

An Enhanced Model of E-Learning Management System Using Semantic Web Technology and Development of Universal Namespace for University Domain

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Abstract

E-learning Management system is one of the special features of today's World Wide Web (WWW) which is known as Web 2.0. Research works in the field of E-Learning have presented a broad spectrum of applications, ranged from virtual classrooms to remote courses or distance learning. At anytime from anywhere around the world Web-based learning offers E-learners access to educational resources without any delay and difficulties. Due to various limitations of web 2.0 for creating E-learning management system, currently we use Web 3.0 which is known as Semantic web. It is a great platform to represent E-learning management system that recovers the limitations of Web 2.0. It represents a potential technology for supporting E-learning requirements. In this paper, we propose a model of E-learning Management System using semantic web and a namespace to represent a university on semantic web where course syllabus, teaching methods, learning activities and learning styles are included. This paper also provides a hierarchical content structure and semantic relationship between concepts that can provide related useful information for searching and sequencing learning resources in web-based E-learning systems.

Keywords: *E-Learning Management System, Semantic web, RDF, Ontology.*

1. Introduction

Electronic base training is known as E-learning. A learner learns the instructional contents through the electronic technology. E-learning has a wide range of learning strategies and technologies; from CD-ROMS, videoconferencing, TV lectures, and virtual educational work, corporate universities and many more but our main focus is on virtual education, based on Semantic web [1].

Semantic Web is a group of methods and technologies to allow machines to understand the meaning - or "semantics" - of information on the World Wide Web. It was "invented" by Tim Berners-Lee (amongst others), a physicist working at CERN in 1980s. Furthermore, Semantic Web is about explicitly declaring the knowledge embedded in many web-based applications,

integrating information in an intelligent way, providing semantic-based access to the Internet, and extracting information from texts [2].

Unfortunately, the Web was built for human consumption, not for machine consumption, although everything on the Web is machine-readable, it is not machine-understandable [3]. We need the Semantic Web to express information in a precise, machine interpretable form, ready for software agents to process, share, and reuse it, as well as to understand what the terms describing the data mean. That would enable web-based applications to interoperate both on the syntactic and semantic level.

In this paper, we create a namespace of universities that identify any universities that could be helped to build for E-learning Content Management System using Semantic web technologies such as Resource Description Framework (RDF), RDF Schema (RDFS), Web Ontology Language (OWL), Uniform Resource Identifier (URI), XML, and SPARQL.

2. Related Work

F. P. Rokou *et al.* distinguished three basic levels in every Web-based application: the Web character of the program, the pedagogical background, and the personalized management of the learning material [4]. They defined a Web-based program as an information system that contains a Web server, a network, HTTP, and a browser in which data supplied by users act on the system's status and cause changes. The pedagogical background means the educational model that is used in combination with pedagogical goals set by the instructor. The personalized management of the learning materials means the set of rules and mechanisms that are used to select learning materials based on the student's characteristics, the educational objectives, the teaching model, and the available media. Many works have combined and integrated these three factors in E-learning systems, leading to several standardization projects. Some projects have focused on

determining the standard architecture and format for learning environments, such as IEEE Learning Technology Systems Architecture (LTSC), Instructional Management Systems (IMS), and Sharable Content Object Reference Model (SCORM). IMS and SCORM define and deliver XML-based interoperable specifications for exchanging and sequencing learning contents, i.e., learning objects, among many heterogeneous E-learning systems. They mainly focus on the standardization of learning and teaching methods as well as on the modeling of how the systems manage interoperating educational data relevant to the educational process [5].

IMS and SCORM have announced their content packaging model and sequencing model, respectively. The key technologies behind these models are the content package, activity tree, learning activities, sequencing rules, and navigation model. Their sequencing models define a method for representing the intended behavior of an authored learning experience, and their navigation models describe how the learner- and system-initiated navigation events can be triggered and processed. Juan Quemada and Bernd Simon have also presented a model for educational activities and educational materials [6]. Their model for educational activities denotes educational events that identify the instructor(s) involved and take place in a virtual meeting according to a specific schedule. F. P. Rokou *et al.* [4] described the introduction of stereotypes to the pedagogical design of educational systems and appropriate modifications of the existing package diagrams of UML (Unified Modeling Language) [6].

The IMS and SCORM models describe well the educational activities and system implementation, but not the educational contents knowledge in educational activities.

Juan Quemada's and F. P. Rokou's models add more pedagogical background by emphasizing educational contents and sequences using the taxonomy of learning resources and stereotypes of teaching models. But the educational contents and their sequencing in these models are dependent on the system and lack standardization and reusability. Thus, we believe that if an educational contents frame of learning resources can be introduced into an E-learning system, including ontology-based properties and hierarchical semantic associations, then this E-learning system will have the capabilities of providing adaptable and intelligent learning to learners.

The hierarchical contents structure is able to show the entire educational contents, the available sequence of learning, and the structure of the educational concepts, such as the related super- or sub- concepts in the learning contents. Furthermore, some of semantic relationships among the educational contents, such as 'equivalent', 'inverse', 'similar', 'aggregate' and 'classified', can provide important and useful information for the intelligent E-learning system.

Stojanovic *et al.* [10] describe an E-learning scenario based on the Semantic Web, in particular concentrating on ontologies for E-learning objects. This group is associated with the Learning Lab Lower Saxony, which itself is a partner in the Wallenberg Learning Network.

Naeve *et al.* [9] describe an E-learning framework, again based on the Semantic Web that discusses Semantic Web techniques and peer-to-peer services for the search, retrieval, publication, replication and mapping of metadata. This group is part of a consortium comprising Swedish and German universities developing a P2P network for the exchange of educational resources.

Fayed Ghaleb *et al.* [11] proposed Semantic Web-Based model for our E-learning system. They presented an approach for developing a Semantic Web-based E-learning system, which focus on the RDF data model and OWL ontology language. They had demonstrated the effectiveness of this approach through several experiments using different type of courses taught in Qatar University. The facilities that the application will provide include allowing E-learning content to be created, annotated, shared and discussed, together with supplying resources such as lecture notes, course description, documents, announcements, student papers, useful URL links, exercises and quizzes for evaluation of the student knowledge.

In all of researcher's models, they have not specified any conceptualization of a specific domain in terms of concepts, attributes, and relationships. They did not create any vocabulary or namespace for university using ontology that is very necessary to identify any university semantically. They created this ontology based model only for Qatar University.

For this purpose, ontology is introduced in our model. We also create a namespace "univ" to identify any university from around the world that is based on our proposed model. It can play a crucial role in enabling the representation, processing, sharing and reuse of knowledge among applications in modern Web-based E-learning systems because it specifies the conceptualization of a specific domain in terms of concepts, attributes, and relationships.

Moreover, the number of ontology-centered researches has increased dramatically because popular ontological languages are based on Web technology standards, such as XML and RDF(S), so as to share and reuse it in any Web-based knowledge system [7, 8]. Thus, we have devised a model that provides the contents structure using an ontology for an adaptive and intelligent E-learning system.

3. Domain and Namespace

3.1 Domains

Ontology is a formal representation of knowledge as a set of concepts within a domain, and the relationships between those concepts [12].

Now this leads to the concept of domains. The **domain of discourse**, also called the **universe of discourse** (or simply **universe**), is the set of entities over which certain variables of interest in some formal treatment may range. The domain of discourse is usually identified in the preliminaries, so that there is no need in the further treatment to specify each time the range of the relevant variables [13].

Another good definition is “A class containing all the entities referred to in a discourse or an argument also called universe.” [16]

For example, in an interpretation of first-order logic, the domain of discourse is the set of individuals that the quantifiers range over. In one interpretation, the domain of discourse could be the set of real numbers; in another interpretation, it could be the set of natural numbers. If no domain of discourse has been identified, a proposition such as $\forall x (x^2 \neq 2)$ is ambiguous. If the domain of discourse is the set of real numbers, the proposition is false, with $x = \sqrt{2}$ as counterexample; if the domain is the set of naturals, the proposition is true, since 2 is not the square of any natural number [13].

In the concept of ontology, a domain ontology (or domain-specific ontology) models a specific domain, which represents part of the world. Particular meanings of terms applied to that domain are provided by domain ontology. For example the word *card* has many different meanings. An ontology about the domain of poker would model the “playing card” meaning of the word, while an ontology about the domain of computer hardware would model the “punched card” and “video card” meanings.

Another concept is the upper ontology; an upper ontology (or foundation ontology) is a model of the common objects that are generally applicable across a wide range of domain ontologies. It employs a core glossary that contains, the terms, and associated object descriptions, as they are used in various, relevant domain sets. There are several standardized upper ontologies available for use, including Dublin Core, GFO, OpenCyc/ResearchCyc, SUMO, and DOLCE. WordNet, while considered an upper ontology by some, is not strictly an ontology. However, it has been employed as a linguistic tool for learning domain ontologies [12].

3.2 Namespace

The attribute **namespace** provides the namespace of an ontology or similar vocabulary. It is encoded as a simple URL, as an additional service, [14].

Essentially, a namespace is a collection of terms that multiple people agree to share, and furthermore, they agree on specific meanings for those terms. The Web, as it turns out, provides a powerful way of sharing namespaces: we can plant them on websites and anyone who wants to use those terms knows where to find them, along with their meanings.

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One of the first namespaces to explode on the Web is called the Dublin Core. (Sorry, but the name refers not to the Dublin in Ireland, but to the Dublin in Ohio, where a group of people met to establish this namespace.) It is a collection of terms that can be used to describe resources that can be found on the Web, or in paper libraries, or in any other place where we store information.

These terms include Contributor, Date, Publisher, Subject, and many more [17].

A vary popular namespace is FOAF. FOAF (from “friend of a friend”) is an RDF based schema to describe persons and their social network in a semantic way. FOAF could get used within many wikis for annotating user pages, or describing articles about people. In Semantic MediaWiki, FOAF annotations can be used as imported vocabulary [15].

4. The “univ” Namespace

With the concept of name space we have gathered in previous chapters, and towards the goal of making an E-learning management system in semantic web, we now will create a name space called the “univ” name space.

The semantic web is a web of data. A person or a program can be represented by either FOAF or BBC ontology. So we thought to make a name space that will able to provide the information about university in semantic web. We defines the “univ” name space as-

“The name space and supported ontologies to visualize and supports the information of an university in semantic web”

Throughout the next chapters, we will develop the name space, test and validate it, and will discuss what we can do next with it.

4.1 Proposed Ontology for “univ” Namespace

The following ontology is used for our proposed “univ” namespace. Here University is base class and it contains eight sub class are shown in figure.

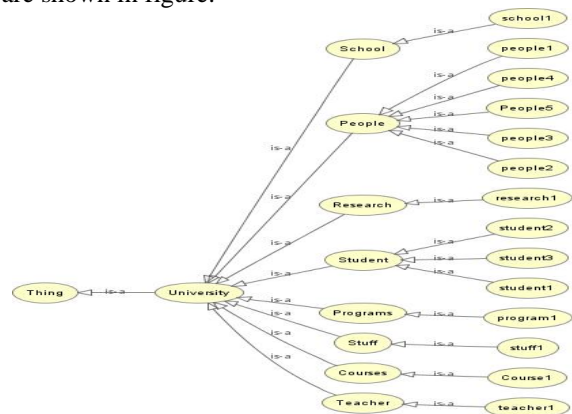


Fig. 1 a snapshot of the proposed ontology for univ namespace using Protégé (ontology editor)

4.2 Description Of proposed “univ” Ontology

Here relationship among several classes and objects are shown in figure. In Figure 2, a people may be student, teacher or stuff by indicating arrows from people to that class. Inversely every student, teacher or stuff must be a people are indicated by arrow towards People. The Research class also directed to people as researcher is a people.

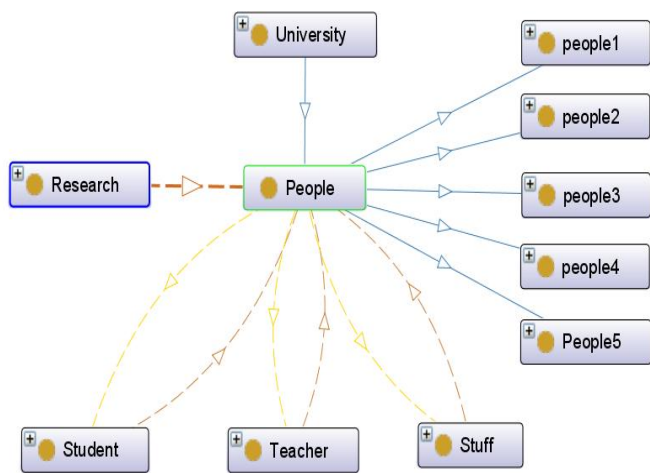


Fig. 2 Relationship among Student, Teacher, Stuff and People Classes

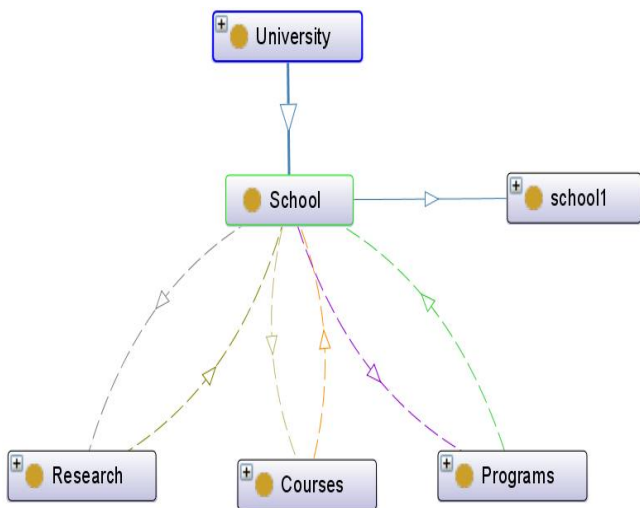


Fig. 3 Relationship among Research, Courses, Program and School Classes

Figure 3 shows that the Research, course, Program classes belongs to the school class and inversely related to each other. In figure 4 objects of People and Student class are shown. Here assume that people1 is student1 and researcher1 is people1 that's why they belong to a same people. In figure 5 the basic relationship among student, teacher, stuff and people objects are shown. Here assume that people1 is student1, people2 is student2, people3 is student3, people4 is teacher1 and people5 is stuff1.

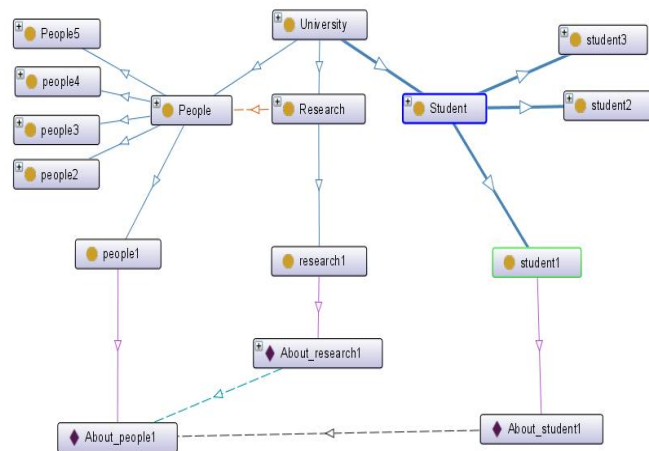


Fig. 4 Relationship among People, Research and Student objects

4.3 “univ” namespace specification

To Relationship among Student, Teacher, Stuff and People Objects implement the “univ” name space by using the above ontology, we use the following classes and properties.

Classes:

University, Courses, People, Programs, Research, School, Student, Stuff, Teacher

Properties:

i) ObjectProperties:

courseProgram, hasElement, isElementOf, schoolHaselement, isElementOfschool, researchAuthor.

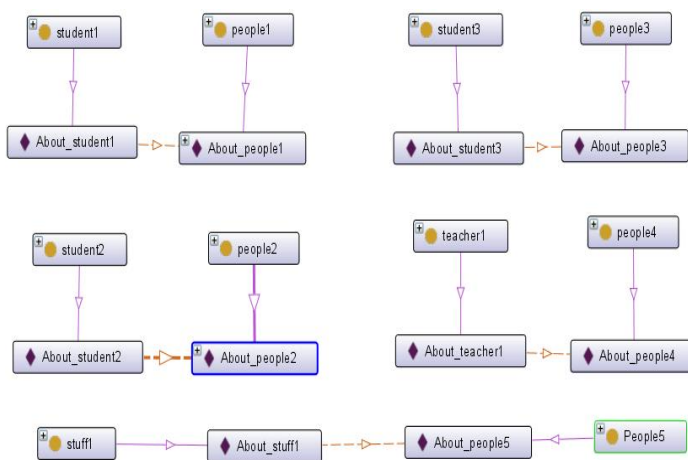


Fig. 5 Relationship among Student, Teacher, Stuff and People Objects

ii) Data Properties:

programDetails,schoolDetails,researchDetails,peopleDetails,coure Details,name,address,city, country,about.

4.3.1 Description of Classes

Class: Univ#University
 University- A University

Status: Stable.

Has

Subclass:

Courses, People, Programs, Research, School, Student, Stuff, Teacher
Properties Include: name, address, city, country, about.

The **University** Class contains a collection of subclasses that represents a university system in ontological structure. For simplification only **name** properties are shown. For example, here is a fragment of a

University class:

```
<owl:Class
rdf:about="http://www.pstu.ac.bd/ontology/univ#University">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty
rdf:resource="http://www.pstu.ac.bd/ontology/univ#name"/>
        <owl:someValuesFrom rdf:resource="&xsd:string"/>
      </owl:Restriction>
    </rdfs:subClassOf>
  </owl:Class>
```

Class: Univ#Programs

Courses –A collection of program (Like B. Sc. Engg(CSE,ECE)).

Status: partially stable

Has Subclasses : Program1

Properties Include: hasprogram, programMustHave, courseProgram, programDetails.

Subclasses of: University

The **Programs** class contains a collection of degree that a university provides. For example, here is a fragment of the **Programs** class:

```
<owl:Class
rdf:about="http://www.pstu.ac.bd/ontology/univ#Programs">
  <rdfs:subClassOf
rdf:resource="http://www.pstu.ac.bd/ontology/univ#University"
/>
    <owl:Restriction>
      <owl:onProperty
rdf:resource="http://www.pstu.ac.bd/ontology/univ#prName"/>
        <owl:someValuesFrom rdf:resource="&xsd:string"/>
      </owl:Restriction>
    </rdfs:subClassOf>
  </owl:Class>
```

Class: Univ#Courses

Courses –A collection of courses.

Status: partially stable

Has Subclasses : Course1

Properties Include: hasCourses, coursesMustHave, courseProgram, courseDetails.

Subclasses of : University

The **Courses** class contains a collection of courses under each **Program** of a university.

Class: Univ#School

School –A collection of faculties.

Status: stable

Has Subclasses : school1

Properties include: schoolHasElement, isElementOfSchool, schoolDetails.

Subclasses of : University

The **Courses** class basically deals with the Courses, Research, Program class. For example, here is a fragment of the **School** class:

```
<owl:Class
rdf:about="http://www.pstu.ac.bd/ontology/univ#School">
  <rdfs:subClassOf
rdf:resource="http://www.pstu.ac.bd/ontology/univ#University"
/>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty
rdf:resource="http://www.pstu.ac.bd/ontology/univ#sName"/>
          <owl:someValuesFrom rdf:resource="&xsd:string"/>
        </owl:Restriction>
      </rdfs:subClassOf>
    </owl:Class>
```

Class: Univ# Research

Research –research document.

Status: stable

Has Subclasses : research1

Properties Include: hasResearch, researchMustHave, researchDetails, researchAuthor

Subclasses of : University

The **Resesach** class basically deals with the various researches under several schools and also connected with the People class via researchAuthor property.

Class: Univ# People

People –overall peoples of university.

Status: stable

Has Subclasses: people1, people2, people3, people4, people5

Properties Include: hasElement, peopleDetails.

Subclasses of: University

The **People** class basically deals with Student, Teacher, Stuff classes. It mainly contains all of the peoples those are connected with the University. For example, here is a fragment of the **People** class:

```
<owl:Class
rdf:about="http://www.pstu.ac.bd/ontology/univ#People">
  <rdfs:subClassOf
rdf:resource="http://www.pstu.ac.bd/ontology/univ#University"/>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty
rdf:resource="http://www.pstu.ac.bd/ontology/univ#pName"/>
          <owl:someValuesFrom rdf:resource="&xsd:string"/>
        </owl:Restriction>
```

```
</rdfs:subClassOf>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty>
rdf:resource="http://www.pstu.ac.bd/ontology/univ#pAddress"/>
    <owl:someValuesFrom rdf:resource="&xsd:string"/>
  </owl:Restriction>
</rdfs:subClassOf>
</owl:Class>
```

Class: Univ# Studnet

Student –student entity.

Status: stable

Has Subclasses : student1, student2, student3.

Properties Include: isElementOf,

Subclasses of : University

The *Student* class is mainly connected with the People class.

Class: Univ# Teacher

Teacher – teacher entity.

Status: stable

Has Subclasses : teacher1,

Properties Include: isElementOf,

Subclasses of: University

The *Teacher* class is mainly connected with the People class.

Class: Univ# Stuff

Stuff –stuff entity.

Status: stable

Has Subclasses: stuff1

Properties Include: isElementOf,

Subclasses of : University

The *Stuff* class is mainly connected with the People class.

4.3.2 Description of Properties

Property: univ# coursesMustHave

Status: stable

Domain: Courses

Range: School

Inverse Of: hasCourses

SubProperty Of: isElementOfSchool

The property **coursesMustHave** refers that each course is under a specific school class. For example, here is a fragment of the **coursesMustHave** property:

```
<owl:ObjectProperty>
rdf:about="http://www.pstu.ac.bd/ontology/univ#coursesMustHave">
  <rdfs:domain>
rdf:resource="http://www.pstu.ac.bd/ontology/univ#Courses"/>
  <rdfs:range>
rdf:resource="http://www.pstu.ac.bd/ontology/univ#School"/>
  <owl:inverseOf>
rdf:resource="http://www.pstu.ac.bd/ontology/univ#hasCourses"/>
  >
```

```
<rdfs:subPropertyOf>
rdf:resource="http://www.pstu.ac.bd/ontology/univ#isElementOfSchool"/>
  <owl:ObjectProperty>
```

Property: univ# hasCourses

Status: stable

Domain: School

Range: Courses

Inverse Of: coursesMustHave

SubProperty Of: schoolHasElement

The property **hasCourses** refers that every school must have some specific courses. For example, here is a fragment of the **hasCourses** property:

```
<owl:ObjectProperty>
rdf:about="http://www.pstu.ac.bd/ontology/univ#hasCourses">
  <rdfs:range>
rdf:resource="http://www.pstu.ac.bd/ontology/univ#Courses"/>
  <rdfs:domain>
rdf:resource="http://www.pstu.ac.bd/ontology/univ#School"/>
  <owl:inverseOf>
rdf:resource="http://www.pstu.ac.bd/ontology/univ#coursesMustHave"/>
  <rdfs:subPropertyOf>
```

```
rdf:resource="http://www.pstu.ac.bd/ontology/univ#schoolHasElement"/>
  </owl:ObjectProperty>
```

The rest of the properties that are given above are also specified like the similar procedure. To implement the relation among several classes through the properties we also used the following Individuals.

Individuals:

About_course1,About_people1,About_People2, About_people3, About_people4, About_program1,About_research1,About_school1, About_student1, About_student2, About_student3, About_stuff1, About_teacher1.

5. Testing the “univ” Namespace

As we already discuss the namespace in semantic web and define the univ namespace, the namespace for defining a university, next we are going to testing the namespace.

For testing, we will use the W3C RDF Validation Service [18] This RDF validation service is based on Another RDF Parser (ARP). It currently uses version 2-alpha-1. ARP was created and is maintained by Jeremy Carroll at HP-Labs in Bristol.

This means that the service now supports the Last Call Working Draft specifications issued by the RDF Core Working Group, including datatypes. It no longer supports deprecated elements and attributes of the standard RDF Model and Syntax Specification and will issue warnings or errors when encountering

them. See RDF Issue Tracking for more information. The service does not do any RDF Schema Specification validation.

This W3C service was created by Nokia's Art Barstow (a former W3C Team member). The internationalization was done by Martin Dürst. It was previously maintained by Emmanuel Pietriga (another former W3C Team member), who also implemented the IsaViz plug-in. It is currently maintained jointly by Eric Prud'hommeaux (eric@w3.org), Ryan Lee (ryanlee@w3.org) and Ted Guild (ted@w3.org). [19]

First, we have to develop an rdf file. That must include our univ namespace. We test the namespace in localhost. The following link we gave

```
<xmlns:univ="http://localhost/ontology/univ.owl">
```

However, the true link will be,

```
<xmlns:univ="http://www.pstu.ac.bd/ontology/univ.owl">
```

We will consider our university (Patuakhali Science and Technology University) should be represented in web 3.0 by the namespace. However, we are not going to visualize the full university but some portion of it.

Here is the detail we are going to use:

```
resource=http://www.pstu.ac.bd  
name= Patuakhali Science and Technology University  
address= Dumki, Patuakhali  
city= Patuakhali  
country=Bangladesh  
about= The host University for univ namespace  
Programs:  
resource=http://www.pstu.ac.bd/faculties/cse.html  
prName=Bsc in CSE  
prClass=undergraduate  
Research:  
resource=http://www.pstu.ac.bd/ontology/univ  
Publisher= resource:http://www.pstu.ac.bd  
rTitle=The univ Namespace  
rYear=2011  
people=resource:http://faysalahmed.wordpress.org  
School:  
resource=http://www.pstu.ac.bd/faculties/cse.html  
sName=Faculty of CSE  
sLocation="http://www.pstu.ac.bd"  
Course:  
resource=http://www.pstu.ac.bd/faculties/cse.html  
cName=Computer Fundamentals  
cCode=CSE101  
cSemester=1st  
resource=http://www.pstu.ac.bd/faculties/cse.html  
cName=Programming  
cCode=CSE102  
cSemester=1st  
People:  
resource=http://faysalahmed.wordpress.com  
pName=Faysal Ahmed
```

```
pAddress= 180/6/23/B East Rampura  
pCountry=Bangladesh  
pDesignation=student  
pCity=Dhaka
```

We write the following rdf file for testing purpose which have the above definitions.

```
<?xml version="1.0"?>  
<!-- -->  
<!-- Demo file for univ namespace -->  
<!-- Faysal Ahmed-->  
<!--the header -->  
<rdf:RDF  
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"  
  xmlns:univ="http://localhost/ontology/univ.owl#">  
<!-- the university-->  
<rdf:Description  
  rdf:about="http://www.pstu.ac.bd">  
  <univ:name>Patuakhali Science and Technology University  
</univ:name>  
  <univ:address>Dumki,Patuakhali</univ:address>  
  <univ:city>Patuakhali</univ:city>  
  <univ:country>Bangladesh</univ:country>  
  <univ:about>The host university for "univ"  
  namespace</univ:about>  
</rdf:Description>  
<!-- Courses-->  
<rdf:Description  
  rdf:about="http://www.pstu.ac.bd/faculties/cse.html">  
  <univ:cName>Computer Fundamentals</univ:cName>  
  <univ:cCode>CSE101</univ:cCode>  
  <univ:cSemester>1st</univ:cSemester>  
  <univ:university  
  rdf:resource="http://www.pstu.ac.bd"></univ:university>  
</rdf:Description>  
<rdf:Description  
  rdf:about="http://www.pstu.ac.bd/faculties/cse.html">  
  <univ:cName>Programming</univ:cName>  
  <univ:cCode>CSE102</univ:cCode>  
  <univ:cSemester>1st</univ:cSemester>  
  <univ:university  
  rdf:resource="http://www.pstu.ac.bd"></univ:university>  
</rdf:Description>  
<!-- People-->  
<rdf:Description  
  rdf:about="http://faysalahmed.wordpress.com">  
  <univ:pName>Faysal Ahmed</univ:pName>  
  <univ:pAddress>180/6/23/B East Rampura</univ:pAddress>  
  <univ:pCountry>Bangladesh</univ:pCountry>  
  <univ:pDesignation>Student</univ:pDesignation>  
  <univ:pCity>Dhaka</univ:pCity>  
  <univ:university rdf:resource="http://www.pstu.ac.bd"/>  
</rdf:Description>  
<!-- programs-->  
<rdf:Description  
  rdf:about="http://www.pstu.ac.bd/faculties/cse.html">  
  <univ:university  
  rdf:resource="http://www.pstu.ac.bd">  
  <univ:prName>BSc in Engg. (CSE)</univ:prName>
```

```

    <univ:prClass>Undergraduate</univ:prClass>
</rdf:Description>
<rdf:Description
rdf:about="http://www.pstu.ac.bd/ontology/univ">
    <univ:Publisher
rdf:resource="http://www.pstu.ac.bd"></univ:Publisher>
    <univ:rTitle>The univ Namespace</univ:rTitle>
    <univ:rYear>2011</univ:rYear>
    <univ:people
rdf:resource="http://faysalahmed.wordpress.com"></univ:people
e>

</rdf:Description>
<rdf:Description
rdf:about="http://www.pstu.ac.bd/faculties/cse.html">
    <univ:university rdf:resource="http://www.pstu.ac.bd"
/>
    <univ:sName>Faculty of CSE</univ:sName>
    <univ:sLocation
rdf:resource="http://www.pstu.ac.bd"></univ:sLocation>

</rdf:Description>
</rdf:RDF>
    
```

We, as stated before, tested the rdf in the validator and find accurate result. The results are given in the Result and Discussion chapter.

6. Result and Discussion

After validating the rdf file discussed in previous chapter, we found the following triples:

Num ber	Subject	Predicate	Object
1	http://www.pstu.ac.bd	http://localhost/ontology/univ.owl#name	"Patuakhali Science and Technology University"
2	http://www.pstu.ac.bd	http://localhost/ontology/univ.owl#address	"Dumki,Patuakhali"
3	http://www.pstu.ac.bd	http://localhost/ontology/univ.owl#city	"Patuakhali"
4	http://www.pstu.ac.bd	http://localhost/ontology/univ.owl#country	"Bangladesh"
5	http://www.pstu.ac.bd	http://localhost/ontology/univ.owl#about	"The host university for "univ" namespace"
6	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#cName	"Computer Fundamentals"
7	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#cCode	"CSE101"

8	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#cSemester	"1st"
9	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#university	http://www.pstu.ac.bd
10	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#cName	"Programming"
11	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#cCode	"CSE102"
12	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#cSemester	"1st"
13	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#university	http://www.pstu.ac.bd
14	http://faysalahmed.wordpress.com	http://localhost/ontology/univ.owl#pName	"Faysal Ahmed"
15	http://faysalahmed.wordpress.com	http://localhost/ontology/univ.owl#pAddress	"180/6/23/B East Rampura"
16	http://faysalahmed.wordpress.com	http://localhost/ontology/univ.owl#pCountry	"Bangladesh"
17	http://faysalahmed.wordpress.com	http://localhost/ontology/univ.owl#pDesignation	"Student"
18	http://faysalahmed.wordpress.com	http://localhost/ontology/univ.owl#pCity	"Dhaka"
19	http://faysalahmed.wordpress.com	http://localhost/ontology/univ.owl#university	http://www.pstu.ac.bd
20	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#university	http://www.pstu.ac.bd
21	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#prName	"BSc in Engg. (CSE)"
22	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#prClass	"Undergraduate"

23	http://www.pstu.ac.bd/ontology/univ	http://localhost/ontology/univ.owl#Publisher	http://www.pstu.ac.bd
24	http://www.pstu.ac.bd/ontology/univ	http://localhost/ontology/univ.owl#rTitle	"The univ Namespace"
25	http://www.pstu.ac.bd/ontology/univ	http://localhost/ontology/univ.owl#rYear	"2011"
26	http://www.pstu.ac.bd/ontology/univ	http://localhost/ontology/univ.owl#people	http://faysalahmed.wordpress.com
27	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#university	http://www.pstu.ac.bd
28	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#sName	"Faculty of CSE"
29	http://www.pstu.ac.bd/faculties/cse.html	http://localhost/ontology/univ.owl#sLocation	http://www.pstu.ac.bd

Here, we are actually representing a very small representation of the Patuakhali Science and Technology University, a very fictional one. However, it shows the possibility of the full visualization of this university as well as any university by the constraints of the given univ namespace. But it is also true that we are seeing a possibility of merging this rdf to the linked data by proper statements.

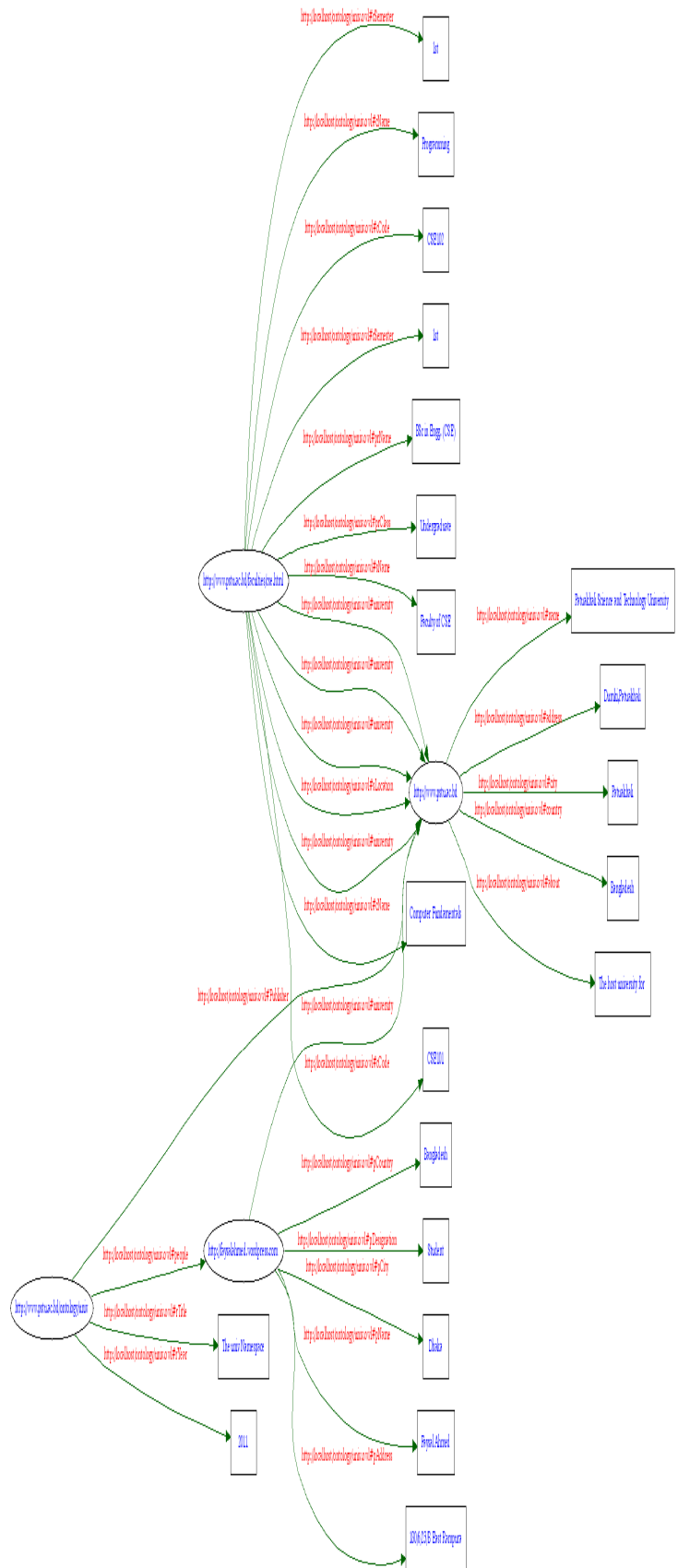


Fig. 6 The graph of the tested rdf file by rdf validator

7. Conclusion

The main contribution of this paper is our new model and the “univ” namespace for E-learning Management system using Semantic web. Our model includes various services and tools in the context of a semantic portal, such as: course registration, uploading course documents and student assignments, interactive tutorial, announcements, useful links, assessment, simple semantic search and the namespace is used to visualize and supports the information of a university in semantic web. Our proposed model contains a hierarchical contents structure and semantic relationships between concepts that provide related useful information for searching and sequencing learning resources in web-based E-learning systems and also provides the way to create namespace to represent a university on semantic web. We hope that this proposed model and this namespace will be very beneficial than other proposed model that we got from other research papers.

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