CsSyllabusLOR: Computer Science Syllabus Learning Object Repository

Mona G Dave[1*], P V Virparia[2]

[1]G H Patel P G Dept. of Computer Science, Sardar Patel University, VallabhVidyanagar, Gujarat, India
[2] G H Patel P G Dept. of Computer Science, Sardar Patel University, VallabhVidyanagar, Gujarat, India

[*]*Corresponding Author:* monadave22@yahoo.co.in, *Tel.: +91-9099014128*

Abstract— Adaptable Educational Learning Object Repository (AELOR) for the subject of computer science has been proposed for the educational institutions and the educators to enable the access to different Learning Objects (LO). AELOR shall enhance the reusability and interoperability of LOs, while taking benefit of the granularity and aggregation features. This Learning Object Repository (LOR) will also give educators the chance to design a new syllabus from the existing courses which includes one or many Los. CsSyllabusLOR provides a platform for creating, collecting, retrieving learning objects and also suggesting Computer Science syllabi to the educator. The Educators and Learners from the Computer Science Educational community will be benefited by the syllabus learning object repository. In this paper, we have tried to propose an architecture of Syllabus Learning Object Repository for the subject of Computer Science.

Keywords— Learning Object Repository, Reusable LO, Syllabus, Computer Science

I. INTRODUCTION

A syllabus describes the contents of a course, an introductory idea to the course number, course title, course description, the learning objectives of the course, a list of the knowledge units / topics covered, links to reference material such as books or publications, allotted time for each topics and other related data. One or more LOs is combined to create a course that is termed as the syllabus. The field of Computer Science is updating rapidly. So there is the pressure from industry, students, and university administrators to keep updating the syllabus and curricula in regular intervals. To fulfil the task of updating the syllabus, there is a need to handle the knowledge resource in course syllabus, to use, reuse them to create a new syllabus and share among the Computer Science tutors, admin staff and industry professionals [9].

The paper discusses about developing an adaptive computer science learning object repository that takes care of the essentials of computer science education. The proposed architecture is a flexible and adaptive educational learning object repository that is personalized to support teaching and learning of computer science at different levels and different degree courses. Reusable learning resources are given the utmost preference in teaching for different classes with different profiles but for the same course. A learning object can also be defined as any reusable digital file that has educational objectives. So designing learning resources with learning objects in mind has the chance to support

personalization / customization and adaptation in e-learning, which can enhance e-learning environments to be well-suited with educator's proficiency, learning classes, and preferences [2].

The paper is organized as follows: Section I contains the introduction to syllabus learning object repository, Section II describes the architecture of the proposed work and Section III concludes the research work with future directions.

II. COMPUTER SCIENCE SYLLABUS LEARNING OBJECT REPOSITORY (CsSyllabusLOR)

Our study as described in fig. 1, shows architecture of CsSyllabusLOR (Computer Science Syllabus Learning Object Repository) that provides a platform for creating, retrieving learning objects and suggesting Computer Science syllabi to the educator [13]. The syllabus documents will be stored in the syllabus repository in a structured organization and then convert from their original format (Word or PDF or HTML formats) to simple text for further text processing [9].

User Tier
The actors such as Creator, Educator and Learner who potentially would utilize a repository for different functions like searching, gathering, submitting, requesting and so on. The user tier or the presentation tier is liable for the visualization of dynamically generated learning objects. This last tier depends on all other tiers to perform their tasks [13].
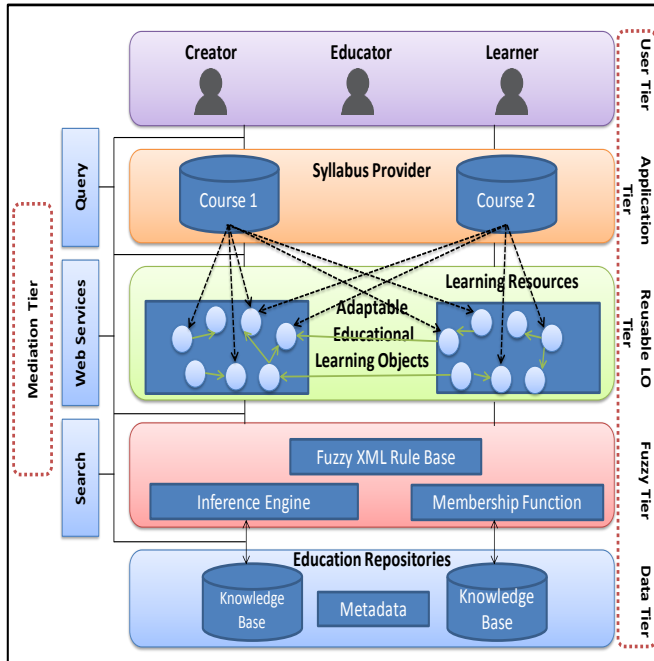
Figure 1: Architecture of CsSyllabusLOR

Application Tier

The structural design of different courses supporting the storing and retrieving of courses into a repository or an application. Courses are coarse-grained objects built as aggregations of finer-grained learning objects and/or resources. Here the learning objects are selected from the existing categories which satisfies our learning objectives using selection and sequencing. The learning objective development plays an important part in this tier. According to the skills and abilities required for a particular class, learning objects will be adapted in this dynamic application [13].

Reusable LO Tier

The concept of LO is presented with the metaphor "LEGO", the small pieces of lessons (LEGOs) can be collected and arranged together into some large learning structure. In other words, any learning object (LEGO block) may be combined with other learning object (another LEGO block) to create a new unity of knowledge [10]. Learning object technology allows us to build repository with well-defined metadata structure that guarantee of use and reuse in different levels of learning processes. The educational actors like educators, creators and learners select these reusable learning objects on the basis of technical aspects, educational features, description of data, so on [8]. All learning objects or references to them reside in this tier. Learning objects is implemented in this tier which are structured and retrieved from the repository. LO is a small component of a bigger, coarse-grained learning resources from the repository [16].

Repository mediates between the domain and data mapping layers, acting like an in-memory collection of domain objects. Learning Object Repositories is capable to describe, store, search, select and retrieve large amounts of learning resources [15]. Interoperability among learning objects repositories relies on three techniques: associated searches, LO gathering through metadata, and finally LO gathering. The repository follows some standards like Learning Object Metadata (LOM) or Sharable Content Object Reference Model (SCORM) to describe the learning objects. For searching and gathering of LO, classification of learning objects plays an important role. For example, SCORM is a collection of XML-based specifications that allows to list, launch and track educational contents, thus enabling their reusability, accessibility and interoperability [13].

Mediation Tier

Mediation Tier contains core system services, which is divided into three sub parts such as search, web services, and query. The Web Services are used for searching and giving access to the learning objects in the repositories [15]. Web Services includes security services and enables us to communicate and exchange data between the education repository and the module structures [4]. The fuzzy query composing of a list of terms and fuzzy values extracts the specific data from the repository.

FUZZY Tier

This tier is responsible for building a model which provide a personalized experience to the creator or learner using simple IF-THEN rules to incorporate adaptability in the course. A creator selects learning objects for a particular topic after analysing the data with the help of inference rules defined by various member functions at time of course creation. The model will suggest the nearest LO match if it cannot find the exact match [10]. Aggregation techniques categorized as fuzzy models use fuzzy logic to calculate a fuzzy value. Fuzzy logic allows to model true value or false value within an interval of [0,1]. It helps to decide whether a resource is dependable or not dependable. Fuzzy logic has been used to cope with uncertainty and simulate the human decision making process [7]. The primary objectives in fuzzy rule-based classification are accuracy maximization and complexity minimization [3].

Data Tier

A vast amount of information and/or knowledge will be stored in education repository. Education is the process of acquisition of knowledge base. Two elements of knowledge - facts and rules, are represented using XML format. The metadata is collected at the time of creation of the repository which allows us to provide additional value to the course development [9]. Education repository will contain accessible syllabus resources for the creator to use, reuse, improve and create new syllabus.

III. CONCLUSION

The research for the learning object repository of computer science has been moving towards new possibilities such as adaptive course generating from learning objects to offer personalization to creators for designing customized syllabus. This paper therefore helps solving the current issue for the faculty to create, adapt and share course syllabi, without the inefficiencies and time constraints associated with the traditional ways of preparing syllabi. Syllabus can simplify details, so that students understand how a course will advance, can plan their effort accordingly, in turn helping students to communicate the course goals and expectations of a course. The proposed syllabus work can be further extended for other subjects in the future.

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Authors Profile

Ms. Mona G Dave, *Assistant Professor* in Computer Science, is a MCA graduate and is pursuing Ph.D. in Computer Science from Department of Computer Science, Sardar Patel University, Vallabh Vidyanagar, Gujarat, India. She has an academic and parallel administrative experiences of more than seventeen and twelve years respectively in the field of Computer Science for programmes like BCA, BBA(ITM) and PGDCA. She has been a *Visiting Faculty* in the area of Computer Applications for UG and PG Programmes like B.Voc (SD), M.Com. Her area of interests is Web Applications, Analytics and Knowledge Based System.

Prof. Paresh V Virparia joined the Department of Computer Science of Sardar Patel University, Vallabh Vidyanagar in 1989 and currently working as a Professor. He was a Director of Computer Science Department, Sardar Patel University during 2012-2017. He completed his MCA in 1989 from Sardar Patel University and Ph. D. in 2002 from Sardar Patel University. TEN research scholars have completed their Ph.D. (Computer Science) under his guidance. Currently, FOUR students are doing their Ph. D. under the guidance of him. Also, three students have completed their M.Phil. (Comp. Sc.) under his supervision. His publications include one book, two chapters in book and 40 papers in International Journal, 16 papers in National Journals and 47 papers in national conferences/seminars. His research interests include the areas of Computer Simulation & Modeling, Data Mining, Networking and IT enabled services. He is an editor and editorial review board member in several journals/magazines.