

# Immediate Assessment Based Semantic E-Learning Evaluation

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**Abstract** – This paper describes improvements made to the system for the evaluation of DSI framework (Drag and Drop Semantic Interface). This framework uses technologies of Semantic Web to enhance learning materials with semantic relations of the terms included. In the paper is presented a modified (immediate) approach to evaluation of the tool for semantic annotation of learning material. It focuses on the disadvantages of the former version of the evaluation approach, and on the new approach to evaluation of this tool. The paper briefly describes the first version of the system for evaluation, and a problem that has been observed during the initial testing of the system. It is proposed a solution to this problem, and then the changes made to the system are described. Synopsis of the planned research is presented in short. Implemented system will be used for planned research.

**Keywords** – Semantic web, E-learning, DSI, evaluation, assessment.

material to the student. Intelligent agents, in addition to aggregation of data are one of the concepts that is very applicable in the field of e-learning as a pedagogical agents.

DSI (Drag and Drop Semantic Interface) is a framework for E-learning that uses Semantic Web technologies to provide a semantic annotation of learning material. Fast and intuitive user interface provides easy access to the definitions of the links (relationships) between concepts (notions) in the teaching material. Using drag-and-drop action on the textual materials users query it for these definitions. This framework is still under development, several versions have been implemented so far. Currently the focus is set on the development of software to support the testing of this concept in terms of real exploitation. The initial version of this software was presented at the YUInfo conference [3]. This paper will discuss the advantages and disadvantages of the developed system and then suggestions for improving this system will be given.

## I. INTRODUCTION

The Semantic Web represents a vision of the Web based on data that are well structured, semantically related and machine-readable. This version of the Web is an environment in which programs (intelligent agents) can autonomously find and integrate data and then draw conclusions on behalf of their owners. The main goal of this vision of the Web is shifting a large portion of the data search from people to the machines, and it is also important to mention connecting data by meaning. [1]

Technologies of the Semantic Web are largely applicable in the field of E-learning. The basis of E-learning is an individualized approach to the learner, which means facilitating the formation of the teaching materials according to the learning objectives of a particular user. In Semantic Web each resource is described with metadata, a machine forms a response to a user's query based on the integration of different resources, depending on the manner in which these resources are related. [2] In E-learning situation is similar. Teaching materials must be divided into small, quasi-atomic units (LO - learning objects). On user demand small units are fitted into meaningful objects and then they are presented to the user. In Semantic Web emphasis is put on machine reasoning of separate resources, while the E-learning emphasis on proper sequencing and presentation of the

## II. DSI CONCEPT

DSi represents a framework primarily developed for enabling semantic enhancement of text learning materials. [4] The system recognizes certain terms (words) in the teaching material and gives them the functionality of dragging and dropping terms on each other. [5] Identifying the terms in the text is done on the basis of pre-defined semantic document. By dragging the words on each other system allows users to get relationships (connections) that are defined between the dragged and targeted term. Framework is designed as a web application that consists of two layers: the textual (instructional materials in plain text or html web page) and semantic (RDF/XML documents in which connections between the terms in teaching material are stored), and the logic that connects these two layers. On the page load system performs a lexical analysis of the text. This analysis checks for text words with pre-defined connections in the semantic document, then system enables drag-and-drop functionality for those words. By dragging and then dropping the words user performs the query of the semantic document, and as a response to this request system returns the connection between the dragged and the targeted term stored in the semantic document. [6]

Framework has been designed in a way that enables it to be embedded into the existing systems for e-learning, while it can also function as a standalone application. [7] The idea with creating this concept was to enable students to link the certain terms by dragging one term onto another while learning specific lesson and provide a linear progression through the learning material - with less need to return to the previous lessons. This way, the student keeps their focus on

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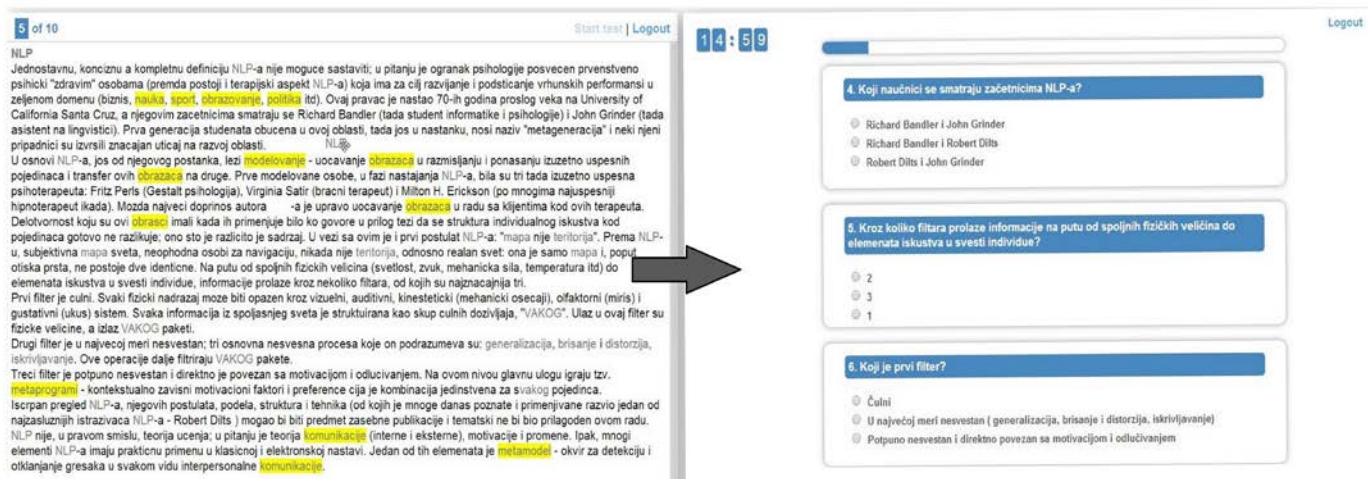


Fig. 1. Learning using DSi concept and after that taking the quiz

the lesson they are currently learning, thus speeding up the learning process.

### III. EVALUATION OF DSI FRAMEWORK

This framework was developed using PHP and JavaScript. The version of the underlying system for the evaluation (version 1.5) [8] was developed using the CodeIgniter PHP framework (for developing application logic on the server). For manipulation of RDF graphs (semantic documents) was used RAP (RDF API for PHP) [9]. JQuery library was used to enable drag-and-drop functionality on the client. In this version RDF graphs are stored on the server, in order to ensure a certain level of security. In this way, the user doesn't have the access to entire document, but only those connections that may require dragging. User makes a request by dragging the word and dropping it on another word, and then the system as a response to this request returns the relationships between dragged and the targeted word. Response is in the form of subject - predicate - object. This "sentence" (called statement) is printed in the bottom of the lesson web page which the user is currently studying. [10]

This system was developed as an evaluation tool in the exploration of the impact of the proposed DSi concept on learning in real operating conditions, learning in a university environment. The basic idea of creating this tool was to examine the impact of DSi framework on learning acceleration. It is important to notice that the system is designed as a tool to test the practical application of this concept in the learning phase (absorption of the learning material), not in order to test the already gained knowledge. As already stated this system is based on version 1.5 DSi framework, and complements it with a module for monitoring users and module for checking the knowledge acquired by learning using the DSi framework. As a part of the module for monitoring users it is implemented user log in to the system. All user's interaction with the system are recorded for later processing. Also, it is possible to easily modify the values of certain variables when using the system, the ability/inability to use the drag-and-drop functionality, free or forced movement through instructional materials/knowledge test.

As already explained in [3] system for evaluation is designed in a way that student first needs to logs in to the

system, and is then redirected to a part of the system that acts as a system for e-learning. Within this part of the system students are offered a number of text pages, with words for which relationships are defined in the semantic document. These specific words are particularly marked in the text, and will have ability to drag. When dragging and dropping the word onto another word the students perform query on the semantic document, which as a results returns already defined relationship between words, dragged and the target word. After completion of learning, voluntarily or upon expiration of the time, students are redirected to the part of the system that checks the knowledge acquired by learning using this system (DSi Quiz). This is a quiz with questions regarding the lessons that have been previously presented to the students. The idea with implementation of this system was to first present to the students a few lessons, and then to test the acquired knowledge of the students using abilities of this concept. On figure 1 is shown the whole process of learning and testing using this system.

The authors conducted an initial informal testing the first version of the system for the evaluation with the small number of subjects in order to identify possible shortcomings of this system before it is released for testing on a larger number of subjects (test groups). During this test, it was noticed a couple of flaws that need to be corrected. Testing with a small number of subjects it was observed that when learning from a purely textual pages subjects tend to forget about the existence of DSi concept, given that the concept is new and users are not used to it. Because of this real effects of DSi on learning are reduced. In this paper we discuss a possible solution to this problem.

### IV. IMMEDIATE APPROACH TO EVALUATION

As already mentioned in the previous chapter, it is necessary to make certain changes to the system for evaluation in order to eliminate deficiencies. The problem that has been observed is that the students when learning tend to forget about the existence of DSi concept and the possibility of using the same. This concept of learning is new and it is necessary to remind the students that they are able to use the DSi concept. As a solution to this problem, the authors

propose the existence of questions (quiz) on the same page on which the lesson is presented to student. In this way, students will be constantly reminded of the possibility of using the DSI concept in order to get clarification of relationships between concepts throughout the learning process.

The proposed solution to the problem brings a change in the way the subjects will be tested. A new approach to the evaluation of DSI concept makes changes to the evaluation process. The learning process is no longer divided into learning and testing, these two processes now overlap in most of the session, with the exception of a small part of learning when the first few lessons are presented without question in the second part of the screen. This approach aims to encourage students to use the opportunities that DSI offers to give answers to questions that will be asked, in order to provide answers to these questions they will need to “connect” the concepts that are presented to them as part of the lesson.

It is expected that existence of questions on the same page as the lesson (and in which the emphasis is on the relationships between the concepts in the text) will remind students of the possibility of dragging the words in the text. In this way, students will be able to use DSI learning approach so they can simplify and accelerate their learning process.

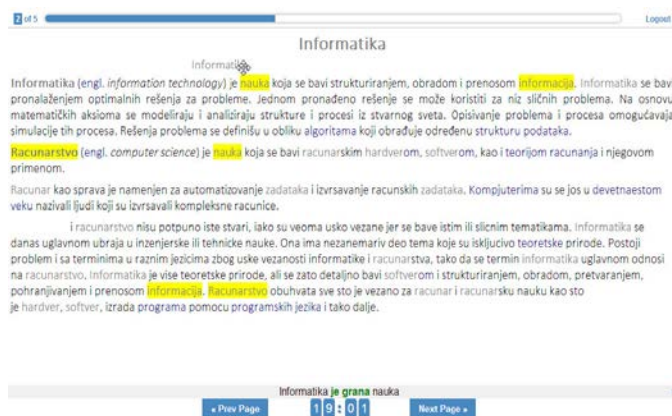


Fig. 2. The appearance of the first few lessons, after making changes to the system

The paper [3] discusses the ways the research is to be performed - which drive the development of the system presented hereby. As for the changes that this approach brings, it will not change much the structure of the planned research. The structure of the research remains the same. There will be two groups of subjects: control group and experimental group. The control group will be tested with the same teaching materials and questions, but without the possibility of dragging words, while the experimental group will be allowed to drag words, and for what they will be informed at the beginning of the learning process.

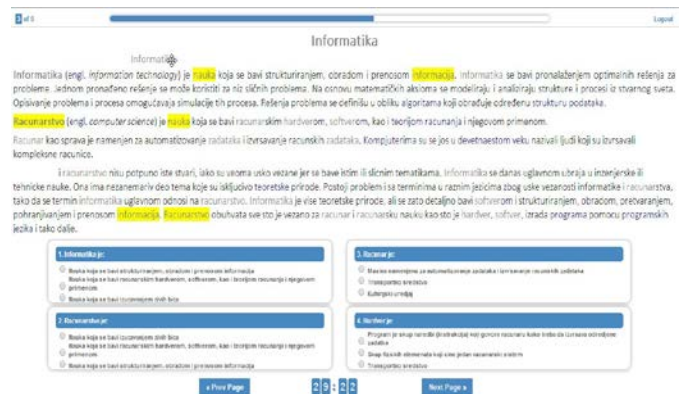


Fig. 3. The appearance of lessons combined with the quiz

After logging on to the system members of the control group will be welcomed, after which the system will display the first page of the learning material. The subjects of the experimental group after logging on to the system will be instructed to use DSI tool, then the system will display the first page of the learning materials. On figure 2 is shown appearance of the first few lessons. After that, the user experience will be the same for both groups (with the exception that the experimental group on all pages have access to the DSI). After a certain number of pages of learning material to the subjects will be shown a number of combined pages (in the upper part of the learning material in the bottom of the multiple choice questions about the material on the top of the page). On figure 3 is shown appearance of lessons combined with the quiz. The exact number of pages of both types depends on the particular choice of the material for learning. After a certain number of pages combined session ends. During the session user interaction with the system will be recorded (number of drags, couples of dragged words, selected answers to the questions, the time spent on each page and the time required to pass through the entire session).

Some of the parameters that can be used for measuring the impact of the DSI framework on learning acceleration are proposed further in the paper. The time needed for learning by using this concept will be compared to the time required to learn the same material without the possibility of using the DSI tool. The same lessons will be used for both groups of students. Also the answers given to the questions, the time necessary for answering those questions, and the accuracy of the answers will be compared between groups with/without possibility of using DSI concept while learning. These are some of the parameters that can be taken into account when measuring the impact of the proposed solutions to learning acceleration. The system is designed to record all user actions while learning. After conducting research the resulting data will be statistically processed. As already stated system is still under development, so there can occur some changes if there be a need for them.

## V. CONCLUSION

In the paper are discussed advantages and disadvantages of the implemented system for evaluating semantic tool for E-learning called DSI. Authors propose a solution to a problem that has been observed in the form of changes in approach to the evaluation. An immediate approach (students at the same time study and answer the question that are presented to them, and are related to the teaching material) is applied, counter to approach used in the previous version of the system (students first study new lessons and then after that take the quiz). As part of the research subjects will be presented instructional material, and instructional materials combined with questions related to material that is presented to them. In this way, the authors wish to encourage students to use DSI tool to use the possibility of dragging and dropping terms on each other. Depending on the results of planned research and feedback from subjects authors will make some modifications on the research. Also, depending on the outcome of the research, there is the option of introducing new parameters for measuring the impact of DSI framework on acceleration of learning (such as the linearity of students going through lessons in learning, etc.).

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