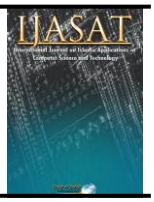

Ontology Based Knowledge Representation For Prayer Complications

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Abstract

Prayer (صلاة) is the most important worship and among the five pillars of Islam. The lack of knowledge to offer the Prayer may require to offering it again. Thus, it is necessary for every Muslim to understand the Complications of Prayer carefully to get full benefit of this worship. In the last decade Semantic Web Technologies are getting much popularity in the development of knowledge base system. The ontology is the essential component of Semantic Web Technologies where knowledge can be defined in a standard way that make it interoperable and machine understandable. There is none of the research try to construct ontology for Prayer Complications. Therefore, this research proposed an ontology based knowledge representation for Prayer Complications using ontology constructs such as concepts, properties, constraints, rules (SWRL). This ontology will answer the user's complex queries according to Prayer Complications using SPARQL query language and enable the access of knowledge to everyone at any time. In this research, as a first step, the ontology is developed according to Hanafi School, however the conceptualization in ontology is general enough to modify it according to other schools of Fiqh. Finally, the application has been developed to understand the benefits of the proposed research.

Keywords: Prayer, Semantic Web, Ontology, Complex queries, Reasoning

1. Introduction

Prayer is one obligation among the five pillars of Islam. The importance of this worship is that Muslims have to offer it five times a day in every condition, except any genuine reason (EXCUSE) even if they are fighting with enemies. The Prayer is mentioned in Holy Quran about 100 times. The following hadith shows its importance:

Prophet Muhammad (P.B.U.H) said "Allah has made obligatory (Faraz) Prayer on my Ummat (Nation) before all other things and Allah will inquire for Prayer at first."[1].

Also "The first question that will be asked from man is about Prayer if Prayer will be found worthy then the man will be declared as prosperous." [1].

In this paper, Prayer knowledge system is proposed using OWL as the Semantic Web technologies (RDS, OWL) enable machine to interoperate Knowledge and answer user according to related query with less human effort. Ontologies (RDFS, OWL) are considered as pillar of Semantic Web Technology. According to Tom Gruber," an ontology is a formal specification of a shared conceptualization" [2]. Ontologies are used to structure the information that can be understandable by the machine.

In this research we build an Ontology based knowledge system that focuses on Prayer Complications domain for the first time. The rest of paper describes related work in section 2 and Prayer Complications in Section 3. The System architecture, the Ontology model for Prayer is described in Section 4. Few examples of the Proposed Model are given in Section 5. Finally, the Conclusions and future research direction are described in Section 6 and 7 respectively.

2. Related Work

In the last two decades, with the popularity of World Wide Web (WWW) information over the web is continuously increasing. There are several of data available online. Wikipedia, books, online stores are few examples, however kinds information searching/extraction is still a big challenge. With the advent of semantic web technologies such as RDFS, OWL information is represented in a structured form that makes information sharing and access much convenient[2][3].

Now a days more and more information become available online that includes Islamic knowledge as well. There are several online websites where information is available on different topics of Islam such as translation of Quran and Hadith, information on Fiqahi-Complications, etc. In contrast, there is no website that provides querying facility where system will answer according to user query. On the other hand, the available Islamic information has been used for knowledge extraction using machine learning, NLP (Natural Language Processing) and Rule based techniques [4][5][6][7][8].

3. Prayer Complications

Since Prayer is most important worship for Muslims, therefore, authenticity is very important that Prayer is being performed correctly or not. For this purpose in this paper, the Complications description of Mejisty Imam Abu Hanifa is used.

According to Hanafi Complications each Prayer contains its own Faraiz, Wajibat and Sunnah and these three with ablution and bath whereas ablution (وضوء) and bath (غسل) have their own Faraiz. The Faraiz of Prayer are declared very compulsory and failure to perform any Faraz intentionally or even unintentionally would require repeating the Prayer. The Wajibat, however, is not restricted as Faraiz; Failure to perform Wajib unintentionally would require Sajdah-e-Sahav for completion of Prayer. However, if Wajib is left intentionally or Sajdah-e-Sahv is not done in case of missing Wajib unintentionally, the Prayer should be repeated. The Faraiz and Wajibat are compulsion for Prayer, however, Sunnah are the actions performed by Prophet Muhammad (P.B.U.H) and these are negotiable, but the more Sunnah attempted during Prayer, the more it will be beneficial and will be acceptable for Allah. [9]

Before each Prayer, the ablution should be done, however, with dirty body the ablution is ineffective so for clearance one should do bath. Both bath and ablution have their own Faraiz. The completeness of Prayer is shown in Figure 1.

In fact for Body cleaning the bath is required and no ablution is required for completion of bath. Similarly for Prayer, the ablution is required and no Prayer is required for ablution. Therefore the restriction of ablution and bath is represented by Asymmetric property in Figure 1.

Since Islam is the religion of humanity, therefore, due to any emergency any of affiliate is forgiven depending upon the condition of problem that is known as Excuse.

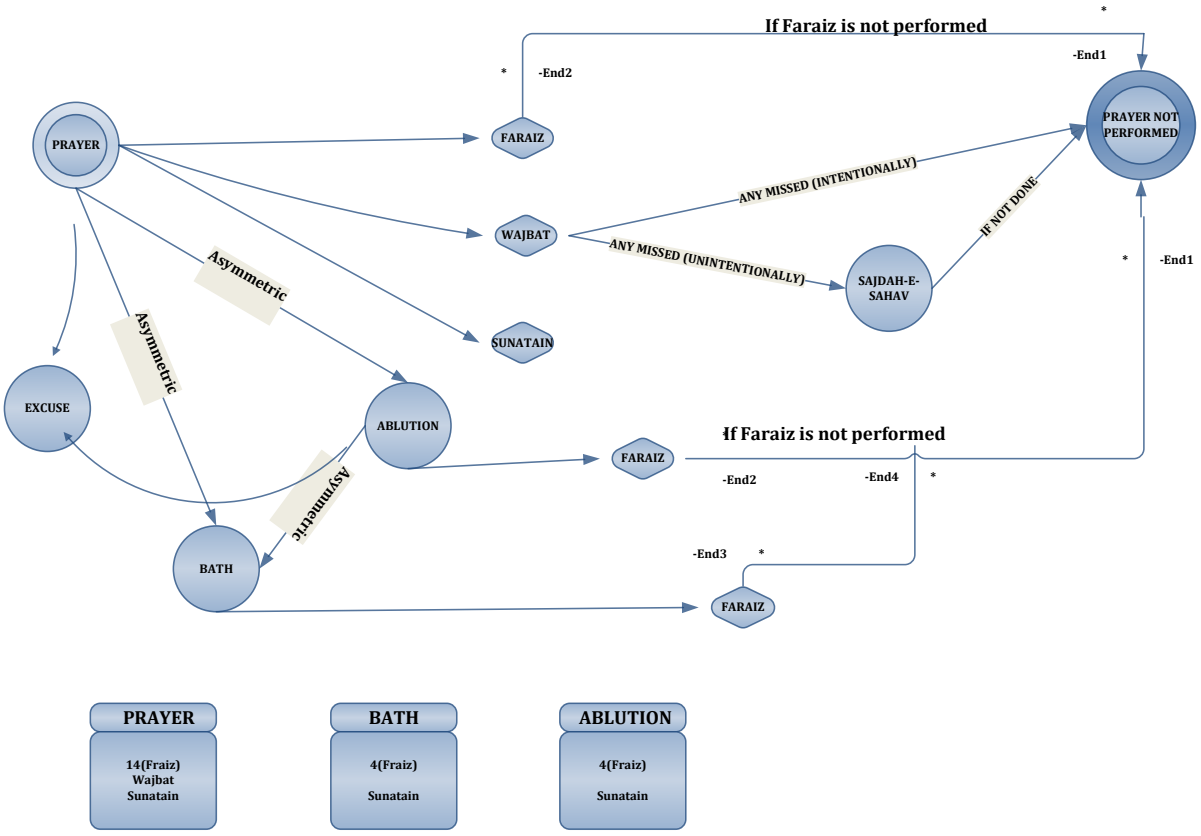

Figure 1: Process for Prayer Complications

4. Ontology Based Knowledge Representation for Prayer Complications

This section explains the presented approach to identify when Prayer is being done correctly and when it has to be repeated. The ontology is utilized to represent Prayer Complications and restrictions are applied to infer knowledge. The essential component of presented approach is shown in Figure 2. The user ask query to the system and interact with ontology to respond to the user query using ontology Jena API.

In this paper few Prayer Complications are considered for initial phase of this research. The Simple Schema is made using Concepts and Roles for following Complications:

- Clearance of body, place and clothes
- Cover the Satar (body area) with clothes
- Time of Prayer
- Prayer Steps.

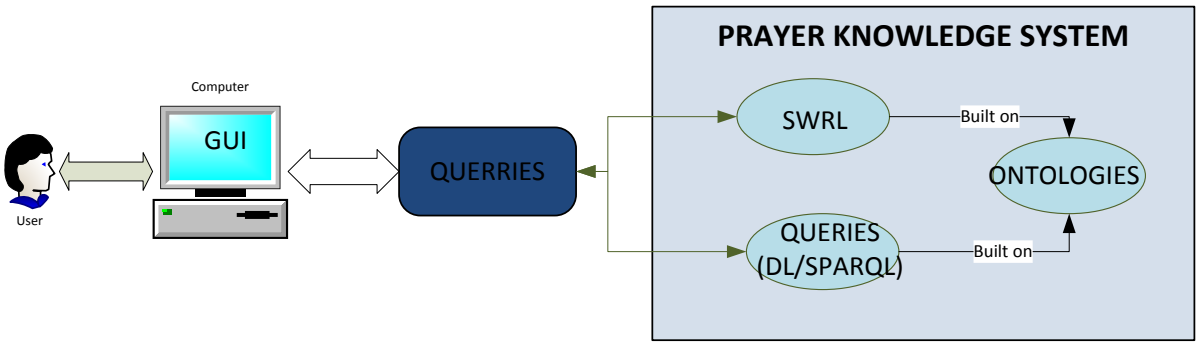

Figure 2. Prayer Knowledge System.

The four of Prayer Faraiz i.e. Clearance of body, place and clothes, and Satar (body area) with clothes are considered and they are represented in single Schema in Fig 3. The Complications about the foresaid Prayer Faraiz are that; The body, clothes and place are unclean (نجس) when some minimum value of filths fall/attach on it, else it is clean. Since Prayer has to be performed in a specific range of area, therefore place has only range in which one can perform Sajda and can do Qiyam. The Satar is minimum part of men and women that must be covered with some clothes. However the range of Satar body area for men and women are different.

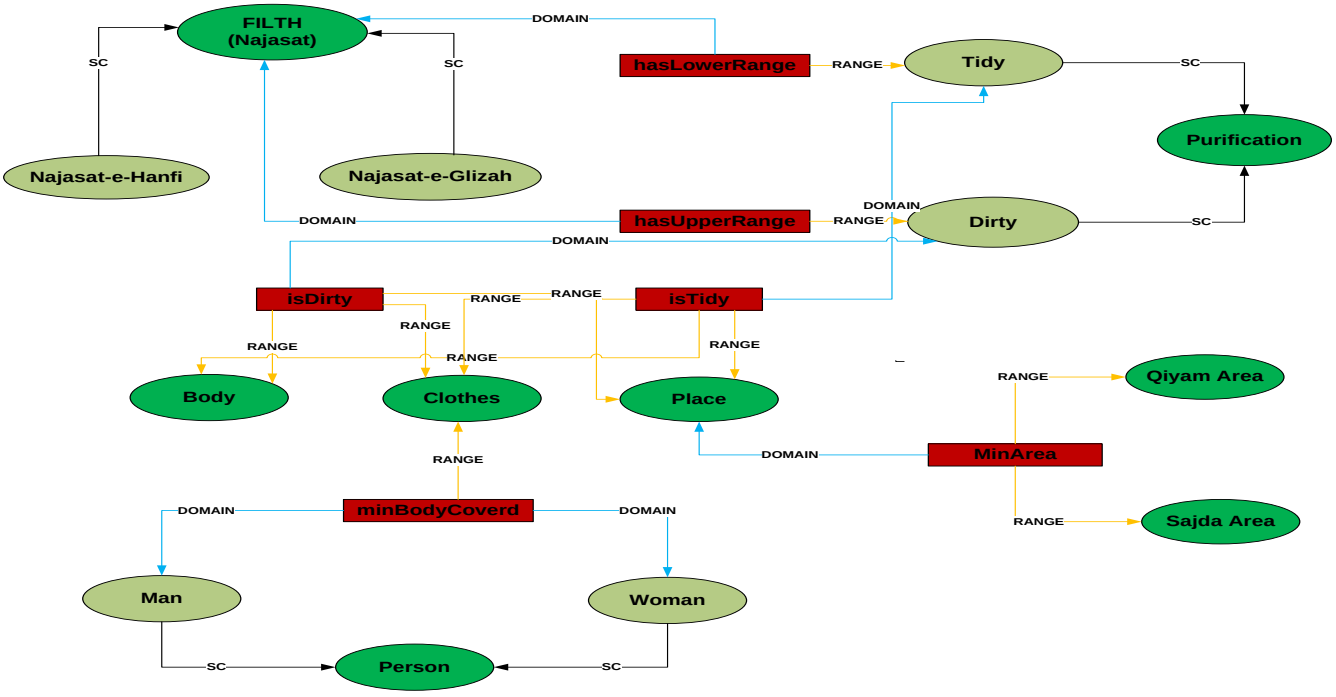

Figure 3: Schema Description of Cleanness on Body, Clothes, Place is affected and man woman Satar of Body Area RDFS

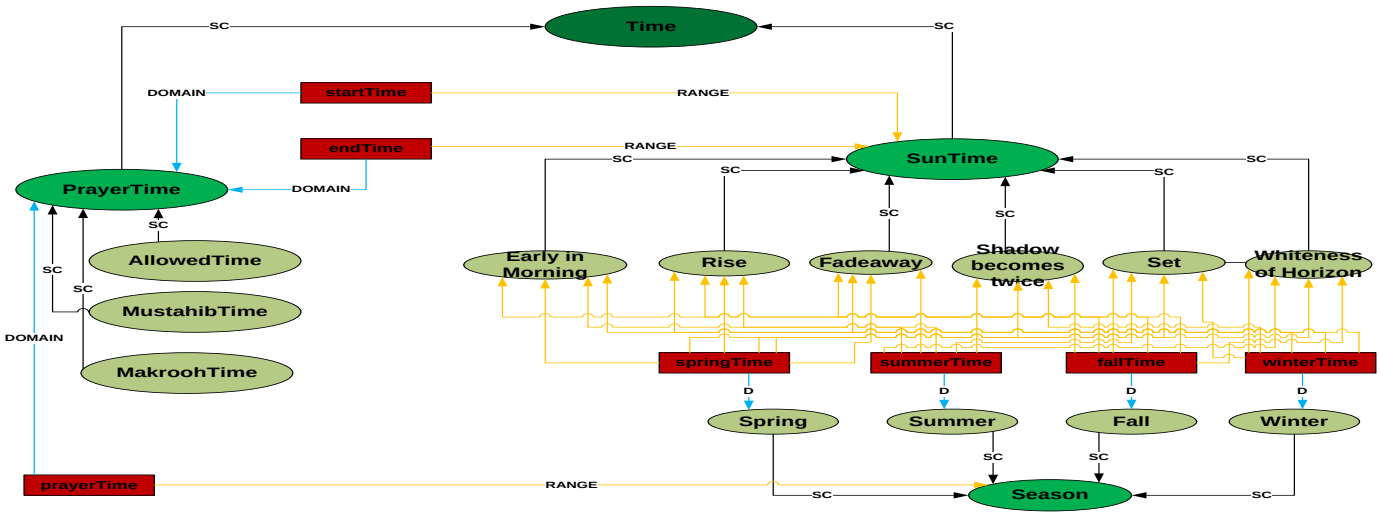

Figure 4: RDFS for Prayer timing w.r.t. to Sun timing in each Season

Figure 4 considers the schema of Time related Complications. Each Prayer has a time slot. That time slot is determined by movement of Sun. Since the duration of Sun varies in every season, so in the described schema the season class makes sure about the time difference in each season. The Schema describes the Prayer has Allowed Time, Mustahib Time and Makrooh Time that has starting and ending time in every season.

While performing Prayer, there are eight Faraiz. Here only Jalsa is considered for Schema as shown in Figure 5. The Jalsa Faraz is to sit between two Sajda.[9] and how much time one should sit and how to sit that is Sunnah. The Schema covers these in jalsaFaraz, jalsaWajib and jalsaSunnah property.

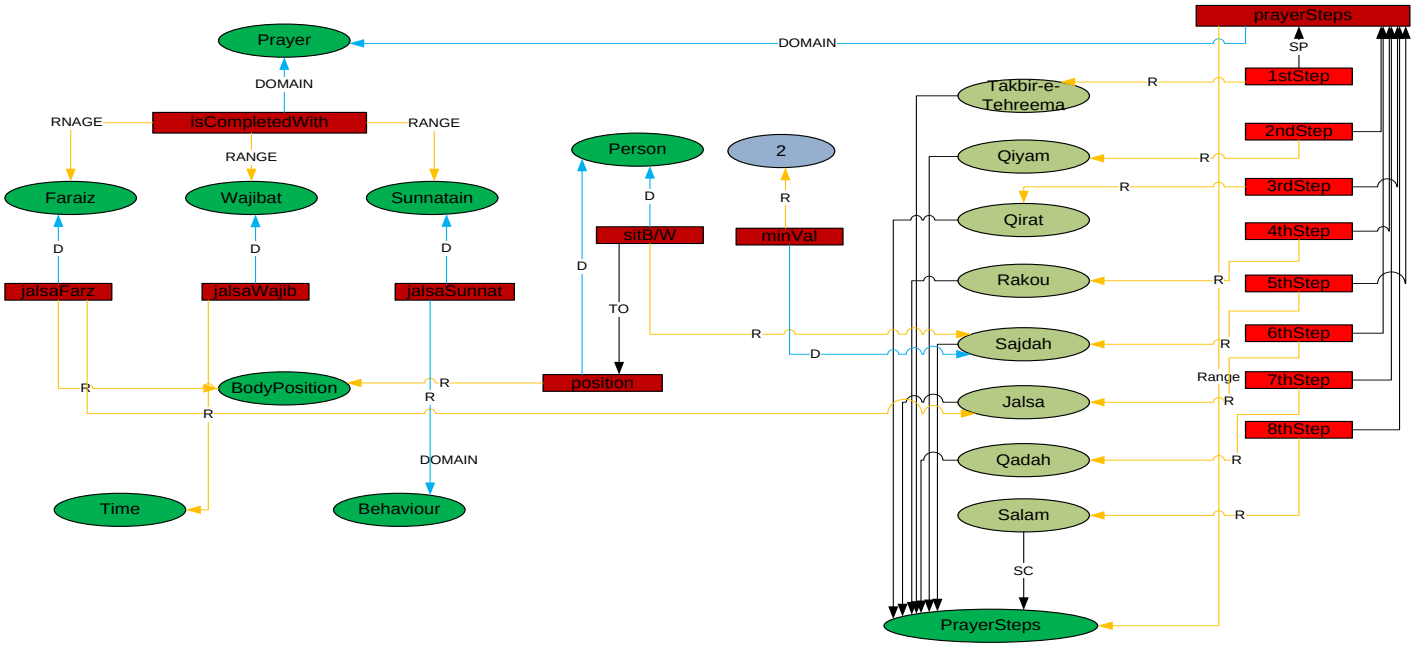

Figure 5: Schema for Prayer Steps and Jalsa

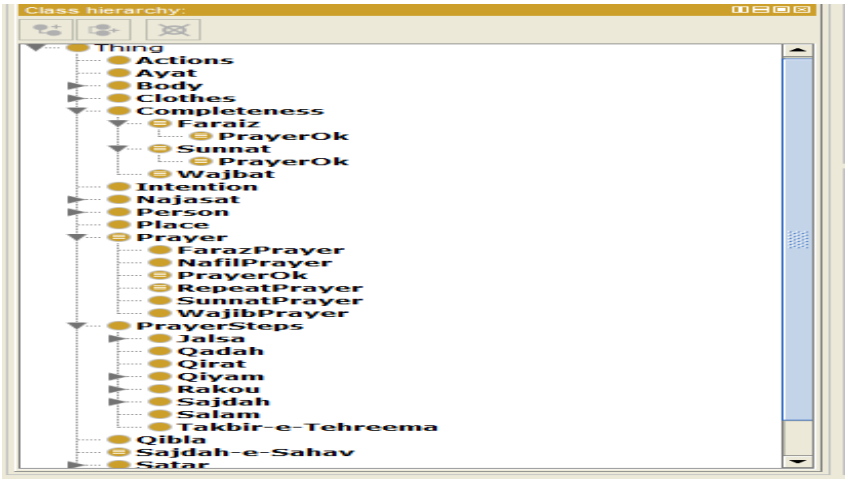

Figure 6: The ontology class hierarchy

The above description is the schema to represent the Prayer Complications in ontology. Since in this research we are interested in complex queries, for that ontology is made in protégé1. Figure 6 shows the class hierarchy of build ontology.

4.1. Constraints

The necessary Conditions for Faraiz, Sunnah and Wajibat classes are built in Protégé using Manchester Owl as shown in Table 1.

Table 1: Constraints on Prayer Ontology

Faraiz Constraints	Sunnat Constraints
Equivalent To Rakou and (RakouFaraz value RakouFaraz) Jalsa and (JalsaFaraz value HandsinJalsa) and (JalsaFaraz value ManJalsa) and (JalsaFaraz value WomanJalsa) Sajdah and (SajadFarz value 2)	Equivalent To Sajdah and (SajadSunnat value SajdaSunnat) Rakou and ((RakouSunnat value RakouMan) or (RakouSunnat value RakouWoman)) Jalsa and (JalsaSunnat value SunnatJalsa)

Wajibat Constraints
Equivalent To Jalsa and (JalsaWajib value JalsaMinTime) Qiyam and (QiyamWajib value QiyamWajibTime) Sajdah and (SajadFarz value Consctively)

4.2. Reasoning

For consistency of the Ontology Model, the reasoner is run and the model is checked with described Complications. As it has been described in section III; that if any wajib is missed unintentionally then Sadah-e-Sahav must be done for the correctness of Prayer. So ontology

[1] http://protege.stanford.edu/

is made by considering this Complications and when the reasoner is run then it is observed that reasoner inferred that the Prayer is OK with Faraiz and Sunnah, hence Wajib is also compulsory. Because if wajib is missed then sajad-e-sahve determines whether the Prayer (Prayer) is correct or not, therefore Wajib is not inferred in PrayerOk class hierarchy.

Whereas the whole Prayer Steps are inferred by using reasoner. Faraiz inference i.e. the Names of all Fariaz are inferred and Similarly, Sun Timing i.e. the starting and ending timing of particular Prayer in Particular season is also inferred

5. Query examples

The Ontology model is checked by applying some example query.

5.1. SPARQL

In querying, SPARQL is considered for querying on Ontology Model. Different queries are tested on the build Prayer Complications Ontologies for Extraction of information purpose. Few examples with their results are given below.

Example 1:
The user wants to know about how and in which sequence, there are Prayer Steps

```
SELECT * WHERE {
?Prayer ont:has1stStep ?PrayerStep1.
?Prayer ont:has2ndStep ?PrayerStep2.
?Prayer ont:has3rdStep ?PrayerStep3. }
```

The above query gives result Takbir-e-Tehreema; Qiyam; Qirat.

Example 2:
The query to find Prayer according to rakat

```
SELECT *
WHERE { ?FarazPrayer ont:faraz_rakat "4"^^xsd:integer .
?NafilPrayer ont:nafil_rakat "2"^^xsd:integer .
?WajibPrayer ont:vitar_rakat "3"^^xsd:integer .}
```

The answer obtained from Query is Isha Prayer.

Example 3:
If a user ask about how many rakat of a particular Prayer let say ISHA, then

```
SELECT *
WHERE { ont:Isha ont:sunnat_rakat ?sunnat_rakat;
ont:faraz_rakat ?faraz_rakat;
ont:nafil_rakat ?nakil_rakat;
ont:sunnat_e_moqda_rakat ?sunnat_e_moqda_rakat.
}
```

The result obtained from above query is 4,4, 2,2

Example 4:
Count the total Prayer in a day.

```
SELECT (Count(?FarazPrayer) AS ?TotalPrayerFarazInaDay)
 WHERE {
?FarazPrayer rdf:type ont:FarazPrayer.
}
```

This query give result 5

Example 5:
Query to find the names of Prayers that are either Faraz/ Sunnah/ Nafil

```
SELECT * WHERE {
?FarazPrayer rdf:type ont:FarazPrayer.
?NafilPrayer rdf:type ont:NafilPrayer.
?WajibPrayer rdf:type ont:WajibPrayer.
}
```

Fajir, Zuhir, Asar, Magrin and Isha are obtained for Faraz Prayer, while Awaabeen, Chaasht, Ishrak, SalatulTasbeeh are Nafil Prayers and Vitar is for Wajib Prayer as result.

5.2. SWRL

To answer complex query, some rules are defined using SWRL (Semantic Web Rule Language) and ran that to give result, in form of individuals, the Prayer is OK, or repeat it or do Sajad-e-Sahav.

Rakou(?x), RakouSunnat(?x, RakouSunnatMissed) ->PrayerOk(?x)
Jalsa(?x), jalsaWajib(?x, 3) -> Sajad_e_Sahv(?x)
Sajdah(?x), SajdaFaraz(?x, 3) -> RepeatPrayer(?x)
Sajad_e_Sahv(?x), Wajib(?x) -> RepeatPrayer(?x)
Rakou(?x), rakou(?x, "Bends such that hands should reach to Knees"^^string) -> PrayerOk(?x)`

6. Conclusions and Future Work

This presents ontology based knowledge representation system for Prayer Complications. Several constructs of ontology utilized in the development of ontology such as Concepts, properties, restriction, rules etc. and with reasoner different queries results can be observed and using SPARQL different types of questions are answered related to Prayer Complications and user can identify when the Prayer is correct with the help of defined SWRL.

At starting level of this research, only few Complications are considered to be represented in ontology. More Complications will be considered for future research. NLP techniques will be used in such a way that any user can write query in his own language instead of SPARQL or SWRL.

7. References

Kandhlawi, Muhammad Zakariya, Fazail-e-Amal (فضائلِ اعمال).

P. Hitzler, K. Markus, and R. Sebastian, Foundations Semantic Web Technologies. Chapman & Hall/CRC, 2009.

G. Cheng, Q. Du, and H. Ma, The design and implementation of ontology and rules based knowledge base for transportation, International Conference on Computer Science and Software Engineering, 2008, vol. 3, pp. 1035–1038.

S. Marwaha, Ontology based Expert System, e-book on Development of Expert System in Agriculture, Indian Agricultural Statistics Research Institute (ICAR), 2012. http://www.iasri.res.in/ebook/expertsystem_o/Home.htm

K. Jbara, "Knowledge Discovery in Al-Hadith Using Text Classification Algorithm," J. Am. Sci., vol. 6, 2010.

D. Bacciu, A. Bellandi, B. Furletti, V. Grossi, and A. Romei, "DisSatar Strategic Behaviors in Multi-Agent Scenarios by Ontology-Driven Mining," in Advances in Robotics, Automation and Control, J. Aramburo and A. Ramirez, Eds. InTech, 2008.

Qurat ul Ain, Amna Basharat, "Ontology driven Information Extraction from the Holy Quran related Documents", 26th IEEEP Students Seminar, Pakistan Navy Engineering College, National University of Sciences & Technology, Pakistan, 2011.

Mohamed Ahmed Sherif a and Axel-Cyrille Ngonga Ngomo , "Semantic Quran: A Multilingual Resource for Natural-Language Processing", Semantic Web – Interoperability, Usability, Applicability an IOS Press Journal, submitted 2012.

Mufti Muhammad Inam-ul-haq Qasmi,, "Namaz kay Complications ka Encyclopedia" in Urdu.

SPARQL: "W3C Semantic Web Activity News - SPARQL is a Recommendation". W3.org. 2008-01-15.

SWRL: A Semantic Web Rule Language Combining OWL and RuleML, W3C Member Submission 21 May 2004

Biodata

Hamza Zafar had graduated in Maritime Studies, but ever since he got introduced to the exciting world of artificial intelligence, He exactly knew what his passion was. He took a somersault towards computer science and finished his Master's degree with a Gold Medal from the Faculty of Computer Science, IBA. It was an intellectually stimulating experience for him. Further, he completed specializations from Coursera such as Data Science, Machine Learning, Business Analytics, Leading with sense, and Deep Learning and became a Course Mentor for Convolutional Neural-Network. His research interest includes artificial general intelligence, data science, machine learning, predictive modeling, ontology, and expert systems.

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