УДК 004.77
Orobchuk O.R. – postgraduate student
TernopilIvanPul'uyNationalTechnicalUniversity

THE SEMANTIC WEB AND ONTOLOGY INE-LEARNINGSYSTEMS

Supervisor:Kukharska V.B.

Keywords:e-learning, ontology, semantic web

Technologies have always played an important role in the educational process. Currently, an important place among the systems of knowledge bases is occupied by electronic educational systems which are based on ontologies of subject areas. If ontology forms the basis of system knowledge then such a learning system is ontologically oriented.

The newest technology Web 3.0 is aimed at the Internetthat can allow machines to process and understand the information contained in it and interact with each other. A semantic network is a joint movement led by the World Wide Web Consortium (W3C) which must accomplish this task. The semantic network contributes to the development of ontologies used as a representation of formal knowledge, as well as in the design and creation of metadata elements. They provide taxonomy for the domain and the set of constraints, rules and relationships between concepts in taxonomy.

Traditional educational systems are based on closed learning materials that are preliminarily identified by teachers or experts in the subject area. Such systems can not provide content from external sources, they can not be processed by a PC to link them to other electronic systems. An effective solution to the problem of interoperability is the use of a semantic network which provides an opportunity to build educational ontologies and semantic annotation of educational materials. To represent domain data, you can easily use the web-ontology language OWLthat is one of the latest developments of the W3C consortium in the direction of the Semantic Web for organizing a high level of syntactic and semantic ability of applications to interact. Also, the significance and value of ontologies are seen in the possibility of their repeated use. Ontology is designed to structure the learning content, to combine the terminology of the subject domain.Also ontologies link two important aspects: definition of formal information semantics with its processing by computer; definition of the real worldsemantics and communication on the basis of the common terminology of information given in the form necessary for computer processingwhich the information presented in the convenient for human perceptionform. These aspects are successfully used in active (interactive) educational information products. Such products provide the active role of the studentsdetermining the sequence of their studies in contrast to passive learning products that are designed only for managing the process of displayinginformation.

In the framework of educational process, web-ontologiesapplying will allow clarifying the main components of the academic disciplines (lectures, practical classes, laboratory works) that use teaching materials, providing the opportunity to organize effective distributed access to learning resources.Single knowledge base combines many academic disciplines and will actually be distributed over the Internet makingit independent from the interpretation of a particular educational process. The role of e-learning systems in this case will be reduced to the role of intelligent agents that select necessary information from knowledge bases depending on the context of the training and possibly the construction of agents to automatically supplement or replacementof such knowledge base by new data.

Another important feature of such system is the ability to build testing software systems that will generate control tasks based on the semantics of the described ontologies of specific training courses. Obviously, such systems of building knowledge control far surpass existing at the moment tests aimed at sampling one of several answers.

The new concept of the electronic educational process provides the use of educational facilities that present smaller multiple units of training. Each learning object consists of three main components: content, training activities, context elements, and must contain metadata which are defined as attributes necessary for the complete description of the learning object. The description of objects is more effective if metadata contain their semantic value in addition to their syntactic description. Metadata are also used foridentifying learning objects in search systems, learning management systems, or content management systems. The main reason of creating a standard for the metadata of learning facility is the opportunity of exchanging these objects between different repositories and learning systems. Although the main aim of object learning is the possibility of reuse and interoperability, there are still some barriers for sharing resources between educational institutions and their learning management systems and repositories. Different learning management systems are characterized by variousdegrees of support of learning objects and learning repositories. It is convenient to use ontologies for standardizing the content of educational objects.

In order to raise traditional distributed learning on the basis of Web technologies to a new higher-quality level, the following requirements for on-grade learning systems can be distinguished:

1) Open architecture and interfaces: learning infrastructure must have an open architecture and open application interfaces for interaction and integration between educational institutions, educational service providers and other entities that allow distributed learning.

2) High interoperability for the exchange of information: learning infrastructure must be able to accept learning components or applications developed in one place by one set of tools or a platform and use them elsewhere with another set of tools or on another platform.

3) Flexibility: all learning objects in this model are generic which means that the system must offer a dynamic mechanism that allows developers to easily add or remove components at any time.

4) Accessibility: educational objects can be published with a clearly defined description in the universal repository for their search, detection and retrieval by other remote programs they need.

5) Longevity and reuse: training materials or applications of such systems are considered as encapsulated components with consistent interfaces which allows to resist technological changes without reconfiguration or re-encoding, and then there is the possibility of their reuse in several applications and contexts.

6) Compatibility with other systems: a system based on this framework should provide an open interface standard for interaction with other training programs.