Automatic answering tool for e-learning environment

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This work is devoted to design a tool that can answer automatically students by using and exploiting past cumulated experiences in past e-learning sessions. This tool constitutes a new component to be incorporated in e-learning environments. For instance, this tool will be added to the system we are developing since several years that we have called PERSO. The main objective of PERSO is to introduce intelligence into e-learning environments by automating a set of its features (e-mail return, student profile determination, dynamic course generation, online assessment and generation of course material at the student level, …)

Keywords E-learning environment; automatic answering; latent semantic analysis; intelligent tutor.

1. Introduction

The goal of current works of the unity of research of Technologies of Information and Communication (UTIC) of the Higher School of Sciences and Techniques of Tunis, is to improve efficiency of e-learning by introducing intelligence into e-learning environments and automating a set of its features (e-mail return, student profile determination, dynamic course generation, online assessment of student and generation of course material at the student level, …). In this context, we are developing since several years a system that we have called PERSO. The goal of PERSO is to design and develop an adaptive hypermedia e-learning system [4, 5], where learners with different learning goals are treated differently, by building a model of knowledge and preferences about each of them. This model is used to generate automatically a personalized course fitting the needs of each learner.

In this paper, we present a new component to be added to our system and concerns the automatic answering of student questions in e-learning environment.

2. The automatic answering tool

The aim of this tool is to reduce lecturers’ work load and to give an immediate answer to the student (when possible) by exploring the cumulative experiences from previous students’ answers for the benefit of new ones. It is well known that in every learning session of a given course, students may ask the same questions and that tutors (who may be different) may answer the same answers.

![Fig 1 : The automatic answering tool](image-url)
Our approach consists of storing questions/answers (with the permission of the tutor) in a data base. If any e-mail’s similarity occurs regarding asked and/or answered questions, the tool tries to search for this information in the data base and answers automatically the student by giving him the stored data. Otherwise, the question will be submitted to the tutor. The functioning of the tool is summarized in figure 2.

![Functioning of the answering tool](image)

**Fig 2** : Functioning of the answering tool

2.1 Latent Semantic Analysis of questions
A key step of the approach consists on the semantic analysis of questions in order to compare them with others. To process this analysis, we calculate the semantic closeness between the current student’s question and previous questions saved in the data base. The semantic closeness is calculated by use of LSA.

![Latent semantic analysis](image)

**Fig 3**: Latent semantic analysis

The treatment of the question depends on the semantic closeness value returned by LSA as described in figure 4.
When the analyzer does not find exactly the same question saved in the database, the system uses other techniques. It proceeds to a refinement treatment of the collected questions when LSA could not give an accurate decision. This treatment uses the meta data introduced by the tutors who have saved the questions and their answers. Every saved question has been answered only one time when it first has been asked. In this case, the tool reacts in semi-automatic way. It may interact with the student by considering his opinion.

2.2 Refinement (Fuzzy treatment)
This section presents the fuzzy treatment adopted when the system can not recognize the question with high accuracy, i.e. when LSA gives a set of candidate questions with very close semantic closeness values. In this case, the automatic answering tool proceeds in two steps:

**Step 1:** It proceeds to a refinement of the result by using the Meta data of every question. Those Meta data contain information related to the subject of the question such as the related section in the course, the cognitive level, the pre-requisite sections…

This step leads to a reduced set of candidate questions.

**Step 2:** The system can react with the student by proposing for him the reduced set of candidate questions and asking him to select a question from the list else to reformulate his question differently and to submit it again to the system.

Whereas if the system does not succeed to treat the student question even after the last step, the system sends the question to the tutor for answering.

Figure 5 describes the fuzzy treatment process.

2.3 Steps of the treatment
To give more insight on the system’s work, we can identify two different phases:

2.3.1 Alimentation phase: during this phase, the data base will be alimented by questions/answers under the total control of the tutors. A tutor may decide or deny saving the selected questions and their answers with an appropriate interface.

2.3.2 Exploiting phase: it consists of answering automatically or semi automatically the student by using the previously stored data. Notice here, that the efficiency of the tool is ameliorated progressively as much as the data base of questions is alimented.
3. Conclusion

In this paper, we presented an automatic answering tool based on latent semantic analysis approach. The objective is to exploit the cumulative experiences from previous e-learning sessions in order to give an immediate answer to the student (when possible).

A prototype of the answering tool is currently under development. It is based on open source software i.e. MySql database, tomcat web server, JSP code and Linux operating system. We plan in the future to integrate it in the system PERSO in order to experiment and evaluate it before making it available at the internet for free use.

Fig 5: The fuzzy treatment
References


