Abstract

The aim of this paper is to present an Constructivism Approach for an Educational Adaptive Hypermedia Tool. The learning platform has a constructivist approach, assessing the user knowledge and presenting contents and activities adapted to the characteristics and learning style of the student. The platform allows the students and teachers to autonomously create and consolidate knowledge, with permanent automatic feedback and support, through instructional methodologies and educational activities explored in a constructivist manner.

1 Introduction

The main objective of Adaptive Systems is to adapt its relation with the user (content presentation, navigation, interface, etc.) according to a predefined but updatable model of the user that reflects his objectives, preferences, knowledge and competences [1].

For Educational Adaptive Systems, the emphasis is placed on the student knowledge in the domain application and learning style, to allow him to reach the learning objectives proposed in his training [2].

Constructivism is the dominant learning theory of the last decade and according to this theory, knowledge is actively constructed by the student with an adaptive process. The application of the constructivist learning theory is more and more used and it suggests that the students do not keep simply the information in a way static but look for blocks of old knowledge related to construct a new and more significant "learning" process [5].

This paper is organized as follows. Section II provides a general approach to Adaptive Hypermedia Systems (AHS) and Learning Styles concept. Platform development and Some Results and Conclusions are presented in section III and IV.

2 Adaptive Hypermedia Systems

Adaptive Hypermedia (AH) is generally referred as a crossroad in the research of Hypermedia and User Modeling (UM) [1]. An AHS builds a model of the objectives, preferences and knowledge of each user and uses it, dynamically, through the Domain Model and the Interaction Model, to adapt its contents, navigation and interface to the user needs.

De Bra in 2004 [2] indicates that these systems must present the functionality to change content presentation, links structure or links annotation.

Several architecture models already have been implemented with success, like for example the [6]:Dexter Model; Amsterdam Hypermedia Model (AHM); Adaptive Hypermedia Application Model (AHAM) or;Munich Reference Model.

The key of constructivism theory is that student must be actively involved in the learning process. It is important that teachers understands that the construction of knowledge acquisition occurs from knowledge that student already possess and differs
from Student to Student. The role of the Teachers is now to be a guide for the student [3].

The emphasis in student individual differences is also important in a context to recognize, design and support students activities (tasks). In constructivism learning theory, Students have different learning Styles. Also, the capacity of adaptation in different social contexts and the constructive social aspect of knowledge must be taken in consideration [3].

Generally, Learning Styles is understood as something that intent to define models of how determinate person learns. Generally it is understood that each person has a Learning Style different and preferred with the objective to achieve better results. Some case studies have been proposed that teachers should assess the learning styles of their students and adapt their classroom and methods to best fit each student's learning style [4].

4 Platform Development

Our platform application is based on AHA! (Adaptive Hypermedia Architecture). AHA! is a Web-based adaptive hypermedia system and is able to perform adaptation that is based on the user's browsing actions (Fig 1) [6]. AHA! is a Open Source project built on Java Servlet technology, use XML and XSLT and the database support is mySQL [6]. AHA! provides some adaptation features like for example adaptive content by conditionally including fragments, and adaptive navigation support by annotating links [6].

4.1 Definition of our platform

The learning platform developed has a constructivist approach, assessing the user knowledge and presenting contents and activities adapted to the characteristics and learning style of the student. Also, the platform allows the students and teachers to autonomously create and consolidate knowledge, with permanent automatic feedback and support, through instructional methodologies and educational activities explored in a constructivist manner.

The adaptation of the application is based on progressive self-assessment (exercises, tasks, etc.) (AHA! present only Multiple-Choice Tests) solved by the student that evolve in difficulty and topic. The scheme is set by the teacher but is individualized to each student's level of knowledge, competences, abilities and learning path. The platform is also connected to tutorials that are contextually accessed by the students when they fail a progression step.

The constructivist approach is also in the sense to suggest some references to the student according with the response of the progressive self-assessment (exercises, tasks, etc.).

In order to evaluate the system a set of courses in one Polytechnic school are used.

The student must access the platform in a classroom adapted for this effects two sessions per week (two hours each) with the teacher guidance and also more four hours per week from any local with access to Internet.

All the privacy aspect is considerate in account in the application.

4.2 Student Model Implementation

The approach to build the User Model (UM) is the Stereotype Model with the overlay model for the knowledge representation of the student.

The representation of the stereotype is hierarchical. Stereotype for user groups with different knowledge have been use to adapt information, interface, scenario, goals and plans.

The User plan is a sequence of user actions that achieve a certain goal. The System observes the user actions and try to infer all possible user plans. This goal is possible because the system possess a library of all possible user actions and the preconditions of those actions.

4.3 Domain and Adaptation Models Development

The Domain Model represents concept hierarchies and the related structure for the representation of the user knowledge level (quantitative value).

The Domain and Adaptation Model use the student characteristics from the User Model (UM). With these functions, it is possible to define the concept graph by each user to use in the Adaptation Model to “apply” on
the Domain Model of the system. The route used in the
date is defined by: The interaction with the student
using a progressive assessment; The student knowledge
representation defined by the Overlay Model and The
user characteristics in the UM.

The system adaptation (adaptation to content or
links) to the user can cause user model updates as well.

4.4 Interaction Model

In the Interaction Model, the system presents the
 functionalities to change the content presentation, the
structure of the links or the links annotation with
the follow objectives of the student. To guide the user to
the relevant information and keep him away from the
irrelevant information or pages that he still would not
be able to understand it is use the technique generally
known by link adaptation (Hiding, disabling, removal,
etc.). Also, the platform supply, in the content (page),
additional or alternative information to certify that the
most relevant information is shown. The technique that
is use for this task it is generally known by content
adaptation.

The interaction model is able to use multimedia
adaptation technologies to choose the type of the
content more appropriated according to the profile of
the student (for example, according with some user
disability).

The constructivist approach is also in the sense to
suggest references and activities to the student
according with the response of the progressive self-
assessment exercises, tasks, etc.

5 Some Results and Conclusion

The first version of the framework presented in
previous section, was already implemented, tested and
evaluated in learning processes in higher education [5].
The collected evaluation data has showed a very high
degree of interest and motivation from students and
teachers alike, resulting from its use. Students also
perceive this tool as very relevant for their learning, as
a self-operating application to be integrated in a more
global learning strategy that includes also tutoring
(direct contact with the teacher) and peer learning.
Teachers agree with these definitions of the platform,
as well [5].

Another result is the definition of a new strategies
and architecture for the implementation of an
Educational Adaptive Hypermedia platform.

The capacity of adaptation of these tools in relation
to the different necessities and the diversity of the
background of each student is necessary for bigger
effectiveness and efficiency of the learning process.
The increased responsibility of the student in the
education process, is in accordance with the
individualization and adaptability of learning process
proposed in. It will be also possible to introduce more
responsibility to the student in his learning process,
namely in the individualization and adaptability of
learning.

At present, ours research of the Student Model and
AHS, goes in the direction to make possible the reuse
of each student model in different systems. The
standards are more and more relevant for this effect,
allowing the systems to communicate and to share data,
components and structures, at syntax and semantic
level [2], even if most of them still only allow syntax
integration.

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