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AHKME eLearning Information System. A 3.0 approach

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Abstract. AHKME (Adaptive Hypermedia Knowledge Management E-Learning Platform) is an eLearning Information System that has evolved in order to fulfill the web-based learning requirements when they are compliant with a Web 3.0 philosophy. The ideas behind Web 3.0 are related to more semantic and intelligent systems, AHKME is devoted to allow teachers accessing standardized resources and evaluating integration and reuse possibilities in eLearning systems, not only content but also learning strategy. The educational resources adaptation in AHKME is supported by a set of collaborative tools, which also allow the users' feedback provision that is stored in system database. The semantic component in AHKME is based on a set of tools for the instructional designer to create/customize specifications/ontologies to give structure and meaning to resources, manual and automatic search with recommendation of resources and instructional design based on the context, as well as recommendation of adaptations in learning resources. Finally, AHKME takes into account the mobile learning (mLearning) capabilities allowing access by teachers and students to learning resources, regardless of time and space.

Keywords: eLearning 3.0, Web 3.0, Ontologies for eLearning; Standards and Specifications, Knowledge Management, Metadata; Instructional Design; Collaborative tools.

1 Introduction

As the world naturally evolves, internet does too. Nowadays we live times of change on the web with web 2.0, social networking and mass collaboration [4], even showing already some signs of what Tim Berners-Lee and guru Nova Spivak predicted as semantic web, intelligent web or in broader terms Web 3.0 [11].

One of the fields that have expanded information technology lies in the implementation of systems for distance learning. Currently, there are many eLearning systems, but the main difficulty lies in structuring the in line content and information with the

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existing learning models in order to achieve greater integration and comprehensiveness of the learning environment and by this providing better quality education. At the same time, yet there aren't too many tools and eLearning systems for web/eLearning 3.0, enabling the practical point of view or preparing to implement the semantic web, mobility of resources, as well as the universality of learning design, allowing teachers to approach the design process in an intuitive and practical way.

In these kinds of learning environments the access to standardized information is very important where it has to be perceived and processed into knowledge. One of the problems that have emerged from this process was how to represent knowledge. Standardization was indispensable, to provide semantic representation of knowledge through ontologies where concepts are clearly and unambiguously identified, providing a set of semantic relation types to represent meaning by linking concepts[7][2].

Trying to address these needs we have been developing AKHME [10] a system that uses the IMS specifications in order to reach goals like: learning object management and quality evaluation; standardization of all resources; and the interaction of all subsystems through the feedback between them allowing the platform to adapt to students/teachers characteristics and to new contexts.

Regarding Web/eLearning 3.0 we have been developing/adjusting this system to meet some requirements of this great concept, addressing issues like collaboration, machine learning, the need of global database, and integration between systems.

In this paper we will start to present the importance/impact of the called evolution to web/eLearning 3.0, the structure of AHKME and the developments/evolutions made to the system. Finally we'll present some conclusions and future work.

2 Web/eLearning 3.0

While the concepts behind Web 2.0 are about social networking, where systems/platforms like Myspace, Twitter, Facebook and Orkut were introduced, and mass collaboration, where the boundaries between authors and the users are thin, the concept behind Web 3.0 is slightly different, is based on web applications that provide value to the user through the usage of intelligent applications giving them a more accurate and precise information [3]. The idea behind this concept is that information should be available anytime, anywhere, anyhow, by this meaning that it should not only be available on common desktops but also in all types of devices that can somehow display web contents. This kind of concept raises the issue of interoperability where different devices and applications must interact with each other, allowing a freer environment for the final user. The main idea is to use technologies like XML, EDF, OWL, SPARQL, to standardize the information so it can be readable by anyone, allowing this way the desired interoperability between systems.

Besides this, Web 3.0 aims a little further with the usage of 3D where virtual environments may become a common use like Second Life and personalized 3D avatars.

One of the main concepts behind Web 3.0 is the semantics, where using semantic technologies and tolls powered with semantic understanding we can provide valuable

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information to users. All these may be achievable through the usage of a common language (standards) and intelligent systems that may extract meaningful information.

As for the eLearning 3.0 concepts, they aren't too distant from the Web 3.0 concepts since the all idea is to use all these potentialities of Web 3.0 on eLearning.

According to Steve Wheeler eLearning 3.0 will have at least four key drivers: Distributed computing; Extended smart mobile technology; Collaborative intelligent filtering; 3D visualization and interaction [12]. All these key drives meet the concepts behind Web 3.0.

eLearning 3.0 aims to reach a wider range and variety of persons being available on different kinds of platforms/systems, through different tolls and devices, where users will have the possibility to personalize their learning and have an easier access to comprehensive information. The usage of mobile technologies will certainly have a great impact in eLearning 3.0, nonetheless the availability of tools, services, resources and support will play an important role, since a new perspective of usage is being created.

This situation may turn eLearning into a cross-social learning methodology since it will be possible to be applied in all contexts, making collaboration easier. Possibly learners will take much more of the responsibility for setting up their own blogs, wikis, and podcasts and for creating their own networks where the role of the teacher may change to facilitator and where learners may be responsible for their own learning[5].

The 3D visualization devices will become more readily available, with interfaces like the ones provided by iPhone or Microsoft Surface, and the usage of 3D avatars.

3 Preparing for Web/eLearning 3.0

To address the issues mentioned before, we have been developing/adjusting/expanding AHKME in order to include tools and features to support them. AHKME is an eLearning system, that is mainly divided in four different subsystems (Learning Object (LO) Manager and Learning Design (LD), Knowledge Management, Adaptive, Visualization and Presentation subsystems) like presented on figure 1.

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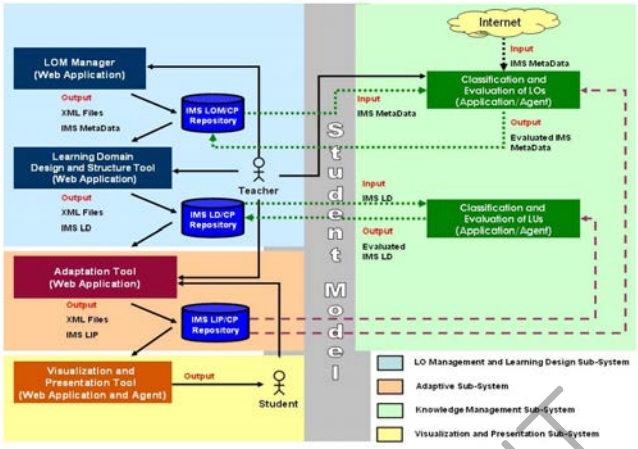

Fig. 1. AHKME's frontend.

These subsystems were structured taking into account a line of reasoning, where first we have the process of LOs creation and management, which is followed by the course creation process through the learning design.

In parallel with these two processes the Knowledge Management subsystem evaluates the quality of the available LOs and courses. Then they pass through an adaptive process based on the students' characteristics to be presented to them, a screenshot of the system is presented on Figure 2.

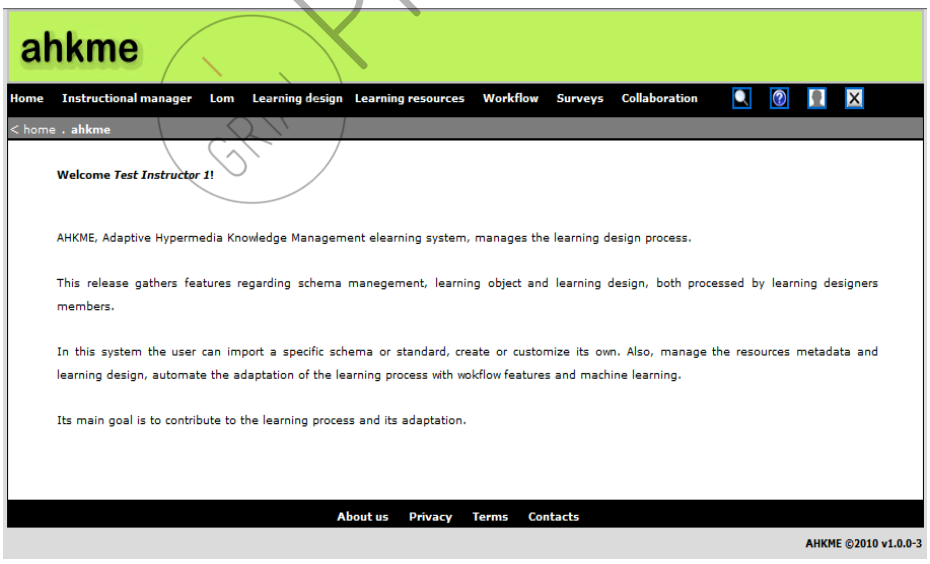

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Fig. 2. AHKME frontend.

We will now focus on the components of the system that have been developed/adjusted/expanded to address the needs of Web/eLearning 3.0 and that provide the management and evaluation of resources.

3.1 Subsystems and Tools

Here we will describe the different subsystems and the contributions they give in order to address the needs of Web/eLearning 3.0.

The LO Manager and Learning Design subsystem is the subsystem that deals with the LOs and Course management. It allows teachers to define/create metadata to describe LOs using the IMS Learning Resource Metadata (IMSLRM) specification [1] and define the learning design components, create and structure courses using the IMS Learning Design specification [7].

The Learning Objects Manager is a tool that allows teachers to define and create metadata to describe LOs. It uses the IMS *Learning Resource Metadata* specification.

All the information is stored in XML manifests that gather all the XML files with their metadata and all the resources used by it. It has an information packaging feature that gathers the LOs with their manifests enabling the management of the packages that will be used in the design of courses. The information packaging of LOs and courses with their metadata facilitates the transport and reuse of the resources in other systems going towards interoperability. A screenshot of this tool is presented on figure 3.

Fig. 3. Learning Object manager.

In the design of learning units the participants can assume different roles. These roles can be student or staff, what makes possible collaborative and group learning,

which importance is recognized at the training and educational levels [7]. We can see a screenshot of this tool on figure 4.

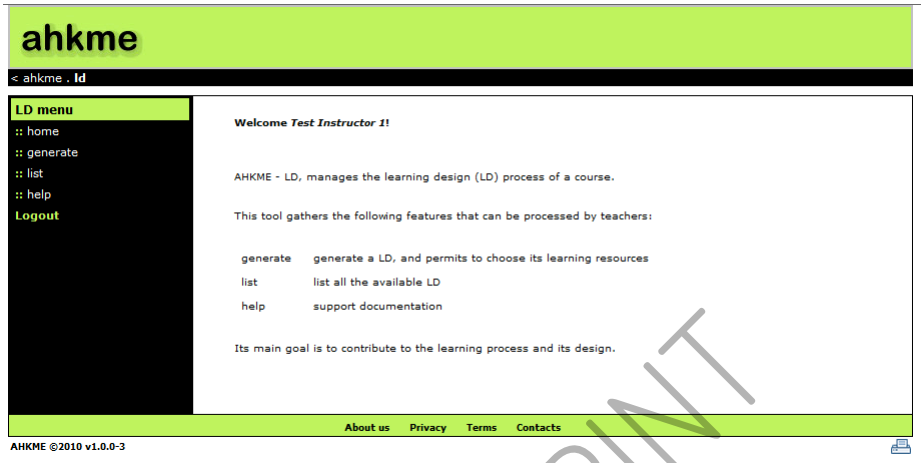

Fig. 4. Learning Design.

All files and packages are validated to check if they're in conformance with the specifications and are in constant evaluation made by the KM subsystem.

In order to facilitate the insertion of metadata we provide an automation of this process, advising the most commonly used values for the elements on the LO cataloguing in order to describe the LO's through the most adequate metadata elements.

To address the issue of collaboration we have been developing a workflow and feedback tool where teachers may collaborate in the creation of resources and get feedback from the courses and resources. We can see this tool on figure 5.

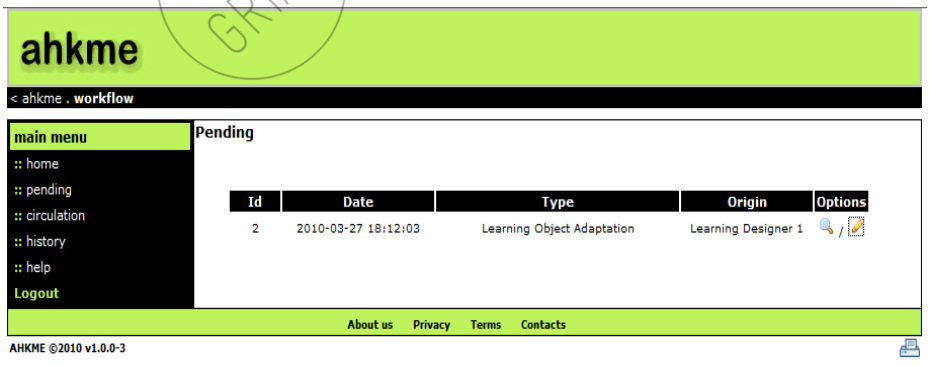

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Fig. 5. Workflow tool.

This tool allows the automation of procedures during which documents, information or tasks are passed from one participant to another in a way that is governed by rules or procedures allowing flexibility and collaboration increasing efficiency [5].

We also provide a tool for teachers where they may create their own questionnaires/surveys in order to efficiently collect the information they want to get.

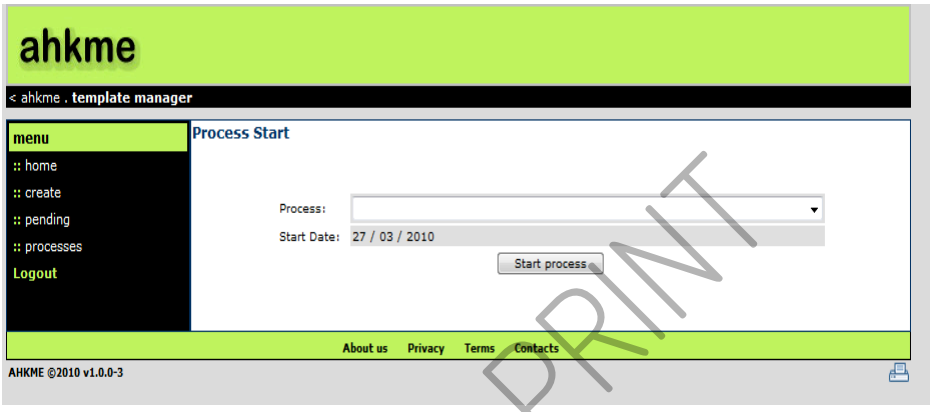

Fig. 6. Survey tool.

As for the issue of machine learning we've been using intelligent agents in the knowledge management and adaptive subsystem.

The main objective of the Knowledge Management subsystem is to avail the quality of the resources that are on the system. One of the tools we have been developing is an intelligent agent that automatically evaluates LOs that acts when some kind of interaction is made on the LOs in order to readjust its quality evaluation. The evaluation is made taking into account the criteria defined by Morales where several educational issues are address [9][10]. On figure 7 we can see screenshot of this tool.

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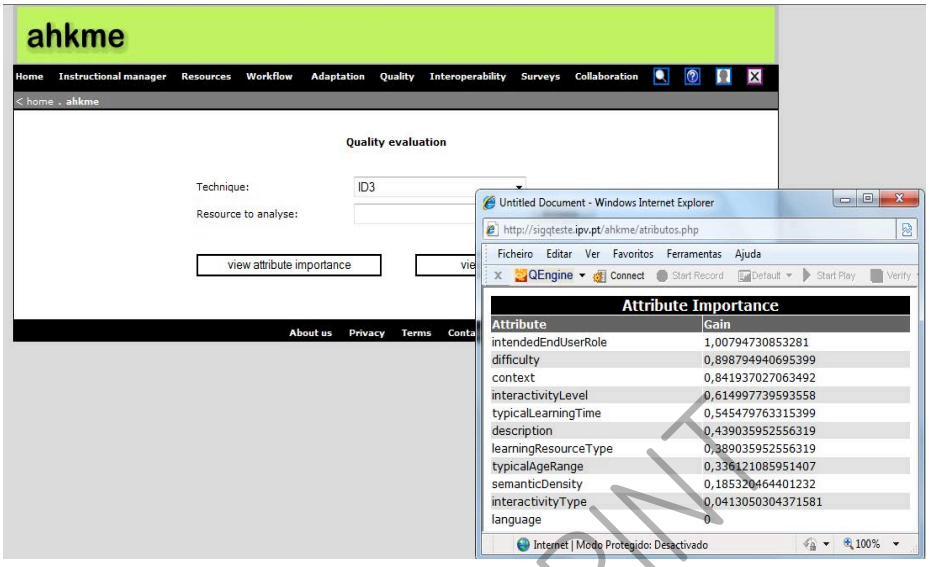

Fig. 7. Quality evaluation.

The agent starts to import the LO to evaluate and others already evaluated, then applies data mining techniques to the educational characteristics defined in the IMSLRM specification to calculus its final evaluation. A schematic presentation of this process is presented on figure 7.

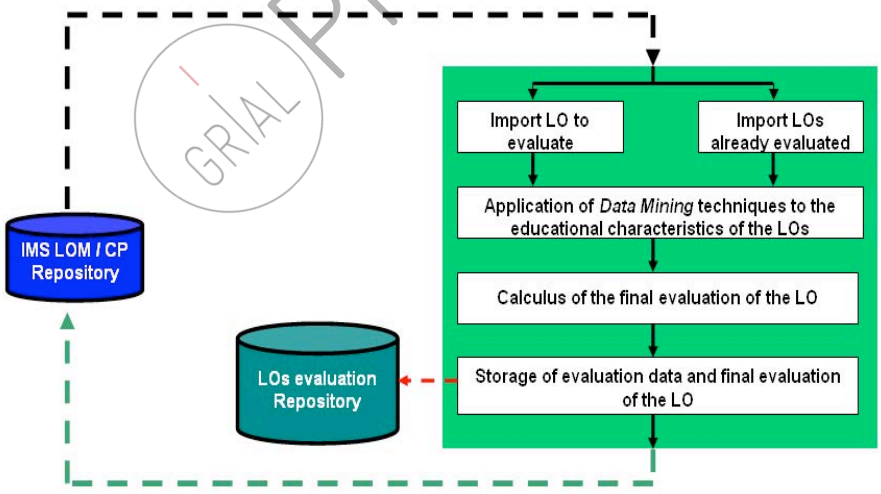

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Fig. 8. Knowledge Management process.

Regarding adaptation we are using data mining techniques for recommendation of the attributes that are more relevant to facilitate de adaptation of the resources.

In order to reach the so called global database issue it is important to use standards, so that information can be readable by different systems and cross-platform. In the development of AHKME we have adopted the IMS specifications, since they allow most of the aspects we've analyzed and that we considered important to reach our goals like metadata support, learning design, content packaging, among others [10], allowing the desired interoperability. We have also developed a tool, which is a schema generator that allows the teacher to create his own structure/schema/ontology or personalize a schema that has already been imported to the system in a simple form approaching the teacher to the learning design process without having great knowledge/experience in educational technologies.

3.2 Integration with other Systems and Mobility of Resources

We have been developing a subsystem, Visualization and Presentation subsystem, which main objective is to give a frontend to AHKME, presenting the educational contents to students taking into account the adaptive meta-model generated for each student, and to act as an integrator with other systems like LMSs and Social Networking Systems. The objective for this integration is to give an opportunity for LMSs/social networking systems to benefit from AHKMEs' functionalities, as well as to give a front-end to AHKME system.

This integration can be done in different ways depending on the type of LMS or Social network. We can develop specific or general plugins depending of the LMS or Social Network that we are trying to integrate. For example if we want to integrate with Moodle we may develop a plugin in PHP and MySQL database and to integrate with Blackboard it can be done, through a plug-in like a building block. It always gives the possibility of integrating the courses by importing it to the LMS that supports the IMS specifications.

This subsystem also gives a front-end to AHKME, allowing the combination from different platforms, collaborative, interactive, communication and community tools.

4 Conclusions

In this article we have presented how we are developing the platform AHKME in order to meet the needs of Web/eLearning 3.0.

We use the IMS specifications, that combine metadata and XML potentialities, to represent knowledge, dividing information in several meaningful chunks (LOs) providing their description through metadata and storage in XML files, therefore permitting their cataloguing, localization, indexation, reusability and interoperability, through the creation of information packages. These specifications grant the capacity

to design learning units that simultaneously allow users with different roles promoting several types of both collaborative and group learning.

Through knowledge management we have a continuous evaluation of contents, granting quality to all the resources in the platform for teachers and students to use.

With the tools we are developing with are looking forward to meet some of the needs of Web/eLearning 3.0 regarding collaboration, machine learning, the need of global database, and integration between systems.

AHKME's main contributions are: management and quality evaluation of resources; usage of the specifications to standardize all the resources to reach interoperability and compatibility of learning components; interaction of all subsystems in order to adapt to students and teachers characteristics and to new contexts, and to grant success in teaching/learning process, being able to be applied to several kinds of matters, students, learning strategies training and educational environments.

In terms of future work, we will add the level B of the IMS LD specification to the learning design tool. In the adaptive subsystem we will add functionalities according to the IMS Question and Test Interoperability and Enterprise specification. In the KM subsystem we will add the feature of course quality evaluation through the development of some tools. We will also upgrade the system to store information using databases based on the RDF or OWL formats.

Acknowledgments

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