ISSN: 2278 – 1323
International Journal of Advanced Research in Computer Engineering & Technology
Volume 1, Issue 5, July 2012

SEMANTIC BASED LEARNING APPROACH IN EDUCATION SYSTEM

Dr Shikha Singh, Gaurav Jindal

Abstract- **Extensive Research works in the field of knowledge base Learning are represented by a broad spectrum of applications .Education system transform from class room system to E-Learning system which are ranged from virtual classrooms to remote courses or distance learning. E Learning system offer obvious advantages for learners by making access to educational resources very fast; just-in-time and relevance, at any time or place. Our research is based on proposal of usage of semantic model in e-learning system. Semantic search enables better possibilities for navigating through the cyberspace and accessing its contents.**

This paper presents an approach of semantic model in implementation for E-Learning. Focus of this approach is on Ontology based semantic model for its content, context and structure of the learning materials and thus provides flexible and personalized access to these learning.

Keywords- **Education system, semantic web, Ontology, RDF, E-Learning**

I .INTRODUCTION

New challenges arise in the process of learning system. Virtual learning communities (VLCs) are information technology based cyberspaces in which individual and groups of geographically dispersed learners and providers of knowledge to accomplish their goals of learning implement collaborative learning. E-Learning is a cross discipline artifact that spans e.g., philosophy, psychology, pedagogy, anthropology, artificial intelligence (e.g., Artificial Intelligence in Education (AIED)) and human computer interaction (HCI) [1].E-Learning is a critical support mechanism for educational institutions to grow the performance of their students, teachers, as well as useful for organizations to enhance the performance of their employees. E-learning provides easy access to learning resources just in time, anywhere via data repository of learning resources.

The advancement of semantic web and e-learning technologies may provide more opportunities to achieve the goal of collaborative knowledge sharing. It would also facilitate teachers to share their teaching material, tools, and experiences with others through the medium of internet and web technologies.

Earlier the mantra of the information age had been "More the information, better it is". But unrelated information huddle when we search the web .So the Tim Burner Lee proposed the solution of this problem with the vision of Semantic web or Web 3.0. Among other things, the semantic web makes information more meaningful to people by making it more understandable to machines.

Consider a simple example. If you want to know Faculty mailing address of any institute, with web 2.0 you need to go to home page of institute and root around until you find it. That's because the current coding system used to build web pages, largely HTML, displays information without identifying it in any meaningful way. That is, mailing address of faculty is not coded as "an address," it is simply presented as a series of characters on the screen. Contrast this with a database about you may have which contains a specific column called "faculty mailing address." Even if your database included millions of entries, locating the faculty email address is easy.

Web 3.0 is the transformation of information on web from "only display information" to "meaningful information"[4], by tagging information with descriptors like "mailing address." Further, it allows users to find relationships between tagged information using inference rules and data organizational tools called "ontologies" that provide logic and structure to the information embedded in web pages. As a result, machines can do a lot of the information grunt work currently required of humans. When it comes to a web search, for example, the semantic web makes a reasonable pass at collating, synthesizing, and cross-referencing the results for you. It does this by employing software agents that can locate and combine information from many sources to build meaningful information collages. Simply tell your agent the focus of your interest—whether a person, subject, activity, question, or whatever—and set it to roam the web, finding and distilling information and exchanging information with other agents.

Ultimately, the goal of Web 3.0 is, in a phrase, data integration. Because the semantic web understands the concept of a mailing address, it can relate my address to other web-defined concepts like walking distance, postal rates, climate, or driving directions to the nearest airport. Thus, if I ask my agent to help me prepare for a trip to the Mohali, it can make assumptions about the clothes and flights I need, and so on. Because I live in Delhi, it might tell me to order clothing online soon because it takes longer to get here. It may even tell me the names of friends (who have made themselves semantically available) who have visited the Mohali.

In web 2.0 using XML my address can be understand as an address but, this understanding is not shared with other

websites. That is, there is no universal definition for "address" that any website could use to talk to my web page about addresses. It is the use of common definitions, inference rules, and ontologies that will turn the web from a series of information containers into an ecosystem in which the parts of the web are interrelated.

II. SEMANTIC SEARCHING

Semantic search engines or portals offer semantic services including semantics-based browsing, semantic search and smart question answering. Semantic browsing locates metadata and assembles point-and-click interfaces from a combination of relevant information [5] it should be allow easy navigation through resources, since users with any level of computing knowledge may use it. Semantic search enhances current search engines with semantics: it goes beyond superficial keyword matching by adding semantic information, thus allowing easy removal of non-relevant information from the result set. Smart question answering is the technique of providing precise answers to a specific question. For instance, given a question such as "Which country had the highest inflation rate in 2002?" the system would directly reply to the question with the name of the country, as opposed to the approach of current search engines (such as Google) which might present users with web pages from the Financial Times.

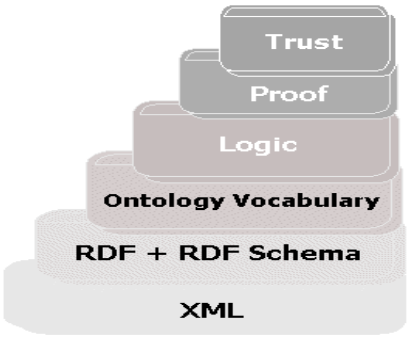

Figure 1: Semantic Web Layer [2]

From a pedagogical perspective, semantic portals are an "enabling technology" allowing students to determine the learning agenda and be in control of their own learning[2]. In particular, they allow students to perform semantic querying for learning materials (linked to shared ontologies) and construct their own courses, based on their own preferences, needs and prior knowledge. By allowing direct access to knowledge in whatever sequence students require them, just-in-time learning [6] occurs. At the other end of the spectrum, tutors are freed from the (now student-run) task of organizing the delivery of learning materials but must produce materials that stand on their own. This includes properly describing content and contexts in which each learning material can be successfully deployed. One possibility is metadata, i.e. tags about data that allow describing, indexing and searching for data.

III. RELATION BETWEEN E-LEARNING AND THE SEMANTIC WEB

E-learning is an area which can benefit from Semantic Web technologies. Current approaches to e-Learning implement the teacher-student model: students are presented with material (in a limited personalized way) and then tested to assess their learning. However, e-learning frameworks should take advantages of semantic services, interoperability, ontologies and semantic annotation. The semantic web could offer more flexibility in e-learning systems through use of new emergent semantic web technologies such as collaborative/discussion and annotations tools.

IV. SEMANTIC BASE E-EDUCATION

The insinuation for education is philosophical. Let's consider three areas of impact: knowledge formation, personal learning network maintenance, and personal educational administration.

Formulation of knowledge

Imagine you are a student researching a topic, like Smart Phone. You might begin by searching Wikipedia, but inevitably you turn to searching the vast information storehouses of the entire web using a tool like Google 2.

Current Web Search on any topic return a gazillion hits, many of which link to complex data resources that link to other resources and so on. The presumption of knowledge in this approach to information gathering and evaluation is faulty, if not potentially dangerous in its limitations.

One vision of a well-developed semantic web includes a search feature that would return a multimedia report rather than a list of hits. The report would draw from many sources, including websites, articles from scientific repositories, chapters in textbooks, blog dialogue, speeches posted on You Tube, information stored on cell phones, gaming scenarios played out in virtual realities—anything appropriate that is accessible by the rules of Web 3.0. The report would consist of short sections that coalesce around knowledge areas that emerged naturally from your research, with keywords identified and listed conveniently off to one side as links.

The information in the report would be compared, contrasted, and collated in a basic way, presenting points of agreement and disagreement, and perhaps associating these with political positions or contrasting research. Because the web knows something about you, it also alerts you to local lectures on related topics, books you might want to read, TV programs available through your cable service, blog discussions you might find relevant, and even local groups you can contact that are also focused on this issue. Unlike a standard report, what you receive changes as the available information changes, and you might have wiki-like access to add to or edit it. And because you told your agent that this topic is a high priority, your cell phone will beep when a significant development

occurs. After all, the semantic web will be highly inclusive, providing a common language for many kinds of media and technologies, including cell phones. The net result, ideally, is that you spend less time searching and sifting and more time absorbing, thinking, and participating.

Semantic Network of Personal Learning

Each one of us sits at the hub of a personal learning network (SNPL) that connects us to our interests. Unfortunately, much of our time is spent finding useful information rather than interacting with it and thinking about it. We troll blogs, search the web, wade through long pod casts, and converse with friends in the hopes of finding something we can use. Some services, like iGoogle, make a modest attempt to streamline this process by allowing us to automatically log into web services we have selected, like news services or various pod casting sources. But we still need to pick through that day's offerings to determine whether they contain anything relevant to our interests. This approach to collecting information is at best clumsy and inefficient, and it can lead to inaccuracies simply because we run out of the time or motivation to do a thorough job.

Under Web 3.0, SNPL are built primarily around subjects, not services. Personal learning agents identify relevant information from any source that is semantically accessible and provide an information synthesis tailored to our personal learning objective. The result is similar to the one described in the "Smart Phone" search example, but applied to an educational goal. Again, the objective is to spend less time searching for information and more time trying to understand, critically assess, and creatively expand it. The semantic web makes it possible for the web to become an effective and focused information resource that can be tailored for specific content area objectives.

V. PERSONAL EDUCATIONAL ADMINISTRATION

Most of us use a multi-source approach to resource gathering. If we want to develop a wardrobe, feed ourselves, or stock a tool shop or music library, we go to several providers to do so, including local stores, online vendors, garage sales, eBay, and even friends. Currently, it is very difficult to use this multi-source approach in obtaining an education and particularly in earning a degree. Educational institutions tend to be stand-alone entities that don't facilitate working with each other.

There is no question that economics and turf drive the lack of inter-institutional cooperation. However, even if these impediments were to disappear, crafting a multi-institutional education from a student perspective would still be logistically very difficult because schools and other education providers for the most part do not share common languages in describing course or degree requirements. Transfer students can bear witness to how difficult it can be to do something as basic as transfer credit for Philosophy 101 from one institution to another.

The Semantic Web has the potential to challenge this kind of institution-centeredness in the same way that distance learning technologies challenged place-centric education. At some point, institutions will describe courses and degrees semantically, probably just to help their own internal functioning, but with the secondary effect of making many of the components of education at least somewhat comparable across institutions. It is a short leap from that point to students being able to identify comparable coursework and experiences from several educational providers and, in the process, even meet the graduation requirements of yet another. Smart schools will get ahead of this and figure out just what the inevitable institutional inter-connectedness will mean for them.

Effect of Semantic Web on E-Learning

Online courses could change very little in their design, with the exception of creating ontology, which would allow course content to be semantically searchable. This would, in theory, make the course more widely appealing simply because more information would be available about it. However, the most successful online educators and their home institutions will want to take advantage of the capabilities of these new Web 3.0 technologies to ensure that their course materials are the most desirable for the largest possible audience. This can be achieved by addressing some or all of the following possibilities:

- Tailor made study material for individuals – Based on prior knowledge and individual interests, study materials will be designed specifically to meet each individual's goals and needs. Reorganizing presentation of information to accommodate different learning styles – Past experience of a learner's success rate in understanding and applying information from various styles of presentation will influence the ways in which current information is presented.

- Groupings – Background knowledge, intellectual learning capacity and current understanding should be utilized to group students so that they can help each other learn in a best possible manner depending on their own prior success.

- Providing information about the background knowledge of the learner – Teachers often struggle with understanding the prior knowledge of all of their students. This technology makes it possible to adjust study materials to accommodate for specific previous learning experiences.

- Tailor made assessments based on present and previous learning experiences – If students have shown previous proficiency in a particular area, assessments can account for that and change

themselves to match a student's current level of knowledge. With smart tests, there would be no possibility of testing students on information that they have not previously been exposed to. These changes in course organization, resource management, design, and teaching are significant and, from our current technological perspective, may seem overwhelming. However, we must not discount the potential power of semantic Web technologies to simplify or even automate many of these processes.

The key property of the Semantic Web architecture(Refer Figure:1)Layered architecture based on common-shared-meaning and machine-process able metadata ,enabled by a set of suitable agents, establishes a powerful approach to satisfy the e-Learning requirements: efficient, just-in-time and task relevant learning. Learning material is semantically annotated and for a new learning demand it may be easily combined in a new learning course. According to his/her preferences, a user can find and combine useful learning material very easily. The process is based on semantic querying and navigation through learning materials, enabled by the ontological background.

In fact, the Semantic Web can be exploited as a very suitable platform for implementing an e-Learning system, because it provides all means for (e-Learning): ontology development, ontology-based annotation of learning materials, their composition in learning courses and (pro)active delivery of the learning materials through e-Learning portals.

Advantages of Semantic web over e-Learning are

- In semantic web based learning Knowledge items (learning materials) are distributed on the web but they are linked to commonly agreed ontologies. This enables construction of user –specific course, by semantic querying for topics of interest.
- In semantic web each user has personalized agent that communicate with other agent for proactive delivery of learning material using web services.
- Semantic web provide the symmetric integration of all processes as well as the learning activities.
- Semantic learning will be as decentralized as possible.

Ontology is the link between user requirements and characteristics of learning content which can be search by user using personalized agents.

Ultimately, the primary change for educators will be in thinking about their course and its components as raw data, rather than as finished content. This concept of "raw data" when applied to course design means that every individual component of a class needs to be designed as a separate piece of data. Each test question, every topic in a video lecture, every word in a required reading will need to be viewable as a unique piece of information that is searchable and, most importantly, linkable to other pieces of data. What this means is that "courses" as we know them may well be broken down into their smallest pieces and re-purposed by Semantic Web agents beyond the boundaries of that course or institution.

The Web agent will be capable of creating new content by intelligently searching the entire Web for relevant information and putting all of those pieces together in a presentation based on the student's learning style, previous experiences, and intended educational outcomes.

From a human perspective, this concept seems completely overwhelming. Individual instructors cannot be expected to craft elaborate ontologies for every element of a course they are designing. Perhaps courses as we know them will become irrelevant as these smart technologies custom design educational experiences which pull from hundreds or thousands of different sources. For the average instructor, their role could change significantly. Course design itself may become more automated and instructors could become content designers and facilitators in knowledge production.

Essentially, some instructors may fulfill the role of subject-matter experts, responsible for the design of innovative presentations of the knowledge that they possess. Others might be responsible for providing a human touch to help with the incorporation of this customized content at the individual level. It is a shockingly different model from our current system, but one that does have the potential to arrive soon and change the teaching profession as we know it.

VI. CONCLUSION

RDF/XML forms the basis for the next generation web. Web 3.0 visions for making machine understandable contents. Ontologies are (Meta) data schemas providing a controlled vocabulary of concepts, where each concept comes with an explicitly defined and machine process able semantics.

By defining shared and common domain theories, ontologies help both people and machines to communicate concisely, supporting the exchange of semantic content instead of syntactic structures. In this paper we have presented a new scenario for learning based on ontology which exploits ontologies in three ways: for describing the semantics (content) of the learning materials (this is the domain dependent ontology), for defining the learning context of the learning material and for structuring the learning materials in the learning courses. This "three dimensional", semantically structured space enables easier and more comfortable search and navigation through the learning material.

REFERENCES

[1]. Issroff,K., & Scanalon, E. (2002). Educational Technology: The Influence of Theory. *Journal of Interactive Media in Education, 6*, 1-11.

[2]. Moreale, E., & Vargas-Vera, M. (2004). Semantic Services in e-Learning: an Argumentation Case Study. *Educational Technology & Society*, 7 (4), 112-128.

[3]. Paul Miller, "Sir Tim Berners-Lee: Semantic Web Is Open for Business," The Semantic Web, posted February 26, 2008, http://blogs.zdnet.com/semantic-web/?p=105.

[4]. Berners-Lee T. "What the semantic web can represent",http://www.w3.org/DesignIssues/RDF/not.html , 2000

[5]. Quan, D., & Karger, D. R. (2004) How to Make a Semantic Web Browser. Paper presented at the *13th International World Wide Web Conference (WWW 2004)*, 17-22 May, New York, USA, retrieved October 23, 2004 from http://www.ai.mit.edu/people/dquan/www2004-browser.pdf.

[6]. Stojanovic, N., Staab, S., & Studer, R. (2001b). eLearning Based on the Semantic Web. Paper presented at the *the World Conference on the WWW and Internet (WebNet2001)*, 23-27 October, Orlando, Florida, USA.

Dr. Shikha Singh is Ph.D from Singhania University. She has completed her MTech(IT) From KSOU and MCA from Maharishi Dayanand University,Rohtak. She has an experience of almost more than 12 years in academics & has taught in various Institutes and colleges of I.P.University & other Universities. Dr. Shikha Singh has published two research papers in International Journals and one in National Journal and has presented three research papers in National Conferences organised by different Institutes of I.P. University and also attended various workshops and seminars.

singh.shikha009@gmail.com

Gaurav Jindal is an Information Technology engineer (M.Tech). He has done MCA from Maharshi Dyanand University, Rohtak, A-Level from DOEACC and Master Diploma in Software Technology from UPTRON. He is currently pursuing Ph.D. in Computer Science from MEWAR University, Rajasthan. He is working as Assistant Professor in Gitarattan International Business School, affiliated to GGSIP University. He has eight years of experience of teaching in various institutes like Management Education & Research Institute, Janakpuri, Tecnia Institute of Advanced Studies, Rohini, PCTI, Pitampura and NDC, Wazirpur. He has published seven books and contributed in many research papers and articles. His areas of interest include Mathematics, Object Oriented Software Engineering, Software Testing and C Language.

gauravjindal05@gmail.com