Adaptive Help System Based on Learners 'Digital Traces' and Learning Styles

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Abstract—Learning management system (LMS) such as Claroline, Gane-sha, Chamilo, Moodle, are commonly and well used in e-education (e-learning). Most of theTechnology Enhanced Learning (TEL) focus on supporting teachers in the creation and organization of online courses. However, in general, they do not consider individual differences of each learner. In addition, they do not provide enough indicators which will help to track the learners.

In this paper, we investigate the benefits of integrating learning styles in the Web-based educational systems. Also, we are interested in the use of interaction traces in order to address the lack of feedback between the learner and the teacher.

Generally, we aim to offer a tool that allows the tutor and the instructional designer to interpret learner courses, in order to provide help as needed for each individual.

1 Introduction

In recent times, more and more institutions and universities in Morocco offer online courses and training. Some of these courses are hybrid (blended learning) combining eLearning and the classic learning mode often called "face-to-face", while others are conducted entirely online. However, online courses need an environment, where they shake up managed and organized. In most cases, this task is performed by a learning management system (LMS). LMS offers a variety of functions to support teachers in the creation, administration and management of online courses.

However, these environments lack many features, such as the evolution and adapt-ability of learner aids in different learning situations. Also, they generally do not consider the individual differences of the learners and treat the learners in an equipollent manner, thus neglecting their personal needs and characteristics. This blocking or analogy approach to learning often leads to frustration, boredom and also a high rate of dropping out of online courses [1], [2], [3].

To overcome these problems, adaptive help systems are used to provide the right amount of information at the right time by adapting the content of the help system according to the knowledge, need and learning style of each individual.

2 Adaptive Help Systems

Adaptive Help Systems (also known as Intelligent Help Systems) is a specific type of help system. As well as a recognized research direction in the fields of artificial intelligence (AI) and TEL. The goal of Adaptive Help Systems (AHS) is to provide personalized help for users who work with complex interfaces. Unlike traditional help systems, which serve the same information in the user's request without considering their individual differences, AHSs try to adapt to individual users' knowledge and goals by offering them the most relevant information in the most relevant way.

To be useful, an AHS help message must present theinformation that are new and relevant to the user's current purpose. To determine what is new and relevant, AHS tracks the user's goal and knowledge about the interface and maintains a user's model. There are two main user modeling approaches in AHSs that are: "ask the user" and "observe the user".

In our case experience we aim to use both approaches, using in the first approach a questionnaire that determines the learning style [4] of the learner, and analyze the traces of interactions [5] of this last with the "observe the user" approach.

3 Learning Styles

Learning styles are becoming more and more integrated in learning technology and a lot of research is being done in this area [6], [7]. Such as, systems developed to offer adaptability according to students' learning styles and students' skills. Although several models of different learning styles exist in the literature, for example the model by Kolb [8] and Honey and Mumford [9], the Felder and Silverman model (FSLSM) [10] is one of the models most commonly used in adaptive education systems in recent times and some researchers even claim that FSLSM is the most appropriate model used in adaptive systems ([11]; [12]). Most other styles of learning models classify learners into a few groups, while FSLSM describes a learner's learning style in more detail, distinguishing between four-dimensional preferences: active / reflective, sensory / intuitive, visual / verbal, and sequential / global. For each dimension, there is a value of 11 to -11 which indicates the preference on the respective dimension. These values represent trends, for example, by saying that even a learner with a highly active learning style can sometimes act thoughtfully.

4 Traces and TEL

Personalization of the Technology Enhanced Learning (TEL) is defined as taking into account elements specific to a learning process as it unfolds for a particular learn-

er [5]. These specific elements that constitute a source of information on the experience of use are called: the traces of interactions. We define an "interaction trace" as any computer object in which data accumulates about the interactions between a computer system and its user [13], we find another definition of the trace given by Settouti [14]: "The trace is defined as a temporal sequence of observed". The term "temporal sequence" denotes the existence of a relation of order organizing the data of the trace with respect to a time reference. The term "observed" when it is defined by Laflaquiére [15] as "any computer object describing an element derived from the observation of the activity of use of a computer environment."

Multiple use can be found for traces in the context of the personalization of TEL such as documentation of learning activity [16], or exploitation for direct reflexive use [17]. But regardless of the type of reuse of interaction traces that is made, the need to collect process and visualize the traces arises.

The Modelled Trace System (MTC) formalizes the treatments to be applied to the "trace" from its collection to its visualization in a very generic context. It applies to any type of environment, especially to TEL [18]. According to Damien Cram [13], an MTC is composed of several interdependent modules:

- The collection system captures interactions through tracing sources, and creates a first trace: the "first trace".
- The transformation system is the heart of the SBT. It allows to obtain other traces from the collected traces. The choice of the transformation model to apply to a trace depends on the intention to use that trace. All traces collected and transformed is then accessible via a query system and a visualization system.
- The visualization system should provide the opportunity to have an ergonomic and potentially interactive view of the MTC traces, to allow their analysis and interpretation. The visualization system can rely on the query system. Currently, systems using traces usually have a visualization module, but the operation of a generic visualization system has not been very well studied.
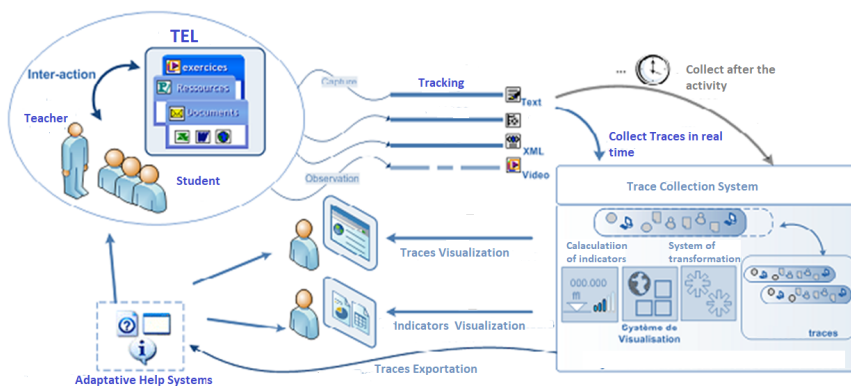

Fig. 1. ATEL based on an MTC [5]

The concept of TEL is a very broad concept and has a lot of application. As a result, we will only consider the interactive computer environments used by the learner in a personal or collective learning activity. Fig. 1 [5] presents an integration scenario to cover a good part of the current uses of learning traces for the personalization of this learning. It can be considered that this figure illustrates the "observe user" approach of the adaptive helper system.

5 Implementation and Future Work

As part of our research project, we have been able to install a distance education platform"ISIF Master Training" (see Fig. 2) for the benefit of the students of the Master's degree in Information Systems Engineering and Training. the faculty of sciences ben m'sik, which we also integrate training courses in addition to other tools of the web 2 (wiki, bolg, forum, chat, ...)

Fig. 2. E-learning platform ISIF Master Training[1]

Also, to fill in the social part of our research project and to take advantage of the different benefits of the ePortfolio, we were able to integrate the Mahara system with the LMS Moodle using the interoperability specifications supported by both systems.

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[1] http://maarifcentre.ma/misif/

This allowed us to browse and recover files from the LMS Moodle and integrate them into Mahara and vice versa [19].

Fig. 3. Home page of ISIFePortfolio [19]

In the next steps we will try to apply the two approaches of user modelling in the AHS, first "ask the user", we will develop and integrate a questionnaire in our Moodle platform to automatically detect the learning style of the students. And afterwards in the approach of and "observe the user" we will try to analyse the traces of interactions of students in the platform, which will allow us to identify their behaviour in real time in the platform.

These results will be used later to help learners with difficulties and / or offer them an additional simple activity in addition to interacting with all students working on the same activity.

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