Advisor Role of Semantic Web in Education

DÜŞÜNAL, Mustafa Onur
Department of Computer Engineering, Kırıkkale University, Kırıkkale, Turkey

EMİROĞLU, Bülent Gürsel
Department of Computer Engineering, Kırıkkale University, Kırıkkale, Turkey

Abstract : *The usage and functionality of the technology is increasing in education and training activities with the developing technology in Today. The ontology-based semantic web has become inferential for web users. It goes beyond the uniform communication between the user and the provider in ordinary web applications; this way, Semantic Web will help web agents. Thus, they will be able to read and interpret web content for users. That semantic web technology in which data can be interpreted it is thought with the developments in the web world can be a guide in education and training. The fact that student orientations can be analyzed with semantic web is one of the best examples of this subject. With the recent developments in the world of internet, semantic network technology guiding students in this matter carries great importance for their future. In this study; firstly, in the WWW (World Wide Web) world from Web 1.0 to Web 3.0 are given the information about the path and the components of Semantic Web technology (RDF, RDF Schema, SPARQL, Ontology Web Language, etc.). An ontology was developed for the analysis of student orientations. Ontology was developed in OWL (Ontology Web Language) with the help of Protégé editor.(Protégé a current ontology development editor.) In this way, the correlation of the courses and the determination of the area of orientation as a result of the scores obtained from the courses were examined in detail. A proposal system developed within the scope of making the education and training activities of this technology more functional and more technological will be exemplified in this way.*

Keywords: *Semantic Web, Education and Training Activities, Orientations, Ontology.*

I. INTRODUCTION

Semantic web technology has been developed with the aim of collecting all the data in the computer from a single source and managing the related processes by the computers and making a meaningful inference to the users. This is only possible if the information on the web is associated with each other, including descriptions. In order for computers to present information by querying, the information required for the process must be entered into the computer environment. Linking information is very difficult and complex. However, their gains are very high. (Emiroglu, 2009) Websites in the WWW (World Wide Web) World usually work linked to a database. However, with this technology becoming obsolete, the fact that the information presented in the database is considered correct does not meet the demands when it is necessary, and may even lead to misleading as some of the wrong results are produced. However, semantic web technology has been put forward as a solution to this problem and is progressing towards becoming a much bigger solution to the problems. In this study, we will show the help of semantic web solution which is encountered in many web technologies ranging from e-commerce to e-government.

II. WHAT IS SEMANTIC WEB?

When a computer user wants to reach the desired result on the web, relevant results are generated and presented from the database by filtering. However, the main problem here is; sometimes we aren't aware of the wrong results. Semantic network technology has provided a solution to this problem and compensated for the lack of this field.

When the WWW world entered our lives for the first time, we were faced with a structure of static web pages that did not change. The content provider would provide the user with the content he created, but the user would be content to navigate through the fixed pages without making any changes. The quality of the site was determined by the number of access to content in primitive technology. In fact, this was not a missing or wrong

solution, but our technology needs evolved over time. In this way, static pages in Web 1.0 technology could not meet our needs.

III. DEVELOPING WEB

Figure 1. User Interaction in Web 1.0

Then, with the needs in the form of web 2.0 technology began to produce dynamic pages. While the web site administrator performs visual design, programming, publishing, users can create the content of the sites. Users can update at present. The quality of the site is not measured by the number of accesses alone, but by the fact that it can now rise to the top rankings in search engines compared to their counterparts.

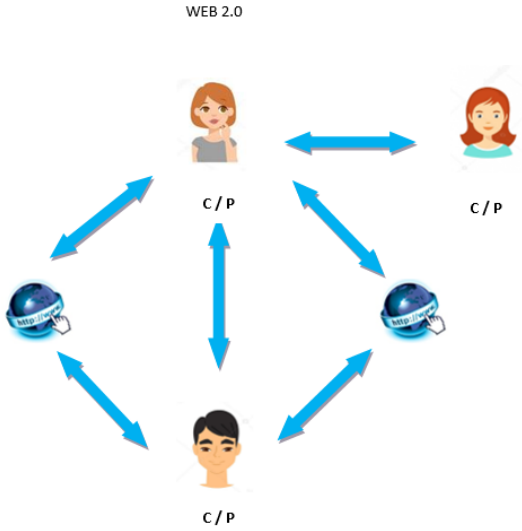

Figure 2. Creating Content with Web 2.0

With the development of Web 2.0 technology, information clusters started to make sense and were presented to the users in a more understandable way with Web 3.0 technology. With the idea put forward by Tim Berners Lee and his friends, a new perspective has been brought into the world of www, thus a milestone has been achieved in web technology.

Web content has been introduced to the use of computer systems by means of structures called metadata. Thus, the web content was understood by computers and had the opportunity to make an inference. Currently, Web 3.0 technology, in other words semantic network technology, is not an alternative to the old ones.

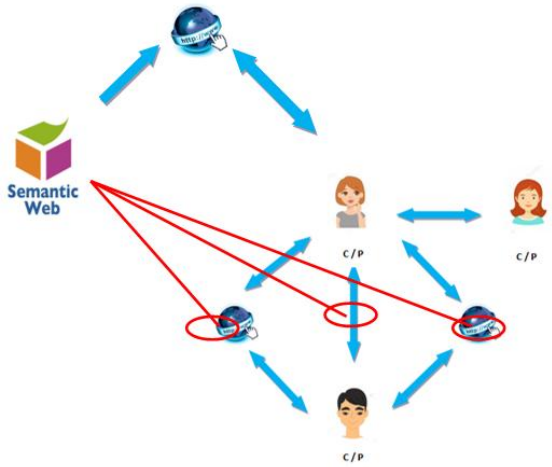

Figure 3. WEB 3.0 Content Meaning by Machines

IV. COMPONENT OF SEMANTIC WEB

a) RDF (Resource Description Framework):

RDF, the most important building block of semantic network technology, is a W3C (World Wide Web Consortium) standard. A data model developed for the identification and association of data sources.

The components that form the basis of RDF;

- Value: These are the values of the resources.
- Property: Resources of specific types.
- Resource: It is defined as any asset that is traded.

b) RDF Schema (Resource Description Framework Schema):

The RDF data model is a basic notation of sources, named values, properties, and sources, in the web environment. This type of system defines the set of words to be used in a field.

c) SPARQL (Simple Protocol and Resource Description Framework Query Language)

It's a query language for querying RDF data.

The SPARQL structure is as follows:

PREFIX xyz: ...	*# Prefix of SPARQL Query*
SELECT ...	*# Called the result-set*
WHERE { ... }	*# Query Conditions*
ORDER BY ...	*# Ranking*

Table 1. SPARQL Structure

d) OWL (Ontology Web Language):

Ontology essentially means being science as a philosophical concept. However, the equivalent in the field of computing is relational concepts. Semantic web-based web sites are based on these ontologies. Web content created for people cannot be understood by computers. We need ontologies in here.

Ontologies must be available for computers to understand web content in the semantic web. These ontologies are developed with "ontology languages". The W3C consortium recommends Ontolgy Web Language (OWL). Thanks to OWL, ontologies are practically created and computers can be deduced from developed ontologies. Developing ontology is a difficult task. There are many languages that can help. However OWL language recommended by W3C also has advantages. These;

• To support the hierarchical structure between classes (upper class)
• Possibility of triple display,
• Relationships edit between assets easily.

V. RESEARCH FINDS AND DISCUSSION

The essence of our study is the use of semantic web in educational activities. An ontology was designed in order to analyze students' achievements and to deduce the field from which they are oriented.

Table 2 is presented as this table.

Main Class	Sub_Class	Sub_Class(Sub_Class of Sub_Class)
Lessons	Software	Databases, Algorithms, Object Oriented Programming(OOP)
	Hardware	Computer Architecture, Logic Desing, Robotic

Table-2 : Class Structure in this study

While defining ontology, classes and data properties were determined and designed. Based on ontological concepts, hierarchical structure and class structure were formed.

Based on the developed ontology, the concepts related to them are classes. The hierarchical structure of class concepts is presented in the table in Figure 4.

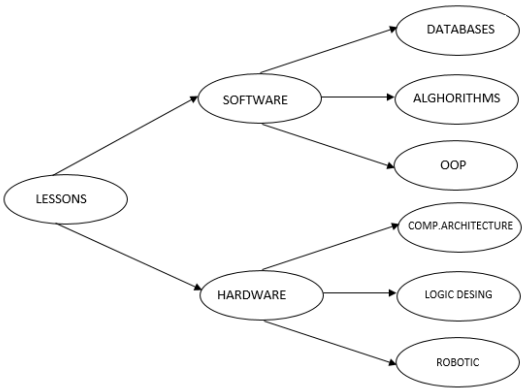

Figure-4 Class Structure

The data properties of the class concepts are presented in Table 3 below.

DATA PROPERTIES	TYPE	STUDENT_1 (INDIVUAL)
Name	String	Ahmed
Surname	String	ARSLAN
Year	Datetime	2016
Department	String	Computer Engineering
Department_Code	Integer	201
Class	Integer	3
Lesson_name	String	Database
Lesson_year	Datetime	2019
Point	Integer	80

Table 3- Data Properties and Types

VI. RESAULTS AND SUGGESTIONS

It was designed in a semantic web-based ontology study for student orientations. Ontology structure, class hierarchy and data properties are presented with figures and charts.

In our study, Protégé version 5.5.0 was used to design our ontology. Ontology was developed with OWL language. It is a popular ontology development language and recommended by the W3C consortium.

First of all, the class structure is designed hierarchically and the data properties of the classes are defined.

In this way, a design was made for an educational problem.

In our study, ontology was subjected to ontology logic test. Hermit 1.4.3.456 Logical testing using Reasoner revealed no logical errors.

In this way, an example of the use of semantic network has been made in order to make

educational and training activities more technological.

REFERENCES

[1] Emiroğlu, B. G., 2009. Semantik Web (Anlamsal Ağ) Yapıları ve Yansımaları, Akademik Bilişim'09-XI., Akademik Bilişim Konferansı Bildirileri, Turkey

[2] Hendler, J., 2001. Agents and the semantic web, IEEE Intelligent systems, 16(2), p.30-37.

[3] Kumar, S., 2019. The Dual Nature of Participatory Web and How Misinformation Seemingly Travels, Advanced Methodologies and Technologies in Media and Communications. IGI Global, p. 366-376.

[4] Berners, L. T., James H., and Ora L., 2001. The Semantic Web, Scientific American, 284(5) p.34-43

[5] Dinger, M., & Grover, V., 2019. Revisiting Web 2.0. In Advanced Methodologies and Technologies in Network Architecture, Mobile Computing, and Data Analytics, p.1777-1788

[6] Süzen, A.A & Taşdelen K., 2016. Anlamsal Web Teknolojisi ile İçerik Arama, El-Cezeri Journal of Science and Engineering, 3(1).

[7] Wang, R. L., Edwards, S., & Ives, C., 2019. Ontology-based semantic mapping of chemical toxicities, Toxicology, 412, p.89-100

[8] Rao, A. P., 2019. Quality Measures for Semantic Web Application, In Web Services: Concepts, Methodologies, Tools, and Applications p.1907-1916

[9] AnitaKumari, D., & Thakur, J., 2019. Semantic Web Search Engines, A Comparative Survey.