No 62

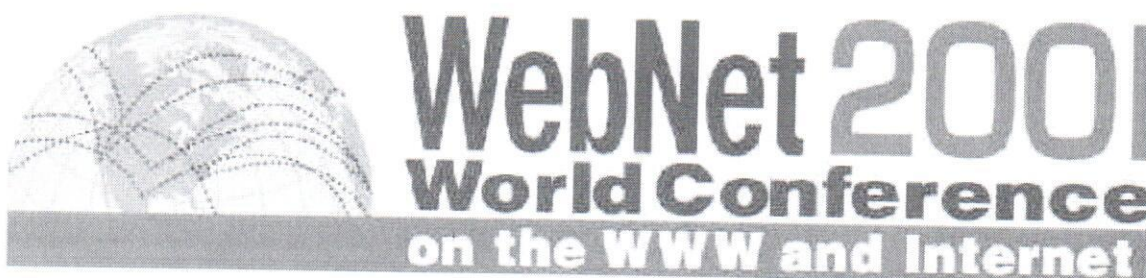I.A.A. 14.

WebNet 2001
World Conference
on the WWW and Internet

Session #: 78
Contact Name: Avgoustos Tsinakos
Decision: FullPaper
Topic Area: ELearning
Title: See Yourself IMprove (SYIM). Implementing an educational environment for individual distance education services and student modeling
Date: October 24, 2001   **Time:** 1:30 PM

Abstract:

Abstract

The current paper describes the implementation of domain independent a educational environment for the provision of personalized distance education services and for the construction of student models via distance, called See Yourself Improve (SYIM) to be applied to asynchronous distance education sessions. The core idea of SYIM is to help the tutors to monitor the individual learning needs and the misconceptions of the distance students and to keep a track of the feedback provided to each student. Additionally SYIM provides to the students the benefit of the intense supervision related to their individual learning needs and the effective support and guidance on how to overcome a misconception or remedy a performance gap in order to improve both their performance and their context comprehension

Demo URL: http://zeus.it.uom.gr/syim/ 3wview/index.htm (Viewed by Internet Explorer)

See Yourself IMprove (SYIM)
Implementing an educational environment for the provision of personalized distance education services and the formulation of student models.

Avgoustos. A. Tsinakos, Kostantinos. G. Margaritis ,

E-mail: tsinakos/kmarg@uom.gr
Department of Informatics
University of Macedonia

Thessaloniki
GREECE

Abstract

The current paper describes the implementation of domain independent a educational environment for the provision of personalized distance education services and for the construction of student models via distance, called See Yourself Improve (SYIM) to be applied to asynchronous distance education sessions.

The core idea of SYIM is to help the tutors to monitor the individual learning needs and the misconceptions of the distance students and to keep a track of the feedback provided to each student.

Additionally SYIM provides to the students the benefit of the intense supervision related to their individual learning needs and the effective support and guidance on how to overcome a misconception or remedy a performance gap in order to improve both their performance and their context comprehension

Demo URL: http://zeus.it.uom.gr/syim/ 3wview/index.htm
(Viewed by Internet Explorer)

Introduction

Student modeling is defined as the task of describing the knowledge and beliefs of the student as a basis for the decision on appropriate actions for feedback.

According Barr and Greer: "Student Model represents student understanding of the material to be taught with the purpose to make hypotheses about students' misconceptions and suboptimal performance strategies" (Barr et al., 1982).

In general terms, student modeling involves the construction of a qualitative representation that accounts for student behavior in terms of existing background knowledge about a domain and about students learning the domain. Such a representation, called a student model, can assist an intelligent tutoring system, an intelligent learning environment, or an intelligent collaborative learner in adapting to specific aspects of student behavior (McCalla, 1992).

A number of Student Models have been reported in the literature. Some of the implemented models were domain independent (Greer and McCalla 1994 ; Kass, 1989, p. 386-410; Bull and Smith, 1997, p. 339-341, Tsinakos and Margaritis 1999, p. 1071-1076) while some others had domain dependency (Katz et al., 1993; Conati and VanLehn, 1996; VanLehn and Martin1997, p. 179-221 ; Conati *et al.,* 1997, p. 231-242).

Student Models are used to elicit information from the students regarding their misconceptions or their weaknesses during the learning session. Furthermore, Student Models may be used to provide help and feedback to the students according to their learning preferences. The general achievements gained by the use of Student Models in education were the inspection and analysis of students' mental behavior, of their reasoning and of the knowledge that was believed to underlie such behavior.

Student Models can positively affect areas of distance education in a similar way as in conventional education, by promoting the achievement of better teaching and learning activities.

The discontinuity of the asynchronous distance education sessions, in addition to the lack of face-to-face contact, causes a pedagogical disadvantage affecting both the tutor and the students. Tutors are less capable of monitoring the individual learning needs of each of the distance students, and in forming a valid image of their performance progress. Thus feedback is more difficult to provide and to be used by the students, especially when the tutor is not present. Lack of intense supervision and support that is related to the students' individual learning needs might also be recognized.

The See Yourself Improve (SYIM) environment aims to remedy all these problems as it makes the feedback process more systematic and permits more communication between tutor and student. Additionally using SYIM a student model can be generated by recording the tutor's suggestions and feedback regarding the students' progress in addition to the comments made by the students regarding their personal problems or the misconceptions what have occurred.

SYIM can be used in any course/session available via distance in an asynchronous based scenario with no face-to-face requirements. The only limitation is that, in such sessions is assumed that a human tutor will supervise the students and that the students' evaluation process will include a number of written assignments. The course can even be a part of an under or postgraduate program and it is assumed that the number of students participating in the course will not be more that twenty to twenty-five.

Implementation of the SYIM

The SYIM model is a domain independent domain educational environment for the provision of personalized distance education services and for the construction of

student models, to be used in asynchronous distance education sessions. The model was partly based on the See Yourself- Write model introduced by Susan Bull (Bull, 1997)

The scope of implementing the SYIM was to remedy as many distance education problems as possible, such as discontinuity of the educational session, lack of intense supervision, hazy monitoring of distance students' progress or faint recording of their individual learning needs. In more detail, the core idea of implementing the SYIM model was: a. to help the tutors to monitor the individual learning needs and the misconceptions of the distance students, b. to keep track of the feedback provided to each student, c. to provide the students with the benefit of the intense supervision related to their individual learning needs and the effective support and guidance on how to overcome a misconception or remedy a performance gap in order to improve both their performance and their context comprehension.

To achieve these goals SYIM was implemented using three different interfaces/views. One was called "Tutor View," for the tutor's use, the other was called "Student View," used by the student and the third was called the "Administration View" to be used by the system administration. A detailed description of each view will follow.

As a first step the user is prompted to enter the assigned Username and the Password in order to login in the SYIM environment. According to the provided login, SYIM recognizes if the user is a tutor or a student and therefore logs the user into the appropriate interface/view.

The Tutor View

In case that the user is an instructor, "Tutor View" is uploaded and the following list of options appears in SYIM toolbar. In more detail Tutor's options are:

1. *Home Page*: To return to the SYIM Home Page,
2. *List all sessions*: To check all the sessions/courses in which the Tutor is participating.
3. *Setup a new session:* To create a new session /course to be taught,
4. *Edit session:* To remove a session/course that already exists.
5. *Logout*: To logout from SYIM.
6. An online help file is also available.

The options 3 and 2 are further discussed.

Setting up a new session: During the setup phase tutor has to define session's parameters. Each session has a title, a number of assignments and a number of evaluation criteria. The tutor is able to define a new evaluation criterion or to select among the list of the evaluation criteria that have already been defined by other tutors. The idea of displaying a list of the available evaluation criteria is to avoid duplications in the criteria formulation process and to help the tutor see what kind of evaluation criteria are used by other tutors. As a next step the tutor has to declare the students that are going to participate in the session. It is worth mentioning that at the time that students are selected to participate, SYIM sends an e-mail notification to each of these students. In more detail each of the participants receive an e-mail in which their login and password to the SYIM system is included

Beyond the parameters defined by the tutor, a number of session parameters are automatically generated by the SYIM. These are

Conference Participation Field: In this field the tutor provides the quantitative and the qualitative performance regarding student's participation in each conference session.

Overall Assessment Field: In this field, quantitative performance of the student on each criterion is automatically summed up.

Misconceptions Field: In this field the student reports potential misconceptions that might have occurred (Main concept), in addition to a short description of what the misconception concerned and why it occurred (Student's explanation). Furthermore, the tutor can reply to each student's request for further clarification, in the form of a conference, like a threaded discussion. By the end of the course the teacher is able to trace all the misconceptions reported by each student or all the misconceptions reported by all the students participating in the course, and use such information for further implementation.

How To Improve Field: In this field the tutor reports a potential performance problem, asking the student to give explanations or reasons why this problem occurred (self-reflection and explanation). Based on student's response, the tutor provides guidance on how such a problem can be remedied.

Total Field: In this field the student's total quantitative performance is reported both on each assignment and on the overall course. In addition the tutor can provide qualitative comments.

<u>*List all participating sessions*</u>: This option creates a list of all the sessions that are assigned to the particular tutor that has logged in, acting like an online tutor's agenda. To select a session, the tutor has just to click on the session's name. Once a session is selected, information regarding the selected session is displayed (Session-specific options) and the tutor's toolbar is further expanded to include some new options which are session sensitive. These options are:

1. Sessions-specific options: Via this option the tutor can check, beyond the general information of a particular session, the improvement of each trainee participating in the session. This can be done by clicking on a trainee's name and therefore the main performance table of the SYIM environment for the selected trainee appears providing the following information :Session Title, Trainee's name and e-mail , Titles of assignments, The evaluation criteria for the assignments, Conference Participation performance, Misconceptions that the trainee might have regarding the taught context and the instructor's comments on how the trainee's performance should be improved (How to improve)

The main table of the SYIM displays not only quantitative information regarding the trainee's progress (i.e. various marks assigned by the instructor) but also qualitative information (i.e., the instructor's comments on the assigned mark).

Every such table is unique and is assigned to each student participating in the session. According to the number of assignments set by the instructor during the session's set up phase, a corresponding number of misconception indices is created. This feature enables both the tutor and the student to monitor and post misconceptions in chronological segments according to the material context encompassed by each assignment. The instructor can check on the student's misconception list by clicking on the relevant hyperlink word of the misconceptions line. It is worth mentioning that only the trainee can create/post an initial misconception thread. Furthermore the instructor can read the student's misconception and provide a reply in a form of a www based message board conference.

A trainee can create as many misconceptions threads or replies as they think necessary. Likewise there is no limit to the number of replies posted by the instructor for a misconception to be overcome.

The option of How To Improve (HTI) has an analogous structure and implementation to that of the misconception option (www based message board conference) including a list of the instructor's suggestions on how a particular trainee's

performance can be can improved. It is important to mention that only the instructor may create initial HTI threads

2. *View all misconceptions:* This option provides the ability to the instructor to check on the misconception list of each of the session's participants at a glance. Each trainee's misconception appears in a list having the trainee's name on the top and the misconception titles, in red, as elements of that list. In this way, the instructor is capable of tracking all students' misconceptions in order to formulate an opinion regarding what was the most common misconception among the students, what was the most difficult part of the context for them, and what particular context comprehension difficulties each student was confronted with.

3 *View all HTI discussions:* Similarly to the "View all misconceptions" option, the current option enables the instructor to read at a glance the entire How To Improve discussion list of each of the session's participants. With this feature, the instructor is capable of tracking all students' performance problems and to identify what was the most common performance problem among them, what was the most difficult skill for students to achieve, and which part of context requires more guidance and support for the students. Similarly to the misconception list, the instructor can retrieve more information on the guidance provided to a trainee simply by clicking on the title of an HTI thread. In this case the correspondent HTI context and the relevant discussion appears in an expanded menu.

4. *Criterion/Assignment Graphic analysis*: Criterion/Assignment Graphic analysis in combination with Session Total Graphic analysis is two options for statistical use. The current option displays an analysis of trainees overall performance per evaluation criterion for each assignment (Figure 11). These diagrams enable the instructor to easily check trainees' performance on each criterion in order better understanding of students' comprehension ability to be achieved.

5. *Session Total Graphic analysis*: This option provides the instructor with a graphical representation of the final performance of trainees on a particular session. This diagram is a kind of easy and handy statistical information to be used as part of the session's summative evaluation.

The Student View:

In case that the user is a trainee, the "Student View" is uploaded and the following list of options appears in SYIM toolbar:
1. *Home Page*: Return to the SYIM Home Page,
2. *List all participating sessions:* Check all the sessions-courses that the student is participating in,
3. *Logout:* Logout from SYIM,
4. *An online help* file is also available.

Using this simple interface, student can access all the features of the SYIM model. Option 2 is discussed in detail:

List all participating sessions: This option creates a list of all the sessions that are assigned to the particular student that has logged in, acting like an online student's agenda. To select a session the trainee has just to click on the session's name. Having done that, information regarding the selected session is displayed.

By clicking on the hyperlink option "View your improvement in this session", the trainee can access the main performance table of the SYIM and read the instructor's comments, assigned marks or context related clarifications.

As was already stated in "Tutor View" section, the main performance table of the SYIM displays not only quantitative information regarding the trainee's progress (i.e.

various marks assigned by the instructor) but also qualitative information (i.e. instructor's comments on the assigned mark). Furthermore, by clicking on the appropriate hyperlink word of the misconceptions line, a list of trainee's misconceptions appears . The trainee can post a new misconception or check the instructor's reply to a pre posted misconception. The new element in this section is the student's ability to create a new/initial misconception thread using the "Create new misconception" option. Note that only the trainee can create new misconception threads while the instructor can only reply to them. It is worth to mention that there is no limit to the number of the misconceptions that may be posted.

Similarly to the misconception option, the trainee, by clicking on the hyperlink word (More) of the How To Improve (HTI) line, may view a list of the instructor's suggestions on how the trainee's performance can be can improved. The trainee can check the instructor's suggestions on a performance problem and reply to the instructor's post asking for further guidance.

Administration View.

This third component of "Administration View" was developed to remedy some administrative issues that may arose during an education session. To access this third component the user has to be verified as being SYIM's administrator by passing a double password check in order to ensure security. Once the user is logged in as administrator, "Admin View" is uploaded and the following list of options appears in SYIM toolbar. In more detail Administration's options are:

1. Home Page: To return to the SYIM admin Home Page
2. Edit instructors: This option creates a list of the tutors that are registered in the SYIM and it is selected when the administrator wants to disable an instructor's account, in case that the particular instructor does not belong anymore in the teaching staff or when an instructor's login profile has to be changed, for example the instructor's name or e-mail has been changed or a new password is required.
3. Add new instructor: This option enables the administrator to add a new instructor by entering the instructor's name, surname and email address. A notification e-mail informing the instructor about how to access SYIM (login name, password and URL to access) is automatically created and sent out to the predefined e-mail address and by the same time current tutor is added in the SYIM instructors list.
4. Edit trainees: This option, similarly to the Edit instructors, creates a list of the students that are registered in the SYIM and it is used in cases where The administrator wants to disable a student's account, in case that the latter does not participate in any session or a student's login profile has to be changed.
5. Add new trainee: This option enables the administrator to add a new student in a similar way to the option of "Adding a new Instructor".
6. Edit Criteria: This option creates a list of the evaluation criteria that the SYIM tutors have entered. It enables the administrator to be aware "at a glance" of the criteria available in the SYIM list and remove duplications or disable the unwanted ones.
7. Logout: To logout from SYIM admin view.
8. Finally an online help file is also available.

Summary

The SYIM model is a domain independent student model to be used in asynchronous distance education sessions. It can be accessed via the Web and the scope of implementing the SYIM model was to remedy as many distance education problems

as possible. It is comprised of three different interfaces/views; the "Tutor view" which is used by the instructor the "Student view" which is used by the students and the "Administration View" which is used by the system administration..

A number of facilities are available in SYIM to enable the tutor to monitor the students' progress and their learning needs. Similar facilities are available for the students, so that they can take the benefit of intense supervision related to their individual learning needs and of effective support by the tutor on how to overcome a misconception in order to improve both their performance and their context comprehension.

References

Baffes P. and Mooney R., (1996). Refinement-Based Student Modeling and Automated Bug Library Construction, *Journal of Artificial Intelligence in Education*, 7, 1, 75-116.

Barr, A., Beard, M. and Atkinson, R. C. (1982). The computer as a tutorial laboratory: the Stanford BIP Project. *International Journal of Man- Machine Studies*, 8, 567-596.

Bull S., (1997). See Yourself Write: A Simple Student Model to Make Students Think, *User Modeling: Proceedings of the Sixth International Conference*, UM97 Vienna, New York: Springer Wien New York:315-326.

Bull Susan and Matt Smith (1997). A Pair of Student Models to Encourage Collaboration, *User Modeling: Proceedings of the Sixth International Conference*, UM97 Vienna, New York: Springer Wien New York.

Conati, C., Gertner, A., VanLehn, K.and Druzdzel M. (1997). On-Line Student Modeling for Coached Problem Solving Using Bayesian Networks, *Jameson, A., Paris, C. and Tasso, C. (Eds.) User Modeling: Proceedings of the Sixth International Conference*, UM97, 231-242. Vienna, New York: Springer Wien New York.

Conati, C. and VanLehn, K. (1996). POLA: A student modelling framework for probabilistic on-line assessment of problem solving performance, *Fifth International Conference on User Modelling* UM-96, Kailua-Kona, HI: User Modeling Inc.

Greer, J. E. and McCalla, G. I., (1994). Student Modelling: The Key to Individualized Knowledge-Based Instruction, *NATO ASI, Series F*. Springer-Verlag.

Kass, R. (1989). Student Modelling in intelligent tutoring systems-implications for user modelling, *User Models in Dialog Systems* [A. Kosba & W. Wahlster, eds], Berlin, Springer-Verlag: 386-410.

Katz, S., Lesgold, A., Eggan, G., and Gordin, M. (1993). Modelling the student in Sherlock II. *Journal of Artificial Intelligence in Education* 3(4):495–518.

McCalla, G. (1992). The central importance of student modelling to intelligent tutoring. In E. Costa [Ed.], *New Directions for Intelligent Tutoring Systems*. Berlin: Springer Verlag.

Tsinakos A. A. and Margaritis K. G., Student Modelling Review-What can be learned for Distance Education?, *WebNet 99 - World Conference of the Web Society*, pp 1071-1076 Honolulu, Hawaii 1999.

VanLehn, K. and Martin, J. (1997). Evaluation of an assessment system based on Bayesian student modelling, 8, 179-221.