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SYSTEM FOR ADAPTIVE ANNOTATION OF HYPERLINKS IN THE CONDITIONS OF UNIVERSITY COURSES FROM THE FIELD OF INFORMATICS

Turčáni, M., Kapusta, J.

Constantine the Philosopher University in Nitra
mturcani@ukf.sk
jkapusta@ukf.sk

Abstract

The main aim of implementing adaptive hypermedia in education is the increase of effectivity of the learning process or the process of acquiring the information related to educational activities. One of the adaptive systems is the system for adaptive annotation of hyperlinks, iLMS. The paper deals with experiences in implementing this system at the Department of Informatics, Faculty of Natural Sciences, Constantine the Philosopher University in Nitra.

Key Words

adaptive hypermedia, e-learning, adaptive navigation, adaptive presentation, LMS Moodle, iLMS

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Introduction

E-learning has become a buzzword nowadays and it has been implemented more or less into various methods and teaching forms on the academic round. It is very important for teaching of Informatics to accept and effectively apply new IT technologies in order to enhance efficiencies in areas such computer sciences teaching and learning (Khan 2006).

During the last years, preconditions for a successful introduction of teaching by using e-learning and the combined form of study have been created at the Department of Informatics. In the first phases, methodics that gave rise to many e-learning courses have been developed. These courses have already been implemented and have become an important part of external studies program, but also a supportive material for internal studies in the field of Applied informatics and Teaching of Academic Subjects (Vrábel 2008).

To sustain a good educational trend by using modern ICT forces us to look for and to implement the newest methods and forms of teaching. At present, those seem to be AHS that represent a higher form of e-learning. The research beginnings in the field of AHS come from the year of 1992 at the University of Pittsburgh. By saying adaptive hypermedia systems, it is meant to be all hypertext and hypermedia systems that reflect certain user characteristics in a user model and that use this model to adapt different properties of the visible output that is presented to the user by the system. In other words, AHS should satisfy three criteria: it should be a hypertext or a hypermedia system, it should contain the user model and it should be able to adapt the hypermedia by using this model.

Adaptive navigation support

AHS are based on two groups of adaptive techniques: adaptive presentation and adaptive navigation support. The main concept of adaptive presentation is adaptive text presentation. Hence, among the adaptive presentation belong the techniques of alternative page fragments or the whole pages, alternative picture presentation, alternative text, drop-down text and others (Brusilovsky 2007).

Adaptive navigation support consists of influencing user's path in an information space. When using this technique, the system's adaptive core evaluates the applicability of each shown link for the given user and offers a result upon which it influences the user's path in the document system. This influence can be directive in such a way that the system disables the paths that aren't applicable for the given user and context or which are non-directive. In this case, the system presents recommended (or not-recommended) path in the information system to the user by using various instruments. When using the non-directive way, the system just sorts the links according to their relevance or distinguishes the important link differently (Bieliková 2006).

To achieve the listed navigation methods in information content, if using the directive or the non-directive approach, the following techniques are used mostly: direct guidance (the AHS guides the user in an information space, which means it selects the most applicable concepts and fragments assigned to them), sorting links (links leading to other pages are sorted hierarchically according to their relevance), links annotation (the adaptive system marks links that are advisable for the user), hiding links (the links that guide to the non-recommended information are hidden) etc.

The iLMS module

The iLMS module has been used for link annotation which enables to recommend links to a user according to metadata and defining of dependencies. The system recommends the links by using four tags: recommended link tag, 'neutral' link tag, a tag when the system could not decide according to the metadata and the not recommended link tag.

Figure 1: Layout of icons for links recommendation

The iLMS module is an addition to the Moodle system. From the technical point of view, the module contains a new adaptive course format (the format complements the traditional course formats, the thematical and weekly ones) and some blocks for creating adaptive content in LMS Moodle.

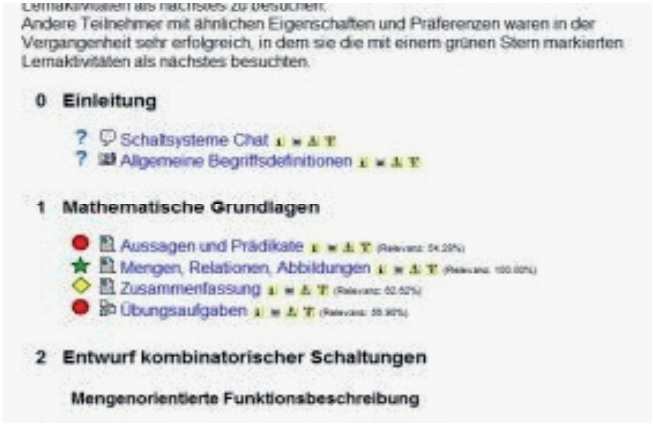

Figure 2: Course content design in a links annotation system

The module has been developed by Gert Sauerstein as a part of his diploma thesis „KI-Ansätze zur Lerner-Adaption in Lern-Management-Systemen' at the Technische Universität Ilmenau (Ilmenau, Germany). As the author states in his thesis, the module had been developed based on the ideas of P. Brusilovsky. After recommending each link, the module asks for evaluation of applicability and content relevance from the student.

The attraction of this module is the fact that it includes the mood and the student's actual motivation into the adaptive mechanism. This attribute is gained in a block of the Moodle system where the students can mark their current mood.

The disadvantage of the iLMS module is the fact that it is not being developed at the moment and also that it can be implemented into LMS Moodle 1.9+ only. Unfortunately, probably the greatest problem of the module is that it is only a prototype dedicated

for 'simple' courses only. These disadvantages have also shown up in our experiment when the system has been collapsing after multiple simultaneous access attempts of students.

Results

The advisability of using the iLMS module for adaptive links annotation has been examined in the end of the winter term based on the students' results of the end-of-term test. During the term, we have been monitoring three groups of students that were created by standard enrolling into groups. The students were divided into the following groups:

1. Without the LMS Moodle support (Unsupported) – a group where classical F2F teaching method was applied,
2. With 'standard' e-course support (Non-Adaptation) - a group that was supervised by using blended learning in LMS Moodle,
3. With adaptive system for links annotation support (Links Annotation) – a group where the adaptive iLMS system was used.

56 students have taken part in the end-of-term test. The groups seem to be equipollent at first sight – both groups have attended the same courses with the same teachers. Results of the end-of-term test can be seen in the categorized histogram that shows the post-test variable distribution in each group.

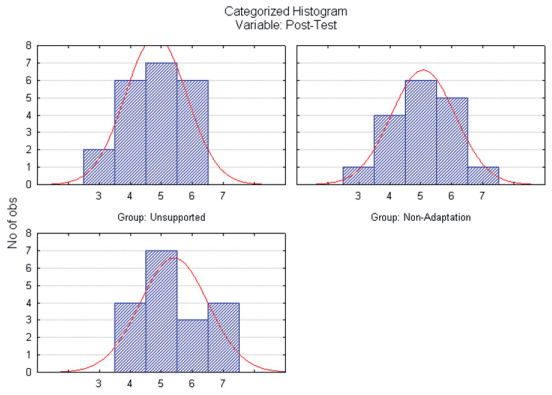

Figure 3: Categorized histogram of post-test variable distribution in each group.

The graph shows that slight abnormalities are apparent. Because of this, to examine the differences between groups in a post-test score, we will use the nonparametric median test.

Overall Median = 5,00000	Unsupported	Non-Adaptation	Links Annotation	Total
<= Median: observed	15,00000	11,00000	11,00000	37,00000
expected	13,87500	11,23214	11,89286	
obs.-exp.	1,12500	-0,23214	-0,89286	
> Median: observed	6,00000	6,00000	7,00000	19,00000
expected	7,12500	5,76786	6,10714	
obs.-exp.	-1,12500	0,23214	0,89286	
Total: observed	21,00000	17,00000	18,00000	56,00000

Table 1: Contingency table

Chi-Square	df	p
0,4805549	2	0,7864

Table 2: Median test

Based on the test results, we accept the null hypothesis stating that the post-test score difference is not statistically significant, this means the Post-Test dependant value does not depend on the Group factor.

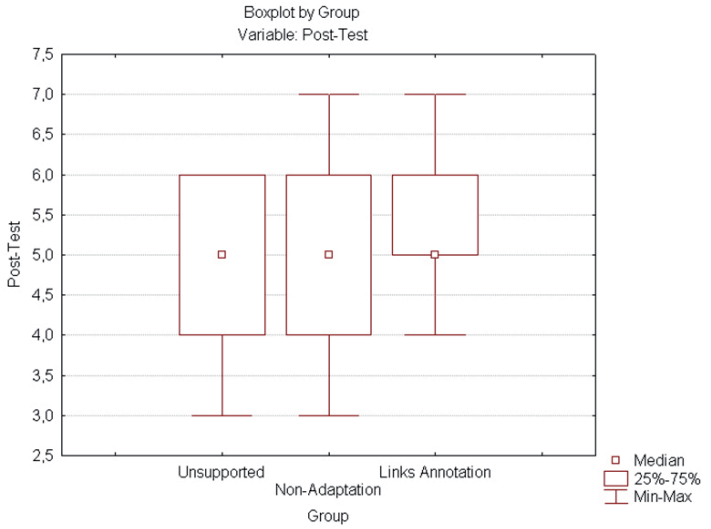

Figure 4: Graph of median test results

The previous graph visualizes the median test results. Although the results are not statistically significant, it is obvious that the results of students using the adaptive system for hyperlinks annotation are slightly better and more homogeneous.

Seeing that the applicability of implementing the adaptive system for hyperlinks annotation compared with the classical blended learning form has not been expressly statistically proven, we are thinking of using the adaptive system with direct guidance with its experimental examination in our further work.

Conclusion

The current task within the increasing of students' knowledge level is the field of adaptive management of educational activities of informatics-based subjects. It is closely connected to the personalization of education which enables the classification of the knowledge acquired by the student and consequently the regulation of his/her study. The outcomes published in the paper show that the application of this method into the Applied Informatics education was correct and reasonable.

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