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Improving E-learning System using Ontology Web Language

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***Abstract*— In recent years, most of the conventional education are suitable for requirements of progress in educational development but they don't able to cope up with the changes of learning demand in time, thus computer networks brought an opportunity for it. E-learning is one of the best solutions for it and is used to represent a wide spectrum of application, ranged from virtual class rooms to remote course or distance learning. Web based courses helps the learners by making access to the educational resources very fast, just-in-time and relevance, which is not depending on time and place. Previously semantic web based model for e-learning system uses XML but nowadays it is developed with RDF data model and OWL ontology language. By combining RDF and OWL into e-learning, learning become feasible and this technology can greatly improve the efficiency of learning and achieve a win-win situation between instructor and learners.**

***Keywords*— E-learning, SW-Semantic Web, Ontology , RDF-Resource Description Framework, OWL- Web Ontology Language, , DAML-DARPA Agent Mark-up Language, OIL-Ontology Interface Language**

I. INTRODUCTION

E-learning is an Internet-based learning process, it uses internet technology to design, implement, select, manage, support and extend learning, which will not replace traditional education methods, but will greatly improve the efficiency of the education. E-learning has a lot of advantage like flexibility, diversity, measurement, openness and etc. it will become a primary way for learning in new century.

Artificial Intelligent (AI) along with internet technology is known as semantic web which is the most interesting and evolving technology for e-learning. It is about making the web more understandable by the machines through an appropriate infrastructure for the intelligent agents to move around the web to perform any complex task for their user.

A semantic web is a process of creating the web as machine-understandable and interoperable service that an intelligent agent of AI can be discovered, executed, and composed automatically. Obviously the web was build for human consumption and not for machine consumption, (i.e.) it is machine-readable and not machine –understandable. The semantic web based application enable to interoperate both on semantic level and syntactic level, this will help the semantic web to express information in a precise, machine readable form and help the software agents to process, share and reuse it.

II. SEMANTIC WEB

It is a ―Web-of-data that facilitate the machine to understand the semantics or meaning of information on the World Wide Web. It extends the network of hyperlinked human readable web pages by inserting machine readable metadata and how these data are related to each other. There are four categories of important issues that related to semantic web,

1. SW languages.
2. Ontologies
3. Semantic mark-up of web pages
4. Semantic web services

A. Layers of The Semantic Web

The main goal of semantic web is to express the meaning of the content. In order to achieve the goal several layers are needed indeed. They are represented in Figure 1.

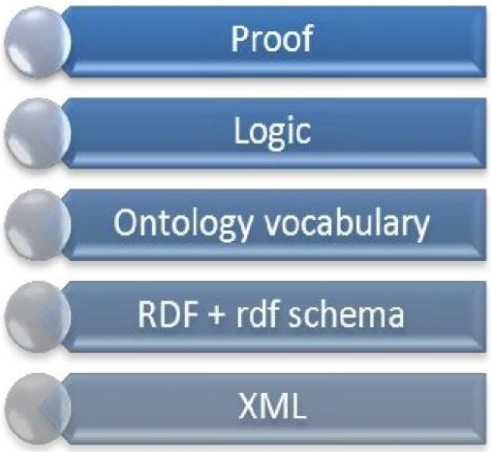

Fig 1 Layers of the Semantic web architecture

The XML layer, which represent the structure of data, the RDF layer, represent the meaning of data, the Ontology layer, represent the formal common agreement about meaning of data, the Logical layer, enables intelligent reasoning with meaningful data

B. Semantic Web Languages

A specific programming language is necessary for representing information on semantic web and also makes that information useful in syntactically and semantically. The languages used in modern semantic web technology are XML (eXtensible Mark-up Language), XML schemas, RDF (Resource Description framework) and RDF schemas. All are developed by w3c by using XML syntax.

An XML document can be viewed as a tree, where leaf corresponds to data values and nodes represents XML elements. It helps user to create its own tags. An XML document consists of three parts; first one is an XML declaration, second is a DTD or XML schema and third is an XML instance (XML document data). The XML declaration specifies the version and the encoding of XML being used, and Document type definition (DTD) helps to structure the content of the documents.

The Resource Description Framework (RDF) is a standard model for interchanging data on the web. RDF has a significant feature that facilitate data merging even if the underlying schemas are differ for adding semantics to a document. It is an infrastructure that enables encoding, exchange and reuse of structured metadata. In general, information is stored in the form of RDF statements, which are easily understandable by search engines, intelligent agents, browsers and human beings to use the semantic information.

C. Ontologies

Information on the web is commonly represented in Natural Languages for human understanding, but not for the computers. It is necessary to represent a language in a form that can be interpreted syntactically and semantically by a computer. Ontology is one of the best key for providing information in a computer-understandable way. It is defined as a formal, explicit representation of the objects and relation and specification of a shared conceptualization. It also defines as the common vocabulary for the researchers to share information in a domain. Ontologies are applied to web for creating the semantic web. It typically consists of definitions which are relevant to the domain, their relations, and axioms about the concepts and relationships.

OWL (web ontology language) is a language that was released by w3c for representing ontology. It is developed from description logic and DAML + OIL and they are developed using integrated, graphical, ontology- authoring tools where DAML and OIL are DARPA Agent Mark-up Language, Ontology Interface Language respectively. DAML+OIL is a successor language to DAML and OIL that combines these features from both. In turn, it was superseded by Web Ontology Language (OWL). The DAML + OIL language has also been developed as an extension of XML and RDF. Ontology as a formal semantic account, see Figure 2, which is analysed the phenomenon of e-Learning and have concluded several semantic that formulate a value layer capable of exploiting knowledge sources semantically. The major problem concerning this interpretation of ontology is the complexity of e-Learning.

DAML stands for DARPA Agent Mark-up Language. OIL stands for Ontology Inference Layer or Ontology Interchange Language. The increasing popularity of OWL might lead to its widest adoption as the standard ontology representation language on the semantic web. The problem of complexity of e-learning gets reduced by DAML.

D. Semantic Mark Up

In order to make the web content to machine understandable, web pages and the documents must contain semantic mark up. For performing this annotation Knowledge Annotator Tool is used which is a standalone tool available in the internet world.

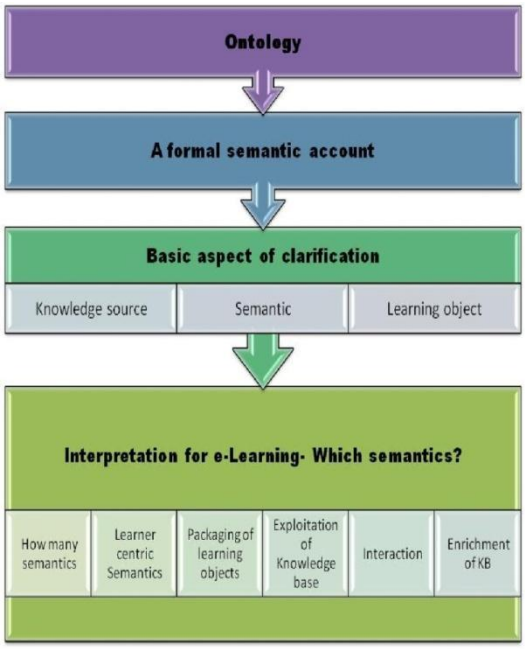

Fig 2 Ontology as a formal semantic account

E. Semantic Web Services

There are few features that the user wants from the semantic web; they must be intelligent and provides high level services like information brokers, search agents, information filters, intelligent information integration and knowledge management. These features are possible only when ontologies get populated on the web which will help the interoperation between the agents and the application on the semantic web.

II. SEMANTIC WEB AND E-LEARNING

The great success of the current WWW leads to a new challenge that a huge amount of data is interpretable by humans only with limited machine support.

TABLE I
COMPARISON OF E-LEARNING AND SEMANTIC WEB WITH FEATURES

Requirements	e-learning	Semantic web
Delivery	Pull- Student determines Agenda	Knowledge Items (learning materials) are distributed on The web, but they Are linked to Commonly agreed ontologie(s). This Enables construction of a user-specific course, By semantic querying For topic of interest.
Responsiveness	Reactionary- Responds to problem at hand	Software agents on the Semantic Web May use a commonly agreed Service language, Which enables co-ordination between agents And proactive delivery Of learning materials In the context of Actual problems. The Vision is that each user has his own Personalized agent That Communicates With other agents.
Access	Non-linear – Allows direct access to knowledge in whatever sequence makes sense to the situation at hand	User can describe the situation at hand (goal of learning, Previous knowledge,...) And perform Semantic querying for The suitable Learning material. The User profile Is Also accounted for. Access to knowledge can Be expanded by Semantically Defined navigation.
Symmetry	Symmetric – Learning occurs as an integrated activity	The Semantic Web (semantic intranet) offers the potential to become an integration platform for All business processes in an organization, including Learning activities.
Modality	Continuous – Learning runs in parallel to business tasks and never stops	Active delivery Of information (based on personalized agents) creates a dynamic learning environment that is integrated in the business processes.
Authority	Distributed – Content comes from the interaction of the participants and the educators	The Semantic Web will be as decentralized as possible. This enables an effective co-operative content management.
Personalization	Personalized – Content is determined by the individual user's needs and aims to satisfy the needs of every user	A user (using its personalized agent) searches for learning material customized for her/his needs. The ontology is the link between user needs and characteristics of the learning material.
Adaptively	Dynamic – Content changes constantly through user input, experiences, new practices, business rules and heuristics	The Semantic Web enables the use of distributed knowledge provided in various form. Distributed nature of the Semantic Web enables continuous improvement of learning materials.

IV. SEMANTIC WEB IN EDUCATION

Web based education has become a very important branch of education technology and plays a vital role. Nowadays, web-based systems are facing challenges like extensibility, interoperability, the use of domain ontologies, contextualization and consistence of metadata, dynamic sequencing of learning and contents, integration and reuse of content, distribution of services, new models of learning, and so on. Such challenges are related to the attempt to represent the information on the Web in a way that computers can understand and manipulate it. The main goal of the semantic web-based educational system is to use resources available on the Web through standards based technologies in order to accomplish AAAL: Anytime, Anywhere, Anybody Learning.

According to Anderson and Whitelock [10], the Educational Semantic Web is based on three fundamental affordances.

- The capacity for effective information storage and retrieval.
- The capacity for nonhuman autonomous agents to augment the learning and information retrieval of human beings.
- The capacity of the Internet to support, extend and expand communication capabilities of humans in multiple formats across the bounds of space and time.

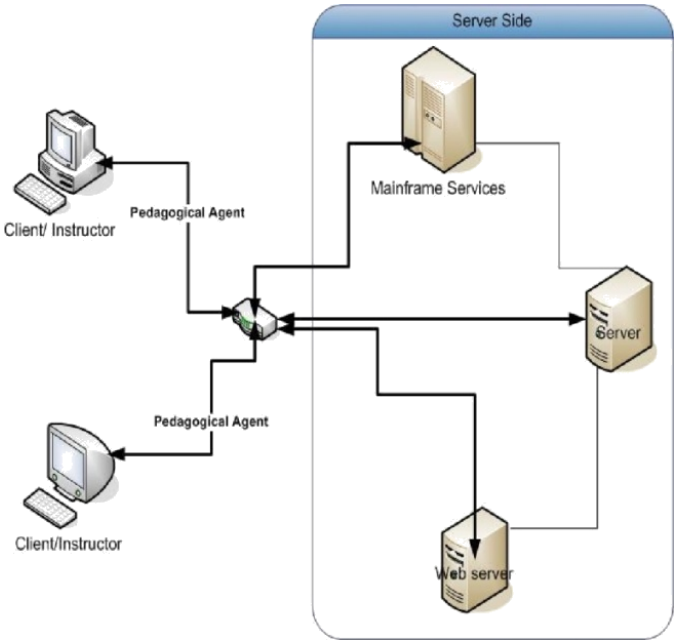

Fig 3 The setting for Semantic Web-based education

The above figure depicts the teaching, learning, collaboration, assessment and other educational activities that are happening on the web. The intelligent pedagogical agents in the Figure 3 help in the flow of information and knowledge between client and servers. These agents are also very much helpful in locating, browsing, selecting, arranging, integrating various education material from different educational servers. These agents access the content from various servers by using high-level educational services as shown in Figure 1.

V. CONCLUSIONS

The biggest growth in the internet, and the area that will prove to be one of the biggest agents of change, will be in E-Learning. E-Learning enables to update materials and information across the entire enterprise, keeping content fresh and relevant. Online training also creates a personalized learning experience. Instead of daylong or weeklong programmers, the typical E-Learning course can be broken into one-hour modules, offering flexibility around training. Employees can adapt training to their own lives and learning styles, accessing material whenever it is convenient to review course material.

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