A REVIEW ON LEARNING REPOSITORIES AND FUZZY XML IN EDUCATION FIELD

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Abstract— Well-designed syllabus plays an important role in the Education Domain. A repository of learning objects that has a well-defined metadata structure can be used to customize and design creative syllabus to embody the exchange and re-use of syllabus. To satisfy the need of reusable syllabus learning objects, many researches have focused mainly on Learning Object Repository and Fuzzy XML based Rules. This paper reviews the work done so far in these areas and founds a need for a knowledge based system for syllabus learning objects to increase reusability, interoperability, accessibility and durability.

Keywords— Learning Object Repository, XML, Fuzzy XML

I. INTRODUCTION

Well-designed syllabus plays an important role in the Education Domain. The quality of the syllabus is a fairly reliable indicator of the quality of teaching and learning that will take place in a course. The process of developing a syllabus can be a reflective exercise, leading the instructor to carefully consider his or her philosophy of teaching, why the course is important, how the course fits in the discipline, as well as what topics will be covered, when assignments will be due, and so on. In addition, by making sure expectations are clearly communicated, instructors can circumvent a whole host of student grievances and misunderstandings during the semester.

Syllabi do not have to be simple, typed documents, but can incorporate graphics (photos, comics, designs) and other creative elements. We would design creative syllabi to embody course goals; for instance, the syllabus for a typography class might itself reflect design elements that are part of the course content and also represent the organization of the course in graphic rather than text form.

Syllabus is based on the learning objectives and the sources like students, teachers and faculty staff. A syllabus also serves three major roles like the *syllabus as a contract*, the *syllabus as a permanent record*, and the *syllabus as a learning tool*. We understand that the content should be in a standard compliant format that can be exchanged and re-used. Therefore, a repository of learning objects that has a well-defined metadata structure can be used to customize the learning processes. [17]

II. LITERATURE REVIEW

- **XML (eXtensible Mark-up Language)**

Extensible Mark-up Language (XML) has been one of the most foremost research concepts in information exchange. In every area of information technologies XML-based applications is utilized to gain the advantages associated with XML and related technologies. In education world, XML has provided the advantages such as shareability, reusability, durability and interoperability in-and-between technology enhanced learning and teaching systems. Researches on the use of XML in teaching and learning have mainly been engrossed on the development of learning objects, content packaging and learning systems design. Though limited number of research works has been done on the use of XML-based syllabi within e-learning platforms. [10]
Excluding the conventional ways of creating a syllabus by the use of common document processors like MS-WORD and PDF Writer, the following problems were determined with the syllabus editing tools that are publicly available. Course syllabi managed with the majority of these tools are:

- Mainly in HTML format
- Unstructured and limited in number of descriptive elements
- Not suitable to extent the elements for different organizational situations
- Not sharable between systems and institutions
- Not reusable for different purposes

Due to the problems listed above, there is an crucial need for online tools and/or systems to create course syllabi which will be used widely by teaching staff. Developing builder tools that can produce the syllabus documents in XML could serve as a key to overcome the problems listed above.

The characteristics of XML, offers many advantages for designing and delivering the course syllabi. As the syllabus created in XML files can be used as interoperable documents, they can be transferred between different operating platforms and LMS (Learning Management System) /LCMSs (Learning Content Management System)without any additional conversion effort. The chosen parts of XML formatted syllabus documents can be processed for various purposes and displayed in different user-defined styles repeatedly.

In education, XML is being increasingly used to define student data (personal and achievement oriented) and also to describe reusable chunks of learning material, the use of XML has not been sufficient, to totally define the data interface between systems. Due to the need for technical realizations of XML in

education, developing an open source syllabus tool which will enable editing course syllabi in XML can provide great advancements. In this research study, preparing online course syllabi as XML documents is deliberated and an authoring tool which has been built with XML, XSL(Extensible Style Sheet Language), HTML, JavaScript and MS ASP(Active Server Pages) is introduced for demonstrating the flexibilities of XML-based syllabi as a sample framework. IEEE LOM (Learning Object Metadata)aims to define the elements and rules for building the metadata of learning objects. [19]

- Learning Object

Learning object specifications often refer to durability, interoperability, accessibility and reusability. The first three characteristics are essentially of a technical nature. "*Durability*" and "*interoperability*" are characteristics related to software and hardware platform independence. The third characteristic, "*accessibility*," is understood as the capability of being searched for and located, which is achieved by the presence of an appropriate searchable metadata record. The fourth characteristic, "*reusability*" remains the most difficult to define, since it is related mainly to instructional design, and not to digital formats or content structure that are the main concern of interoperability and accessibility. Reusability is an essential and important characteristic of learning objects. Author sketches an evaluation method for learning objects for contextualizing design in reuse-oriented situations. [8]
Researcher has worked with Digital repositories which are used by universities, libraries, archives and other education specific institutions that have the responsibility for efficiently handling learning objects. A Repository is typically a part of an n-tier system, where the repository is in the first tier and one or more applications are in the outer tier. A repository stores XML documents in base structures that comprise an 'internal representation' of the XML document.

'Learning Objects' (LOs) is defined as any reusable digital resource that is encapsulated in a lesson or assemblage of lessons grouped in units, modules, courses and even programmes in his book 'Online Education using Learning Objects'. [7]

Review of Learning Object, a course component. To cope with the rapid advances in the field, the contents of each course must be reviewed within short revision cycles. In addition, the continuous change in many disciplines has broadened the synergy and the overlapping between courses. Moreover, courses must be stored efficiently using computer software that facilitates fast retrieval

of their contents. All of the above has made it necessary to seek greater efficiency that supports reusability of course's componentsand templates for publishing on the WWW. [13]

Changtao, Wolfgang and Holgerpresent an approach for integrating native XML repositories into Edutella, a RDF-based E-learning P2P network, through mapping native XML database schemas onto the Edutella Common Data Model (ECDM) and further translating ECDM's internal query language Datalog into XPath, the local query language of native XML repositories. [4]

The concept of learning object reusability is described as the possibility and adequacy for the object to be usable in prospective educational settings, so that usability and reusability are considered two interrelated – and in many cases conflicting – properties of learning objects by Miguel and Elena. [11]

Intelligent Tutoring Systems (ITS) have been shown to be highly effective at increasing students' performance and motivation. They achieve their intelligence by representing pedagogical decisions about how to teach as well as information about the learner. Constraint-based tutors are a class of ITSs that use Constraint-based Modelling (CBM) to represent student and domain models by Nilufar. [12]

Peter and Duncan developed a modular 'Academic Working Environment' (AWE) which encompasses both teaching and learning on one hand and research on the other. Repositories and the ecosystem of services and workflows that surround them, play a key role in this emerging system. [14]

- **Fuzzy XML**

XML is imposing itself as a standard for representing and exchanging information on the Web. Authors proposes an approach and a tool for constructing fuzzy ontologies from fuzzy XML data resources may make the existing fuzzy XML data upgrade to Semantic Web contents. [3]

An architecture of web based expert system using fuzzy XML knowledge base is proposed by Filip and Erik, which can be used for variety of applications in different areas. Here architecture specific to the abdomen pain diagnosing system, characteristics of the abdomen pain, methods available to diagnose abdomen pain and decision tree, and sample fuzzy XML rules for the domain are

presented. A detailed comparison is given between existing XML models (like XPath data model, DOM & XQuery model) and Fuzzy XML model. [6]

Knowledge acquisition in knowledge based systems uses complex representation techniques. Rules are generally easier to use for characterizing knowledge during knowledge acquisition. Prototypic rules should be developed as soon as possible to serve as a focal point for directing the course of the knowledge acquisition process. The initial knowledge base can be developed from written materials or from example cases described by the expert during early unstructured interviews. Then, the rule base can be expanded. Once a stable rule base begins to develop, it can provide feedback for structuring interviews. Initially the rules and procedures can be traced through by hand with the expert considering each step. The same pattern of tracing through rules should continue once a version of the knowledge base is developed on a computer and it frequent use should become part of the process. [2]

Eguigure, Zapata, Menendez and Prietoreviews fuzzy conceptual data models, where fuzzy ER/EER, IFO and UML data models are discussed, and also reviews the applications of fuzzy conceptual data models. [18]

Researcher here discusses basic concepts of learning object repositories; presents work done so far and establishes the need of knowledge based access of the learning repositories to improve cost-benefit ratio of an e-Learning solution. A multi-tier knowledge-based system accessing a fuzzy XML learning object repository is described with architectural framework and detailed methodology. [15]

Authors proposes method which mainly consists two sections of which the first one is to build the knowledge base using XML and the latter part deals with information retrieval by searching using fuzzy. [9]

III. CONCLUSION

Building and handling of course syllabi with a tool reduce the amount of physical work required in the distribution, editing and successive maintenance of the syllabi and therefore decrease the costs made by the institutions.

Thelearning on XML-based construction of course syllabi will contribute to produce interoperable, re-purposable and sharable syllabi among the parties.

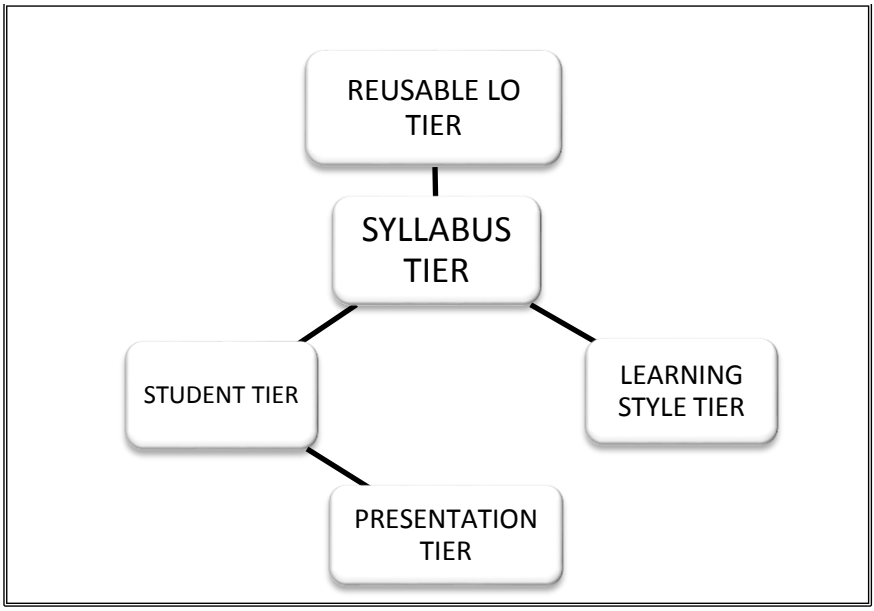

Fig. 1 Learning Object Tier architecture

Ideal learning environments precisely provide the learning contents to the user according to preference. The contents in the learning object repositories are to be retrieved automatically even for a trainee learner. In the excess of learning materials it sometimes becomes difficult even for an expert to obtain the targeted content for learning purposes. To make the system more personalized for the users various methods and techniques are being focused. Creating high quality learning objects is indeed very expensive wherein reusing such learning objects as depicted in the *figure-1*, helps the system to redefine granularity of these learning objects.

The focus first and foremost, is on the identification of the implicit knowledge sources available in connection with the Computer Science Syllabus. Once the sources of the implicit knowledge are found then it will be easier for Knowledge creation. Implicit knowledge is extracted from the sources identified by using different methodologies. The knowledge extracted is now explicit. The available explicit knowledge from text books and other sources is combined to form a combined knowledge. This combined knowledge can also be stored and retrieved. The Knowledge based system as shown in *figure-2*, can improve the quality of the learning process. Knowledge based system is used to provide

intelligent decisions with justification. Knowledge-based system can be implemented with the concept of an expert system. The expert system technology can be implemented by incorporating fuzzy logic to handle qualitative and uncertain facts in the decision making process. Fuzzy set theory and IF….THEN rules can be used to achieve the benefits of the knowledge based systems.[1]

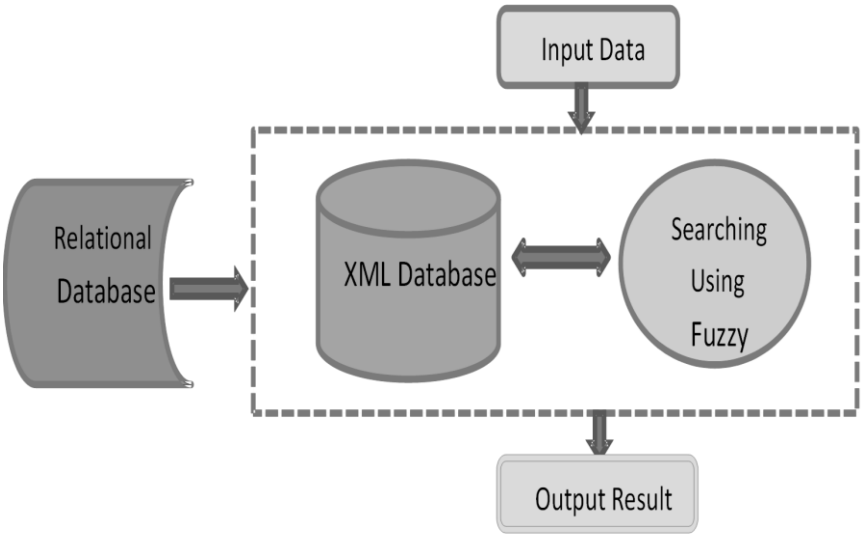

Fig. 2 Knowledge based system architecture

Thus the research work shall focus in the field of education, and we shall investigate metadata standards that are utilized by digital repositories, primarily intended for the preservation and management of educational material. Our main objective is to improve such mechanisms by enriching them with learning object metadata and incorporating fuzzy logic into XML based rules.

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