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Semantic web requirement engineering boundaries

[1] Muhammad Waseem Chughtai, [2] Farhan Elahi, [3] Nicholas Akosu
[1]Faculty of Computing, University Teknologi Malaysia, 81310, Johor Bahru, Malaysia
[2]Faculty of Information and Communication Technology, BUITEMS, Quetta, Pakistan
[3]School of Information Technology, Federal Polytechnic, Nasarawa, Nigeria.
Email: [1]mr.chughtai88@gmail.com

ABSTRACT

Semantic Web is an updated version of existing active web-servers. In recent years, semantic web has become a famous data representation significance due to its remarkable representation and hierarchical exchange of information specialties. From a research perception on web 3.0, the semantic web itself is not enough to identify and organize the functional requirements of hierarchical synchronized knowledge processes (documenting, formulating and maintaining) in appropriate manner. It may need a consistent knowledgeable specification mechanism for visualizing the hierarchical data synchronization in a meaningful and valuable way. Due to such complexity, researchers of W3C inter-operate ontological engineering with semantic web to perk up its hierarchical synchronized knowledge processes and tackle the functional requirement engineering prospectively. The objective of this research paper is to tackle the core information about web engineering, semantic web, and ontology. We also focus on the importance of semantic web ontologies in the requirement engineering for improving the future descriptive web-based systems requirements.

Keywords: Web engineering; semantic web; ontology; semantic web engineering; requirement engineering;

1. INTRODUCTION

The web was purely design and developed in 1990's for sharing information within global support groups. As we know "web" is hierarchical interrelated content mapping to fulfill the functional/non-functional requirements accordingly. Perhaps "engineering" is a methodical principle(s) to overcome the predicted complexities according to the domain perspectives. Both of terms are widely taken in abundant activities (like conference tracks and workshops). According to recent narratives, web is a resource virtual framework that provides a wide range of synchronized progression to imply the methodical principle(s) according to domain knowledge, known as web engineering (WE).

The term "web engineering" was introduced in a conference by HW Gallersen in the mid of 1996. In this era, lot of issues (quality, usability, maintainability, and reliability) occurs in web-based systems due to focusing the ad hoc way of web-development. Web engineering demonstrates a stable way to overcome such issues conveniently. With the mean of time, the growth of web, the users and their data born new issues and researchers equally worked on to overcoming them. In such consequences and the from a research perception on web3.0, Web engineering emerges with semantic web (SW) and ontologies to become semantic web engineering (SWE) and so on. The detail descriptions on these terms are discussed in next sessions.

This research paper is divided into remaining four major sections. Section 2 is about description of the web engineering. Section 3 describes the semantic web. Section 4 is about semantic web engineering and Section 5 concludes this research paper.

2. WEB ENGINEERING

Web Engineering is an emerging discipline of the terms "web" and "engineering". Particularly, it rivet on methodical models, quantifiable approaches and perspective tools to substantiate all the aspects (designing, development, quality assurance, testing, operation and maintenance) of web-based systems [1]. By the running era of time and the wide range of service requirement enclosed the web services in the circle of web engineering. Table 1 shows the three main parts of web services. Afterwards, the vast features of web engineering are eventually beneficial for web-based systems, their synchronized data transformation services and interconnected applications.

Table. 1 Web services composed in three main parts

Parts	Description

Service Profile	For advertising and discovering services
Process Model	Gives a detailed description of service operation
Grounding	Provides details on how to interoperate with service via messages

In the meantime, most of research communities or web standard organizations i.e. W3C, focused on the requirement analysis of web-based interconnected servers with respect to their synchronized services and applications with the use of requirement engineering. The World Wide Web Consortium (W3C)'s research focus is to develop the technology stack and support the web of data. They identify that the forthcoming growth of web and their applications are also increasing the difficulties in the handling of growing size of data. To handle the growth of data systematically, foremost W3C prescribed the term semantic with web engineering [2].

3. SEMANTIC WEB

Semantic is a term of meanings, described by Quillian, MR in 1967. He evaluates the word concept theory on basics of semantic capabilities. With the passage of time, different researchers made their contributions for the improvement in theory of semantics and their capabilities. In 2001, Tim Berners-Lee, a director of W3C provided an expected evolution of active web to emerge the term semantic with web engineering but in 2006, they said "this simple idea remains largely unrealized" [3]. Semantic web in recent years become very famous due to its hieratical data representation specialties [4]. These hieratical representations are controlled by the synchronized connectivity protocols between entire semantic modeling throughout the web-based networks. These synchronized connectivity protocols are known as semantic web (SW). The term SW is not different from current web, actually is an upgraded version of current active web-servers. It is a mechanism of data representing significations through connectivity, expressing the multiple points of view and use of business causes and rules for making models of decision to share information across applications by hierarchical controlled mapping. Figure 1 demonstrates the hierarchy of multiple point information connectivity on semantic network.

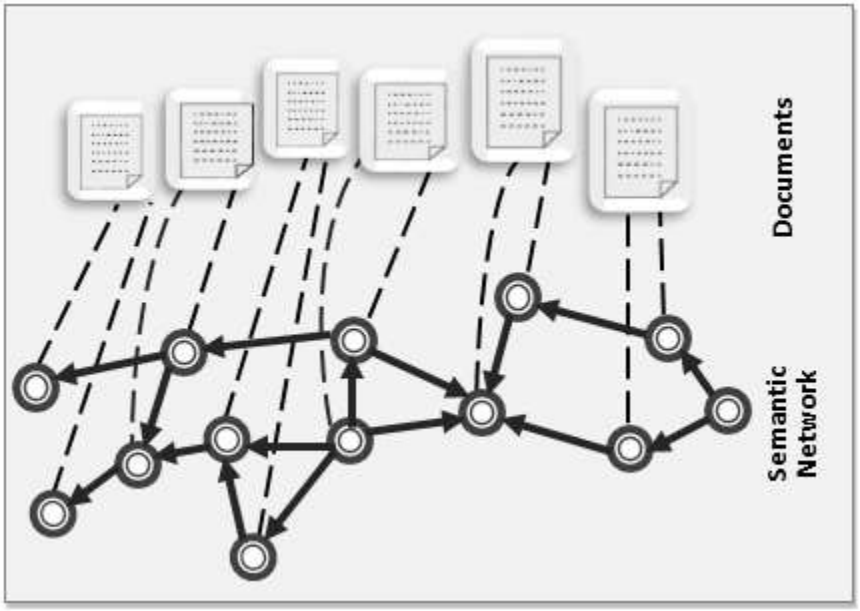

Figure. 1 Multiple point information hierarchical connectivity on semantic network [5]

The goal of Semantic Web is to organize the content of unstructured information significant and imply the requirements by manufacturing the knowledge management modulation [6]. Bundle of researchers globally connected from outside and inside of W3C. This collaborative group of researchers worked on the improvement and betterment of web services with semantic terminologies to identify the functional requirements of web-based system accurately [7]. Such systems work with a hierarchical controlled mapping to serve the correct knowledge to the relative person on the accurate time according to the prescribed requirement semantically.

4. SEMANTIC WEB ENGINEERING

Currently semantic web is solely depending upon a single and main building block Ontology, discussed in the previous section. The word "ontology" comes from Greek ontos for "being" and logos for "word" .The term combines the elements of Philosophy, Linguistics, Logics, and Computer Science domain [8]. Generally, in computer science, the term ontology is known as an "explicit specification of a shared conceptualization". Ontology integrates with the help of semantic web principles. It is an illustration of semantic or meaningful information (sometimes called knowledge-based) in a certain domain. It is categorized in various knowledge-based terms. The researchers used these terms with respect to their relevant domain [9]. Table 2 shows the categorize of ontology knowledge representation.

Table. 2 Categorize of ontology in various knowledge-based terms [9]

Terms	Description
Upper ontology (UO)	Concepts supporting development of an ontology, meta-ontology;
Domain ontology (DO)	Concepts relevant to a particular topic or area of interest, for example, information technology or computer languages, or particular branches of science;
Interface ontology (IO)	Concepts relevant to the juncture of two disciplines;
Process ontology (PO)	Inputs, outputs, constraints, sequencing information, involved in business or engineering processes;

Ontology learning, development and testing are iterative processes to maintain or handle the web-based systems in a semantic way. To understand these processes, first we have to see the ontology languages. The four popular ontology languages are working in the semantic web named as Knowledge Interchange Format (KIF), Standard Ontology Language (OWL), Resource Description Framework (RDF + RDFs) and DARPA Agent Markup Language (DAML) with Ontology Interchange Language (OIL) [10]. Only specific vacant languages are instigating in the ontology development or used in appropriate ways. Figure 2 shows an overview of ontology languages and their features that has-been chosen by most of the researchers.

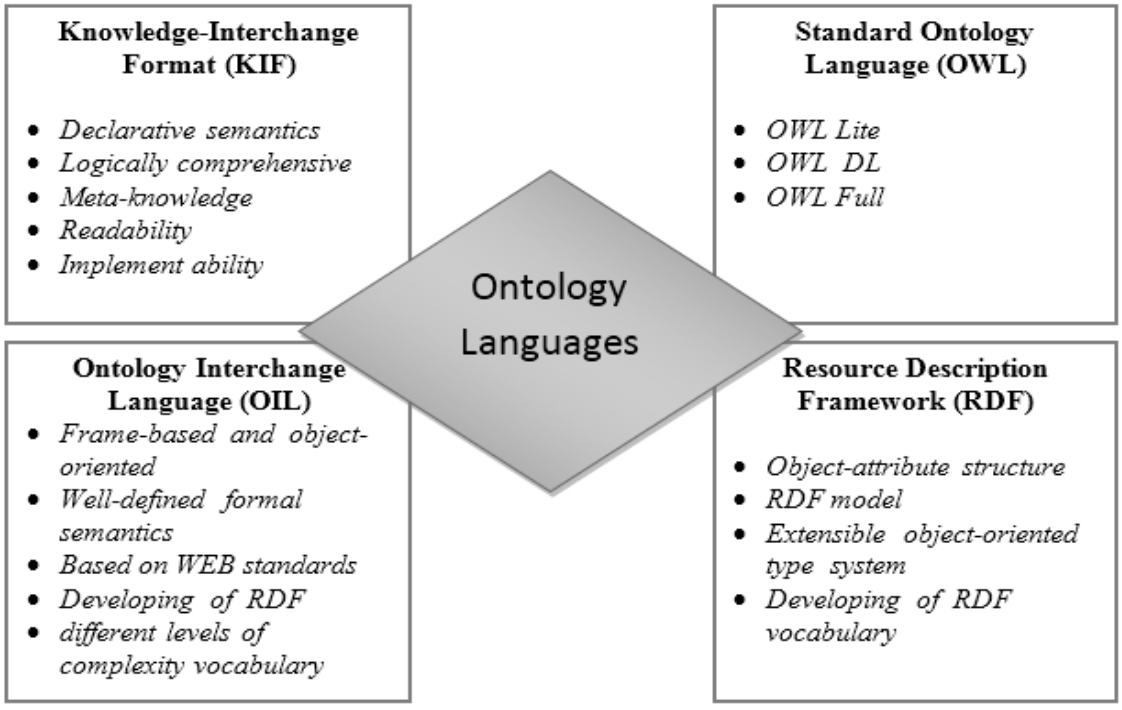

Figure 2: Ontology languages and their features [10]

Now a day, semantic web ontologies are in consideration in the field of requirement engineering. There are several ways to define the requirement engineering ontologies, as these ontologies are classifies according to their role, type, and scope. Generally, semantic web requirement engineering (SWRE) concerns with real-time goals and functions of

a semantic web-based system. It also concerns with system behavior, end-user response, and time tolerance with other system environments [11]. Table 3 shows the classification of the requirement engineering related ontologies.

Table 3: Classification of ontologies according to their role, type and scope in requirement engineering [11]

Ontology Role	Type	Scope
Application Domain Ontology	Domain based	Domain Specific
Application Domain Features Model Ontology	Domain/Product based	Domain Specific
Behavioral Ontology	Product based	Generic
Processes Ontology	Process based	Generic
Quality Ontology	Management and support based	Generic
Technology Ontology	Technology based	Generic

5. CONCLUSION

The growth of web, the users, and their data born new issues and researchers equally worked on to overcoming them. This lack of formation is a leading cause of certain problems based on semantics and the need to adopt an alternative approach that will publish data on the Web, not just in legible format as well as measuring process. Ontology and Semantic Based integration is one of the most difficult tasks in requirement engineering to agree on the ontological commitments that enable knowledge-level communications among the distributed design parties. Another difficulty is the integration of the various available design tools, if the tool data and models encapsulate, rather than using a standardized and unified approach, each tool will be free to use the most appropriate internal representations and models for its intended tasks. This is not a new research topic, but the progress in this area has not been satisfactory. The emergence of semantic web makes it promising. The objective of this chapter is to tackle the core information about web engineering, semantic web, and ontology. We also focused on the importance of semantic web ontologies in the requirement engineering for improving the future descriptive web-based systems requirements. Furthermore, are described the ontologies are the focal influence constituent of Semantic Web systems and it has rapt a vital role in the improved progress of the Semantic Web and the current boundaries.

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AUTHORS PROFILE