Design of an Assistance Tool to Support the Tutor in the Setting-Up of Learning Situations

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ABSTRACT

Currently, tutors roles in distance learning are not clearly defined and few tools support them in their functions. Some tools help tutors to monitor learners and to interact with them, but no tool assist them in the setting-up of learning sessions. The activities are created by the instructional designer who envisages standard scenarios without knowing learners.

Thus, the aim of our research project is to create a system to help tutors to prepare learning situations, by adapting them to learners' characteristics. The first phase of our work consists in creating a general model of on-line tutoring. Then, this model is integrated in the system in the form of a frame-based ontology containing learners' characteristics and parameters of learning situations. An inference engine then creates links between these characteristics by reasoning on the ontology. Finally, some rules deduce relations between ontology elements in order to give the tutor advice.

INTRODUCTION

With the Internet generalization, information and communication technologies (ICT) play a prominent part in distance learning. It involved a new definition of teacher roles, even if up to now these are rather badly defined.

Our work contributes to the identification of tutor's role, in particular during collaborative learning situations. It consists on the one hand, in modelling the place and the role of the tutor within this learning situation and, on the other hand, in designing a system aiming at helping the tutor to take into account learners' characteristics during the setting-up of learning sessions.

In this article, we first explain the research issues which led us to supply an assistance tool to the tutor. The next section proposes a model of online tutoring. The sections that follow present the design of the system, of which we show an example of implementation tutor in the form of rules which advice the tutor. The final section presents an overview of our work in progress.

RESEARCH ISSUES

According to a socio-constructivist approach (Doise and Mugny, 1984), interactions between learners play a dynamic role to individual learning. In this way, collaborative learning activities are more and more used in distance education. This kind of activities, like project-based learning, has already proved to be useful (George & Leroux, 2001). Indeed, the setting-up of collaborative activities is not easy, due to the fact that it must be adapted to learners' needs and characteristics (Inaba & Mizoguchi, 2004).

In most distance courses, tutor has mainly a psychological and methodological role to support learners. Our approach of tutor's roles is based on the view of George et al. (2004) and Denis et al. (2004) for whom the tutor is seen like a pedagogue who has the possibility to build and to adapt activities to learners' needs, as long as the instructional designer

Figure 1. Role of the tutor's assistance tool to set-up learning situations
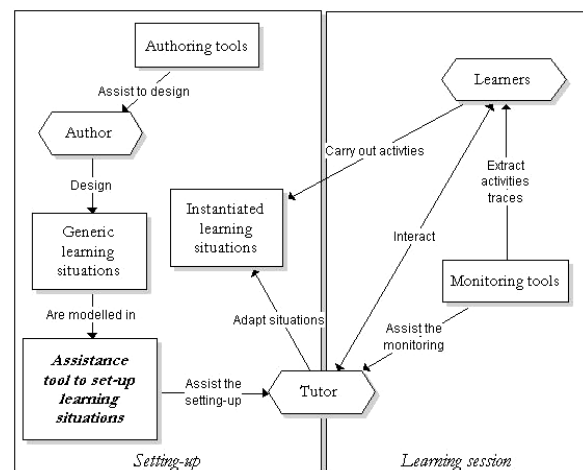
envisaged a variety of activities and possible situations of learning. In this case, tutor's role is not limited to monitor and support learners: it also consists in preparing specific learning situations from existing generic situations.

The instrumentation of tutor's activity in distance learning environments is still little developed. Research was rather centred on the characterization and the standardization of learning activities in order to assist authors in the designing of scenarios, and tutors to support them to monitor learner's activities and interact to solve difficulties (Després, 2003). Noting this deficit, we thus wished to offer to tutors a tool to assist and advise them in the setting-up of learning sessions, by creating links between learners' characteristics and activities parameters.

Figure 1 highlights the role of the assistance system for the tutor to help him to set-up learning sessions. Learning situations consist of a set of activities carried-out by a learners group engaged in the same objective. Project, case study, problems resolution… are examples of learning situations.

MODELLING OF THE ON-LINE TUTORING

The modelling work was realized with the software MOT[1] (Modeling using Object Types), an object-oriented modelling tool, developed by the Tele-University of Quebec (Paquette, 1996). The objective of this modelling is to identify actors and resources of collaborative learning situations, as well as their links with the tutor. This tutoring model centred on the tutor declines in fourteen diagrams MOT, developing several levels of details, an example of which we present in this part.

This work led to the identification of:

Figure 2. Learners' characteristics identification

Figure 3. Properties associating to learners their characteristics in Protege2000
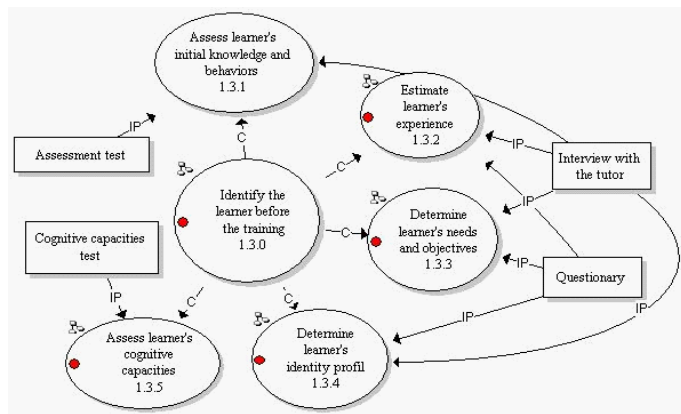
•   Actors of the course: tutor, learner, workgroup, instructional designer, conception and realization team, and computer designer.
•   Educational variables which represent roles and degrees of freedom given to tutors.
•   Resources which the tutor has at his/her disposal during the course.
•   Learners' characteristics which could influence their learning (Brusilovsky, 2001): learner's knowledge and behaviour, his/her experience, identity profile (curriculum-vitae, cultural origins, interests and habits), needs and objectives, and cognitive capacities (figure 2).

Figure 2 is an example of a MOT diagram. It describes learners' characteristics the tutor can identify before a course. To each characteristic are associated resources which can help to obtain them. A questionary and an interview with the tutor are examples of resources.

This representation makes it possible to highlight links between procedures (symbolized by circles), concepts (symbolized by squares) and actors (symbolized by hexagonal shapes). These links can be composition links (labeled C) and input/output links (labeled I/P).

## DESIGN OF THE TUTOR'S ASSISTANCE TOOL

Development Choices
The system must be able to adapt to learning situations which vary according to the type of online courses and tutoring model applied. That's why we chose to separate knowledge and reasoning, the system being based on ontology. Ontology has the advantage to make explicit what is regarded as implicit in the field (Kasai *et al*., 2004), to use a vocabulary comprehensible by all actors, to re-use and make evolve this vocabulary.

Concerning the implementation, we chose the software *Protege2000*[2], a tool for modeling and knowledge acquisition developed by the University of Stanford, in the United States. The plug-in *JessTab*[3], integrated into *Protege2000*, makes it possible to introduce the knowledge stored by *Protege2000* into a data base, in order to be inferred by some rules written in the inference engine *Jess*[4], an expert system independent of *Protege2000*.

Ontological Model
The developed ontology resumes the concepts brought out during the first work of tutoring modelling. Furthermore, it associates to each concept properties and relations. For example, in order to associate to learners their characteristics, we created two different concepts: Actor and Actors' characteristics (Figure 3). Both concepts are connected by
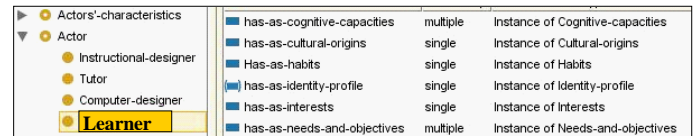
properties of the class Actor which are instances of the class Actors'characteristics.

To give a structure and describe learning situations, we referred to the granularity levels of the standard IMS-LD (IMS Learning Design)[5]. This model, based on the EML standard (Koper, 2001), describes a formal way to represent the structure of a Unit of Learning and the concept of a pedagogical method specifying roles and activities that learners and support persons can play using learning objects.

In the ontology, activities are decomposed in the following way:

Course -> Learning situation -> Activity ->Resources and communication tool -> Media

The course corresponds to the unit of learning described in IMS-LD. Learners carry out a set of activities within a same learning situation. In a case study-based learning, an activity can be the problem formalization, searching for causes or solutions. Some resources (web resources, books, paper documents …) and means of communication (chat, forum, e-mail…) are offered to actors before and during learning sessions. They represent the learning environment. A resource is composed of media (picture, video, sound…).

IMPLEMENTATION OF RULES TO ADVICE THE TUTOR
The implementation of the system consists in writing different types of inference rules, having no ambition to be totally educationally valid at this time of the project; they only show the feasibility of the system. The types of rules are the following ones:

•   Rules which create links between learners' characteristics.
•   Rules which deduct advices to the tutor concerning the type of pedagogy to be applied for each learner, according to some of his/her characteristics.
•   Rules which create links between activities' parameters and learners' characteristics by advising the tutor an activity to attribute to a learner according to some variables.

For example, let us consider a learner which has just validated an activity. We have developed a rule which advises the tutor an activity to attribute to the learner and the modality associated (individual or collective), according to the need of autonomy declared by him/her.

```
(if (and (eq ?pre_required_activities ?validated_activities)
         (eq (slot-get ?activity modality) individual-or-collaborative))
   then (foreach ?need (slot-get ?learner has-as-needs-and-objectives)
        (if (eq (slot-get ?need autonomy) TRUE)
        then (printout t "Propose to learner "?name" to do the
        activity "?activity_name "individually."crlf))
```

CONCLUSION AND FUTURES DIRECTIONS
We conceived a tutoring model which details the functioning of online tutoring: tutor's roles and degrees of freedom, learners' characteristics, resources and means of communication available. We implemented this model in the form of an ontology which integrates all the concepts, by specifying their properties and relations. Finally the development of the system containing rules, which apply on the classes instances of the ontology, showed the feasibility of our assistance system to set-up

learning situations. Moreover, the diversity of rules shows the flexibility of the system and the many prospects offered.

Our research will be directed towards two axes: the evolution of the tutoring model and the complete implementation of the system. We are in relation with several tutors of various formations which are interested in working in collaboration on this subject. It will be as many possible grounds for our future experiments. Concerning the tutor's assistance system, we want to give tutors the possibility to modify and create themselves learning rules, thus ensuring a feed-back on uses and a good appropriation of the tool. We have also in prospect to associate an interactions analysis agent to automatically feed the system with data concerning interactions between learners. This information will guide the tutor in the setting-up of sessions to come.

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ENDNOTES

[1] http://www.licef.teluq.uquebec.ca/anglais/real/mot.htm

[2] http://protege.stanford.edu/

[3] http://www.ida.liu.se/~her/JessTab/

[4] http://herzberg.ca.sandia.gov/jess/

[5] http://www.imsglobal.org/learningdesign/index.html

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