cases are used to evaluate or to justify new situations, such a jurist using previous 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.

The Expert System we propose is in interpretative style based on justification and interpretation tasks mainly. It uses an application ontology for measuring similarities in the data retrieval stage.

2.2 What is an Ontology

The word “Ontology” was taken from Philosophy, that it is concerned with the study of being or existence. In the last two decades, the word Ontology has been an increasing interest in the knowledge engineering domain. We have found several definitions for the word ontology from the literature. Gruber proposed the following definition: “An ontology is an explicit specification of conceptualization” (Gruber, 1993). This definition was the widely cited in the literature. The essential points of this definition are: an ontology defines the concepts, relationships, and other distinctions that are important for modeling a domain knowledge and the specification takes the form of the definitions of representational vocabulary (classes, relations, and so forth), which provide meanings for the vocabulary and formal constraints on its coherent use. This definition was extended by (Borst,1997): “Ontologies are defined as a formal specification of a shared conceptualization” Gruber’s and Borst’s definitions have been merged and explained by (Studer, Benjamins & Fensel, 1998): “Conceptualization refers to an abstract model of some phenomenon in the world by having the relevant concepts of that phenomenon. Explicit means that the type of concepts used, and the constraints on their use are explicitly defined. An ontology should be machine-readable. An ontology captures consensual knowledge, that is, it is not private of some individual, but accepted by a group”.

Ontologies provides a number of useful features for intelligent systems, as well as for knowledge representation in general and for the knowledge engineering process(Gaševic, Djuric, & Devedžic, 2009).

The ontology, we propose, provides a description of the domain of interest which is "Islamic banking and transactions". It provides: concepts, their relations, concept hierarchies, taxonomies and also, specify them in an elaborate way, using specific ontology representation languages. This ontology will be used to produce similarity measures that are based on semantics. In the next point we will present definition of the application domain.

2.3 Islamic banking and transactions

Islamic finance was practiced predominantly in the Muslim world throughout the middle ages. European financiers and business men later adopted many concepts, techniques, and instruments of Islamic finance. In contrast, the term ‘‘Islamic financial system’’ is relatively new, appearing only in the mid-1980s. In fact, all earlier references to commercial or mercantile activities conforming to Islamic principles were made under the umbrella of either ‘‘interest free’’ or ‘‘Islamic’’ banking. This, no debt, prohibits the receipt or payment of interest as the nucleus of the system, but is supported by other principles of Islamic doctrine advocating risk sharing, individuals’ rights and duties, property rights, and the sanctity of contracts. Similarly, the Islamic financial system is not limited to banking, but covers financial instruments, financial markets, and all types of financial intermediation (Zaher & Kabir Hassan, 2001).

The Islamic economic system shares the key characteristics and objectives of a conventional economic system. The additional and vital factor is the Sharīah’s rules, which are designed by Allâh (Subhanahuwata'ala), operationalised through the Sunnah, and made contemporary by the Ijtihad. The Islamic economic system adopted in various countries may differ with regard

to some policy decisions taken by legitimate national authorities. However, the core rules and institutions must be the same. All policies, transactions, contracts and economic activities must be Sharī‘ah-compliant (Khalifa & Hassanain, 2016).

In Islamic legislation, the Fatwa consists of the declaration of a legal opinion according to the Islamic precepts. The delivery of a fatwa constitutes the function of « Mufti ». It is based on, and must always respect in the first place, the Holy Quran and the Sunna of the prophet (Karadaoui, 1977; Zaidan, 1997). Another source of reference is Ijtehad (reasoning of qualified scholars, who agree on a single verdict). Thus, the Holy Quran, the Hadith and Sunnah and the Ijtehad are all used to extract Islamic laws. The compilation of rules and regulations extracted from the above mentioned sources are called Shariah, Islamic Legal Ruling and Islamic Jurisprudence (Alsayyed, 2010).

A fatwa is a legal pronouncement in Islam, issued by a religious law specialist on a specific issue. Usually a fatwa is issued at the request of an individual or a judge to settle a question where fiqh, Islamic jurisprudence, is unclear (IbnAbdEssalem, 1992). Because there is no central Islamic priesthood, there is also no generally accepted method to determine who can issue a fatwa and who cannot, leading some Islamic scholars to complain that too many people feel qualified to issue fatwas (Elfaci, 1993).

The process of generating a Fatwa from scratch is very elaborate. Mufti respects a general inference rule: "The basic statement is allowance" It means that Harram judgment must be argued with juridical text or by analogy, according to the Holy Quran and Sunna of the prophet. It emerges from the Muslim belief that considers that judgment is by the authority of ALLAH and only him(Amari, Atil, Bounour & Nouaouria, 2015). From this rule, the Hallal area is very large relative to the Harram area which is very restricted. The frontier between the two could change when varying the context: time, place, person asking question,…(Ghazali & Shafi, 2000). In what follows, we will see how the mufti could be intelligently assisted in his work.

3 The Application Ontology

We adopted NeOn Methodology (Suarez-Figueroa & Gomez-Perez, 2009) to build IFAO ontology, "Islamic Finance Application Ontology", since it is based on famous ontology engineering methodologies such as: Methontology (Gomez-Perez, 1996), On-To-Knowledge (Sure & Studer, 2002) and Diligent (Pinto, Staab & Tempich, 2004) combined with good practices and feedback from previous experiences of NeOn consortium members Ontology.

Neon Methodology is a set of nine scenarios for building ontologies: Scenario 1: From specification to implementation, Scenario 2: Reusing and re-engineering non-ontological resources (NORs), Scenario 3: Reusing ontological resources, Scenario 4: Reusing and re-engineering ontological resources, Scenario 5: Reusing and merging ontological resources, Scenario 6: Reusing, merging and re-engineering ontological resources, Scenario 7: Reusing ontology design patterns (ODPs), Scenario 8: Restructuring ontological resources, Scenario 9: Localizing ontological resources. Therefore, we decided to development from scratch (scenario 1) with reuse and reengineering of non-ontological resources (scenario 2). The resulting ontology is presented in Figure 2.

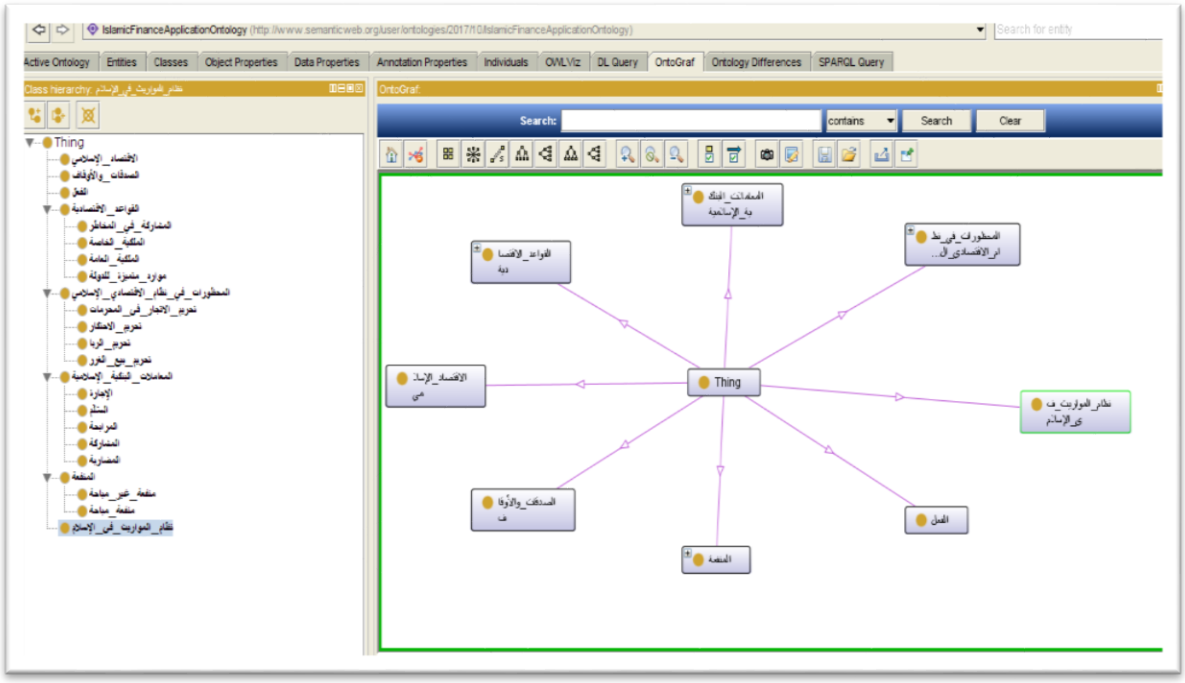

Figure 2. Islamic Finance Application Ontology (IFAO).

4 The Mufti assistance System

Islamic Fatwa is what the Islamic rules judge about an issue. When generating a fatwa, Muftis must have the document of prior fatawa and all updates (giving by expert scholars). This document keeps hundreds of millions of such Islamic Fatwa, searching the right fatwa may takes days.

On the other hand, when, Imam (Mufti Novice) haven't the document of fatwa, then, they could wrongly try to give fatwa. In principal, the fatwa must be given by Jurisprecedent (expert scholars). These reasons motivate us to create a knowledge-based system for assisting Mufti.

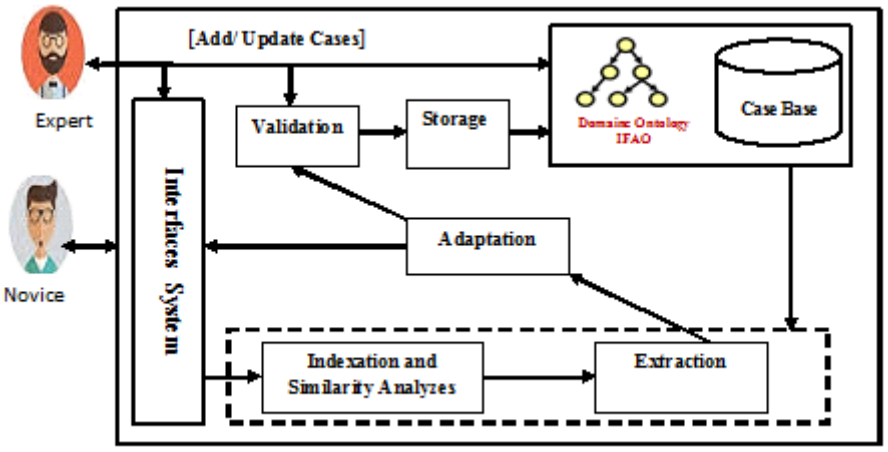

Figure 3. Fatawa system Architecture.

The architecture of the system (see Figure 3) includes the following components: Case memory, Islamic finance application ontology, System interfaces, and five modules: indexing module, extracting module, adaptation module, validation module and storage module. As input, it will receive a description of the situation and it will furnish an answer with its arguments as output.

The proposed system is destined to Mufti (experts and novices). This system can save Fatawa on case base memory (all prior Fatawa), expert Mufti can add, update or delete fatwa (this action permitted only for expert Mufti) via a specific interface after authentication. Expert Mufti and learner Mufti can recover Fatawa by interrogating the system via another interface called question answering interface, where they enter the query in the specific fields using assisted mode. The System analyzes the query not only syntactically but also semantically.

4.1 Case description

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. A case can be an account of an event, a story, or some record typically comprising (Watson, 1997): The problem that describes the state of the world when the case occurred and the solution that states the derived solution to that problem.

In the context of our System, the case contains the parts detailed in figure 4.

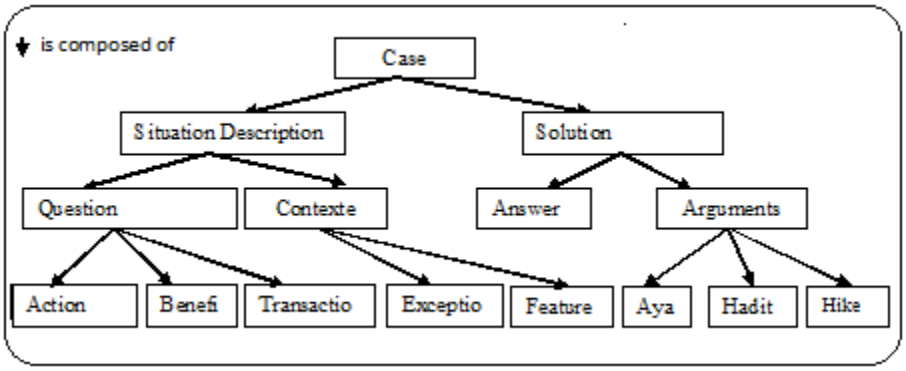

Figure 4. Case description.

Due to the critical nature of the task of the system, and in order to avoid any misconception, we have decided to limit our first implementation to the domain of Islamic finance and banking transactions. Thus, the problem description will contain (see Figure 4):

- Type of the action done by the source of the verb: <Buy, Sell, Offer, Rent, Loan..>,
- Benefit name : <Car, Apartment, Home, …>
- Transactions type: <Murabaha, Mudharaba, Leasing, Inah, Istisna',…

4.2 Case memory

Case memory used to store previous and new learned cases, several techniques of organizing the memory exists (Kolodner, 1993; Bartsch-Spörl, 1999):

(a) ***The flat organization:*** in a flat memory, cases are arranged sequentially in a simple list, an array, or a file.
(b) ***Shared feature Network:*** this regroups cases presenting similarities in one cluster. Hierarchies are formed when clusters are subdivided in to under-clusters. Methods of regrouping used are those met with in machine learning.
(c) ***Discrimination Networks:*** The regrouping done in shared feature networks leads to a discrimination in the second place. In discrimination networks, this happens first: every internal node is a question that discriminates according to the answer cases contained in the base. The most important questions are put in first.

In our system, cases are stored in a case memory organized hierarchically in order to speed the extraction process.

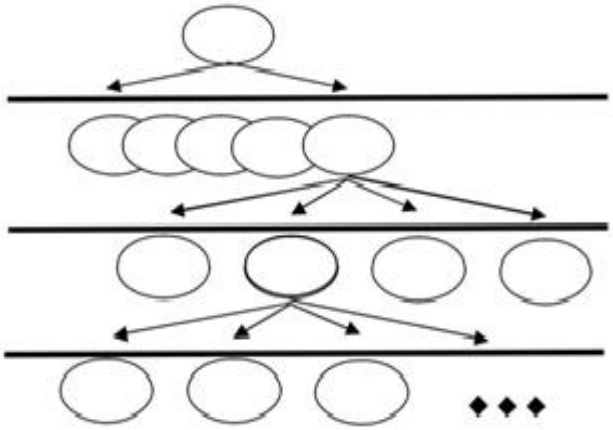

Figure 5. Memory organization.

At each level of the hierarchy, a question allows the discrimination between cases. The root represents the whole base. The leaf nodes represent a subset of the base which is not further partitioned. Each inner node subdivides the base according to the answer asked at this level.

Case descriptors introduced as input, are used for the traversal of the tree. We have three levels. The most important questions are asked first. Thus, descriptors are ordered as following:

<action, benefit, transaction type>

Similar cases are stored in the same leaf node.

4.3 Similarity measure based on the application ontology

For measuring the similarity between classes and objects we propose the use of "IslamicFatwa Application Ontology (IFAO)" built in section 3.2, which provide as common vocabulary of the domain knowledge of Islamic finance and banking. This similarity measures are based on semantics (see table 1).

Table 1: Similarity measure based on application ontology

Rules	***Description***	***Similarity***
Rule 1	D equivalent to D'	Sim(D,D')=1
Rule 2	D instance of D'	Sim(D,D')=1
Rule 3	D same as D'	Sim(D,D')=1
Rule 4	Otherwise	Sim(D,D')=0

4.3.1 Reasoning modules

Reasoning modules consist of: indexing module, extraction module, adaptation, validation, and storage modules.

The indexing module consists in determining what in a case will be subsequently reusable. It consists of the selection of a number of descriptors that become indexes of the case. Indexes must permit to differentiate cases at the time of the phase of research. The indexing requires a good understanding of the domain and the task therefore to achieve (Nouaouria, Atil, Laskri, Bouyaya &Amari, 2006).The indexing occurs at three levels (Kolodner, 1991):

- ✓ in the initial construction of the base of cases,
- ✓ in the storage of a new case,
- ✓ when assessing the situation for the resolution of a new problem.

The indexing process is seen to be a characterization process (Smail, 1994). The work of indexing module consists of computing indices from the input. In our case, the system uses information about Shariaa compliance for Islamic banking transactions to deduce the category which is the first index accordingly to heuristics of the domain. The result will be the path to follow in the hierarchical memory to reach cases which are close to the input.

Indexing in our system consists of determining the indexing chain:

<Action, benefit, transaction type>

This is supported by the structure of interface proposed.

The problem of research is to find one or several similar cases to the problem to solve. For measuring the similarity we use the application ontology 'IFAO' built in (section 3.2).

By the use of similarity based ontology, the correspondence between new case and the old case stored in case base memory will be made by the meaning associated to the terms of indexing chain, table 2 compare between the both kind of measurement syntactic and semantic semilarity.

Table 2: Description of syntactic and semantic measurement

Measurement type	***Description***
Syntactic Measurement	*if∃ index=<action, benefit, transaction>* *then < Solution>* *else <Fail>;*
Semantic Measurement	*if∃ index=<Action', benefit', transaction'> And* { *Sim(Action, Action')=1*; *Sim(benefit, benefit')=1*; *Sim(transaction,transaction')=1* } *then< Solution>* *else <fail>;*

The extraction module will use the indexes computed before to retrieve the closest case to the input. The answer for the retrieved case (solution) could be adapted by the expert Mufti. The validation step is manually handled by an expert in 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 Mufti through a specific interface. This allows the memory to be richer and thus more efficient during further sessions.

5. Conclusion

This paper presented an ontology based semantic similarity for a case based reasoning system to assist Mufti in the process of retrieving and generating fatawa in Islamic banking transactions. The system contains a case base memory for prior fatawa. Every single case stored in the memory consists of two parts: description of the problem, and the solution to that problem. The key element of the proposed approach is the use of "Islamic Finance Application Ontology" that provide a domain vocabulary and then permits the determination of degree of likeness between two classes or objects. This ontology was built using Neon Methodology. This research may investigate more Arabic natural language processing techniques in order to analyze the system more precisely and more efficiency.

Assistance in Fatawa generation is a domain attracting more and more interest. Indeed, the following studies targeted this domain: in (Elhalwany, Mohammed, Wassif, &Hefny, 2015), authors proposed the intelligent Fatawa questions answering system. The system used a Textual Case Based Reasoning System. IIFRS: intelligent Islamic Fatawa retrieval system proposed by (Harb & Sharaf, 2016), depends on ontology to classify Islamic Fiqh Fatawa according to a predefined hierarchy. Actually, both systems were oriented retrieval component, which is not the case in our system where all steps of CBR inference are considered.

References

Aamodt, A., &Plaza, E. (1994). *Case-Based Reasoning: Foundational Issues, Methodological Variations, and System Approaches*. Retrieved from http://content.iospress.com/articles/ai-communications/aic7-1-04

Alsayyed, N., (2009). "Shari'ahBoard, The Task of Fatwa, and Ijtihad in Islamic Economics, and Finance", Malaysia, URL: http://mpra.ub.uni-muenchen.de/id/eprint/20204. (Last Accessed on: October 2, 2017).

Amari, H., Atil, F., Bounour, N., &Nouaouria, N. (2015). intelligent tool for mufti assistance 2015.pdf. *International Journal on Islamic Applications in Computer Science And Technology*, *3*(2), 1–9.

Bartsch-Spörl, B., Lenz, M., &Hübner, A. (1999). Case-Based Reasoning – Survey and Future Directions. In *XPS-99: Knowledge-Based Systems. Survey and Future Directions* (pp. 67–89). Springer, Berlin, Heidelberg. https://doi.org/10.1007/10703016_4

BorstW.N.(1997). Construction of Engineering Ontologies. PhD thesis, Institute for Telematica and Information Technology, University of Twente, Enschede, The Netherlands.

Elfaci A. (1993), Makasidou al Shariaa el IslamiyawaMakarimouha. Editions Dar Al Gharb El Islami.

Elhalwany, I., Mohammed, A., Wassif, K., & Hefny, H. (2015, September). using textual case based reasoning in intelligent fatawa QA system.pdf. The International Arab Journal of Information Technology, Vol. 12, No. 5.

Gaševic, D., Djuric, D., & Devedžic, V. (2009). *Model Driven Engineering and Ontology Development*. Springer Science & Business Media.

Ghazali A. and El Shafi M., (2000) , El Moustasfa fi Ilm el Oussoul. Editions Dar El Koutoub El Ilmia.

Gomez-Perez, A. (1996): Towards a method to conceptualize domain ontologies. In: Workshop on Ontological Engineering, ECAI '96, pp. 41--52, Budapest, Hungary

Gruber T. R. (1993). A Translation Approach to Portable Ontology Specifications. Knowledge System Laboratory, Technical report KSL 92-71. Appear in Knowledge Acquisition, 199-220.

Harb, H. M., & Sharaf, E. (2016). IIFRS intellgent islamic fatawa retrieval system.pdf. *Journal of Education and Social Sciences*, *Vol. 4*.

IbnAbdEssalem A., (1992). Kawaid el Ahkem Fi massalih el anam. Damascus: Editions Dar Etibaa.

Karadaoui, Y.(1977). El Hallalou al Haram fi El Islam. Cairo: Editions MaktabateWahba.

Kkalifa & Hassanain, (2016), Islamic Finance and Banking Chapters 1-4. pdf: https://courses.edx.org/assetv1:IRTIx+IFB1x+1T2016+type@asset+block/Islamic_Finance_and_Banking_Chapters_1-4.pdf (consulted on 22 september 2017) .

Kolodner J., (1991), "Improving Human Decision Through Case-Based Decision Aiding", AI Magazine, pp. 52-681.

Kolodner J., (1993), Case Based Reasoning. Paris: Editions Morgan Kaufman.

Leake, D. B. (2003). *Case-based reasoning*. John Wiley and Sons Ltd. Retrieved from http://dl.acm.org/citation.cfm?id=1074199

Lin D. (1998), An information-theoretic definition of similarity, Proc. 15th Int. Conf. on Machine Learning, Madison, Wisconsin.

Nouaouria N., Atil F., Laskri MT., Bouyaya D., Amari AH., (2006). "A case based tool as intelligent assistant to Muft",Arabian journal for science and engineering.

Pinto, S., Staab, S. & Tempich, C. (2004): Diligent Towards a fine-grained methodology for distributed, loosely-controlled and evolving engineering of ontologies. In: Proceedings

of ECAI, the 16th European Conference on Artificial Intelligence, pp. 393--397, Valencia, Spain

Riesbeck, C. K., & Schank, R. C. (2013). *Inside Case-Based Reasoning*. Psychology Press.

Rissland, E. L., & Skalak, D. B. (1989). Case-based reasoning in a rule-governed domain. In *[1989] Proceedings. The Fifth Conference on Artificial Intelligence Applications* (pp. 45–53). https://doi.org/10.1109/CAIA.1989.49136

Smail M., (1994). Raisonnement à base de cas pour une recherche évolutive d'information; Prototype Cabri-n. Vers la définition d'un cadre d'acquisition de connaissances, Thèse de Doctorat d'Université. Univ. Henri Pointcaré - Nancy I.

Studer R., Benjamins V.R., and Fensel D.(1998). Knowledge engineering: Principles and methods. Data & Knowledge Engineering, 25(1–2):161–198.

Suárez-Figueroa, M.C, Gomez-Perez A.(2009) &Villazon-Terrazas, B.: How to write and use the Ontology Requirements Specification Document. In: Proceedings of International Conference on Ontologies, Data Bases, and Applications of Semantics ODBASE, Algarve, Portugal pp. 966--982.

Sure, Y. &Studer, R. (2002): On-To-Knowledge methodology. In : Davies, J. et al. (eds.) On-To-Knowledge: Semantic Web enabled Knowledge Management. J. Wiley and Sons, Norwich, UK

Watson I. (1997), Applying Case-Based Reasoning: Techniques for Enterprise Systems. San Mateo: Editions Morgan Kaufman.

Zaher, T. S., &Kabir Hassan, M. (2001). A Comparative Literature Survey of Islamic Finance and Banking. *Financial Markets, Institutions & Instruments*, *10*(4), 155–199. https://doi.org/10.1111/1468-0416.00044.

Zaidan, A., Oussoul Eddaaoua. Beirut: Editions El Rissala, 1997.