Evaluation of an Intelligent Approach for Semantic Web

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ABSTRACT

The semantic web is a vision which captures information from the web and makes it possible to help machines to understand complex human requests. Such intelligence based understanding requires important sources of information to be structured semantically so that the meaningful information can be accessed and provided to the users. The main outcome of the current idea is to derive the development of search engines to provide the users with artificial intelligence experience. The achievement of this idea requires integration of autonomous tools and standards. The technology can be realized to its task potentially by incorporating/deploying intelligent agents in semantic web.

KEYWORDS

Semantic Web, Intelligent Agent, Architecture, Ontology.

1. INTRODUCTION

The term semantic web (SW) implies an intelligent web [18]. Semantic web brings the idea of structuring information available across the web in a meaningful way improving search mechanism and thus resulting user satisfaction. The concept of semantic web was introduced by Tim Berners Lee in 2001. It aims that system should enable machine to understand, process on their meaning based complex human requests. It makes information more abundant and improves search mechanisms to result in user's satisfaction [22].

However, there are many obstructions in implementing semantic web. Such as computer has lot of space but not memory. It is evident that the understanding level of human being and machine is different. Human being can relate incomplete words on the basis of his knowledge and experience but this task is very tough for computer. Computer is a machine and can't be intelligent. This intelligence of returning context based information to users is provided by Intelligent Agents (IA) [18]. The present development of web demands the delegation of intelligence of web to a smaller but more intelligent community of components known as intelligent agents.

The main objective of semantic web is to convey the meaning. In order to complete this objective semantic web must gather certain standards and architecture. Architecture for semantic web will assist in the development of specifications and applications. The all well-known editions of the layered architecture that exit in the literature are presented by Berners-Lee. Berners-Lee proposed four versions of semantic web architecture in 2001 [4], 2003 [5] & 2006 [6] respectively. As shown in figure 1, Gerber et al [1] in 2008 proposed an orthogonal layered architecture called Comprehensive Functional Layered (CFL) architecture for the semantic web.
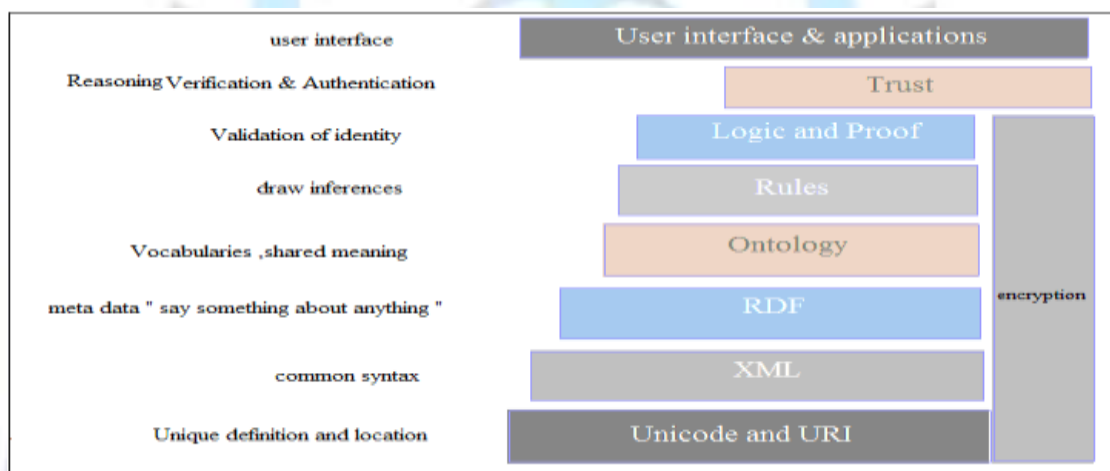

Figure 1: CFL Architecture of Semantic Web

This CFL architecture ove...les a sound base for semantic web development. Implementation of semantic web demands for a tool through which information spread across various sources can be accessed and processed. Table 1 given below provides brief description of the various layers of the semantic web architecture.

Table 1: Description of Layered Architecture

Name of layer	Description
Unicode and Uniform Resource Identifier (URI)	This layer is responsible for the encoding of any symbol of any language or character set and at the same time responsible for uniquely identifying different resource or entities.
Extensible Markup Language (XML)	XML layer along with XML namespace and XML schema definitions make sure that a common syntax be used in the semantic web.
Resource Description Framework (RDF)	Resource Description Framework provides the core data representation format for semantic web.
Ontology	Ontology refers to the vocabulary of a domain. To make computers understand meaning of various terms these must be supported by some files containing description of terms along with their relationship with each other.
Rules	This layer aims to support inference drawing to allow query and filtering.

Logic & Proof	This layer provides facility of writing logic into documents thus providing rules for deduction of one type of document into another type.
Trust	Trust layer ensures that the source of information is genuine

Agent technology is a strong technique for developing semantic web and holds the potential to overcome many other limitations of semantic web.

This paper has been broadly divided into five sections. Section 2 gives a brief overview of Intelligent Agent. Third section presents role of intelligent agent in semantic web, section 4 provides literature review and section five concludes by presenting open research challenges.

 The next section justifies the incorporation of intelligent approach in the existing model of semantic web.

2. INTELLIGENT AGENT APPROACH

Intelligent agent is an autonomous software program that has the ability to done its job on behalf of others. They can perceive the input from the environment and react according to them with the help of their abilities like mobility, learning ability, to be proactive, to be reactive, adaptability and ability to communicate. While learning from their own experience, they should be able to carry out their activities without requiring constant human guidance whenever it is necessary they should, communicate and collaborate with people and other agents by moving from one place to another over a network. Software agent can be classified into two main categories: static and mobile agents. A static agent is autonomous software, that permanently resides on a particular host and other side a mobile agent is a software agent that has the ability to transport itself from one host to another on a network. Autonomy and Mobility are the most important characteristics that should be embedded in a mobile agent.

Literature presented in the upcoming section indicates that agent technology is a strong candidate that holds the potential to overcome many other limitations as explored further. Next section justifies the incorporation of intelligent agent in the existing model of Semantic Web.

3. LITERATURE REVIEW

This section throws light on existing literature on semantic web and current status of deployment of intelligent approach.

Singh et. al [16] proposed a multi- agent based approach in semantic web for efficient communication among agents and reduced communication loads. The MAFSW (Multi Agent Framework for Semantic Web) leads many issues like ontology mapping, trust establishment, security and fault tolerance.

Singh et. al [18] highlighted the obstacle of World Wide Web (WWW) and proposed an Agent Based Semantic Web Mining System (SWMS). The SWMS framework is combination of two techniques, agent technology and web mining. Their work providing agent based approach for mining semantic web contents using clustering and classification techniques. Result of SWMS approach is user will get context based knowledge oriented information and better results.

Gerber et. al in [10] proposed a new layered architecture called Comprehensive Functional Layered architecture (CFL). They evaluates all previous layered architectures of semantic web that proposed by Tim Berners-Lee and highlight, these architectures were not consistent with the principles of layered architecture. The CLF architecture overcomes the drawbacks of previous architectures and provides clarification of the architecture context, development of security stack, abstraction of functionalities.

Berners-Lee et. al in [4] proposed future of World Wide Web (WWW) called semantic web. This visionary article was foundation stone of semantic web. They gave a new direction of WWW. The main objective of semantic web provides web defined and meaningful information to users. Ontology and agent technology play an essential task in semantic web development.

Kravari et.al [12] describes an intelligent agent as software programs intended to perform tasks more efficiently and with less human intervention. Yuxiao et.al [6] describes agents are software programs that does job on behalf of another, an entity or a process. Intelligent agents are widely known and are useful for many applications areas like automation and electronic commerce.

The imminent section presents an insight into the current scenario and discusses the inspiration of deploying Intelligent Agents in Semantic Web.

4. DESIGN OF INTELLIGENT APPROACH IN SEMANTIC WEB

Intelligent agents find their applications in a wide range of discrete optimization problems such as telecommunication network, wireless sensor network, continuous optimization & many more that provides them good solution for semantic web. Intelligent agent is an autonomous software program that has the ability to done its job without any direction. Agent has abilities to perceive the input from the environment, acts on it and produce well output within time. In the advancement of technology, World Wide Web (WWW) is moving from semantic web to knowledge oriented web i.e. Wisdom Web [17]. As per the main concern of semantic web, it demands many autonomous tools and standards in order to provide well defined meaningful information to the users. So the deployment of intelligent agents in semantic web is promising solution. In fact, available literature [19, 4] suggest that agent based solutions are well suited to cope with highly dynamic and large scale nature of these environments.

Turning our attention on the role of intelligent agent in semantic web and it features like autonomy, mobility, proactive and reactive, which help to deploy in semantic web to improve the performance of it. Although there are listless advantages of agents over human users that motivates the use of agents in semantic web but few of them are listed as follows:-

- Automated methods will help to maintenance by checking for inconsistencies and attaining new knowledge.

- An agent is accomplished of managing complex, high-level tasks.

- Agents possess skills for organizing resources and for performing required activities to achieve goals.

- It involves skills for working in a group context (in any role) to ensure effective joint task completion.

- Agents can work on abstract task specification using its prior knowledge of general tasks and can choose either of the method available.

- They have the ability to reach to a judgment or select a course of action.

- Advancement is the proficiency of a system to autonomously adjust its components and links in expectation of changes in its environment.

5. CONCLUSIONS

The work presented in this paper is a vision of semantic web with intelligent agent for improving the performance of web. Intelligent agent plays a key role in implementation exploitation of semantic web. Works of other renowned researchers were carefully studied and it was discovered that there is ample scope of improvement towards the performance of semantic web with intelligent agent.

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