Use of Software Agents for the Management of Distance Education Courses over the Internet

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Abstract — **This work presents a group of tools for the management of distance education courses in the WWW (Word Wide Web) environment. The goal of this work is centered on the development of tools to allow teachers to manage the daily course activities. These tools should also supply the students with mechanisms for interaction with the course activities defined by the teacher. The use of the software agents concept in this work is justified by the need to isolate teachers and students from the lower level tasks of management. The agents interact with the users through graphic interfaces and execute their orders. In this case, the agents become assistants in the management and interaction processes .**

Index_Terms — **software agents, course management, distance education, Java tools**

I. INTRODUCTION

The popularization of the Internet is generating a great variety of new services for its users, such as e-Commerce, bank transactions, marketing and others. The WWW environment of the Internet has been recognized as a powerful method of information distribution, because it attracts a great number of users and has a low cost. The publication of teaching materials in the WWW environment has become a new channel to be explored in the context of teaching for the creation of new distance education programs [6][3].

In the beginning, distance education - defined as a teaching form where the teachers and the students were in different locations – made use of the postal service to teach. Later, new technologies, such as radio, television and computers, were incorporate in this concept with the objective of extending the knowledge access to people that could not participate in conventional courses (because of distance, schedule or other difficulties).

With the growing development of the Internet and more specifically of the WWW environment, the distance education were remodelled. Currently, a great number of virtual students and teachers can be found in the net changing information and working cooperatively. The use of multimedia and Internet increases the distance education process efficiency. It allows knowledge to be taken to the students in a dynamic form without depending upon his location, besides being a powerful stimulus for learning.

For these reasons, schools and companies have been investing a lot of money in distance education and training. Currently, universities and companies are doing partnerships with the objective of making this technology arrive to the people faster and with lower costs.

The distance education programs over the Internet involve courses with special software and techniques of project and management. This is necessary because the teachers and students are not in the same location as in the conventional courses (characterized by the class room, slate and chalk) [5]. Being like this, the course creation process for the Internet can be subdivided in two stages: creation/disponibilization of the course (creation and presentation of the teaching material in the WWW environment) and the management (control of the course activities). In this context, the goal of this work is to present a group of tools to support the management stage that make use of the software agents concept.

II. DISTANCE EDUCATION CONTEXT

Currently, authors have a large group of tools for authoring and disponibilization of WWW materials that are very powerful and versatile. Two commercial examples are the FrontPage from Microsoft [7] and the Composer from Netscape [9].

In the academic world, several tools have been developed with the objective of supporting the elaboration of teaching material considering, mainly, the authoring done by teachers and the navigation done by students over the material presented.

The WebCT environment is considered one of the most important and complete packages for development of courses in the WWW environment [14]. The WebCT is based in HTML documents for both the teacher and the student. For the teacher there are tools for authoring and presentation of teaching material and management of the courses. The management includes student progress verification, creation and automatic correction of tests, students control and others. To the student, there are tools to help his interaction with the course, such as student join, grades, delivery of works, calendars and others.

Other good example is the AulaNet environment that it is used in the creation of courses by people without much knowledge about the WWW environment [1]. The AulaNet offers several services for delivering a course over the Internet, such as student join, chat, calendars, course news, discussion groups, tests, exercises and others.

In the context of structured documents, there are the tools HyperBuilder, QuestBuilder and TaskBuilder developed in

the ICMC-USP for authoring material [11][10]. The tools TaskBuilder and QuestBuilder are used to create exercises as part of teatching material. They offer the possibility of using multimedia resource such as text and images. The tool HyperBuilder is used in the the creation and disponibilization of the teaching material and inclusion of exercises created with the tools TaskBuilder and QuestBuilder.

Other examples of tools can be mentioned, such as the TopClass environment [13], that it is similar to the AulaNet, but has a target more centered around the material of the courses and the activities of postage of homeworks through e-mail. The tool WebCourse is applied to development and automatic correction of electronic questioners [12].

In general, in the context of the computers use in education, there are different tools and environments for the creation and disponibilization of teaching material. But the use of some of this environments restrict the use of the materials created in them, not allowing that this materials be exchanged with other applications. In addition, many authoring tools do not have programs to manage the course activities once the teaching material has been created.

The tools presented here come to fill this management gap. They are intended to complement the capabilities of creation tools, like the HyperBuilder [11], without limiting them. The teachers are free to create their teaching materials in whatever authoring tools they like.

III. MANAGEMENT TOOLS

The management of online courses over the Internet can be seen under two different aspects: the management of the teaching material and the management of the course activities. The management of the teaching material is usually done through programs that generate the hyperdocuments for each part of the course. The management of the activities involves the definition and control of all activities that are related to the course, including homeworks, exercises and tests. The tools for this kind of work help the definition of the activities and the creation of an environment for each course. In addition, the tools have to supply the student with interactivity. The tools of this project are not concerned with the creation of teaching material or with the degree of control the students have over this material.

As mentioned earlier, the management tools make use of the software agents concept. In general, software agents can be defined as entities with autonomy and interoperation capacity. Although a formal definition doesn't exist for the term [8], there are a group of properties that allow us to classify the agents in five main types [2][4]:

- information agents: systems that obtain information requested by a human agent;
- entertainment agents: they simulate artificial personalities in virtual worlds destined to entertainment;
- mentor agents: they help the people in the execution of certain tasks giving advises and suggesting solutions;

- assistant agents: they execute tasks for a human agent;
- interface agents: they exchange information with a human agent.

In the context of this work, the assistant agents type is used because they adapt better to this proposal. The assistant agents of the tools should supply support to students and teachers to accomplish all the tasks of a course. The agents are responsible for doing the low level management tasks, while the students and teachers use graphic interfaces to enter the high level information requested by the agents. The assistant agents involved in this work use the cooperation concept, where each one of the agents just executes a simple function and, through cooperation, they complete a specific and complex task.

The figure 1 presents the architecture of the process of presenting a course in the WWW environment. The figure shows the interaction of both students and teachers with the course through agents on the WWW environment. In addition, the figure shows that the management tools are independent of the teaching materials. It is supposed that these materials have already been created.
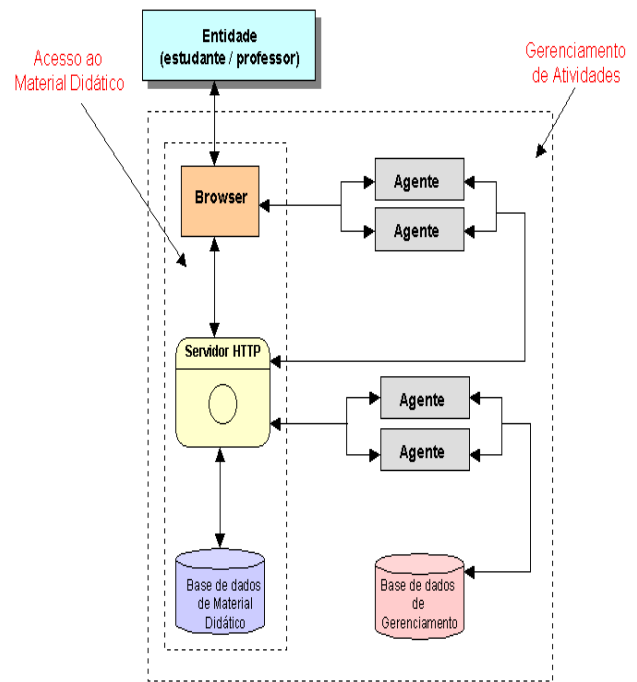

Fig. 1. Arquitetura básica dos componentes proposta para o projeto

Using the tools presented here the teacher is guided in the process of creating a management area, where information about a specific course can be stored in a database and physical disk space for the storage of homeworks. The figures 2, 3 and 4 present some illustrations about the process of a course creation. The tool for the course creation allows the selection of types of students activities.

Fig. 2. Definition of basic information about the course

Fig. 3. Definition of types and number of course activities

The teaching methodology supported by the management tools favors the exchange of information and the cooperative work among the students of a course through the activities selected by the teacher. In the creation of the teaching environment, the teacher has the possibility to choose which types of activities he wants to develop in his course. He can opt for assignments, reports, and tests.

- Assignments are the types of activities that "induce" the cooperative work, because they allow the assignment of homeworks to groups of students and the writing of reviews for these homeworks by other groups. These activities should generate as a result reports "posted" in the site of the course.
- Reports are activities done individually that should also generate a report " posted " in the site.
- Tests involve individual activities defined by the teacher, for example, tests or exercises, that don't generate a "post" in the site of the course.

When the teacher creates the environment of the course, he reserves a space in the course server and in a database for each specific course. Remember that the tools are not linked to the teaching material. In this way, the information about the assignments, reports and tests of the course must be explained in hyperdocuments written by the teacher.

Fig. 4. Definition of propertities for one activitie assignment

After a course becomes available over the Internet, the students have to register as candidates to the course. The teacher selects the students that will participate in the course and send them a confirmation message with an username and password. Then, the student are able to join the course and use the available tools for interaction. There are tools for transfer of files, formation of work groups, alteration of passwords, search grades and calendars and others. The figures 5, 6, 7 and 8 present some tools interfaces for the students interaction.

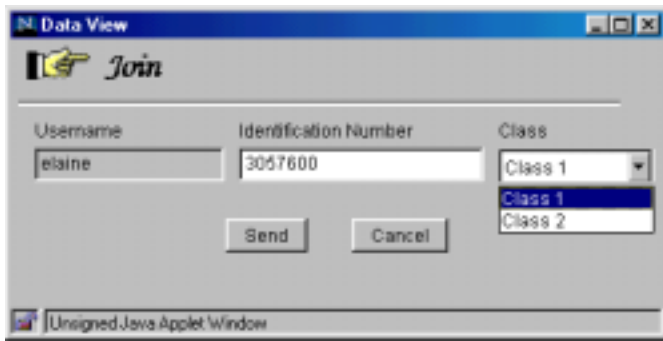Fig. 5. Form to the student register as candidate for the course

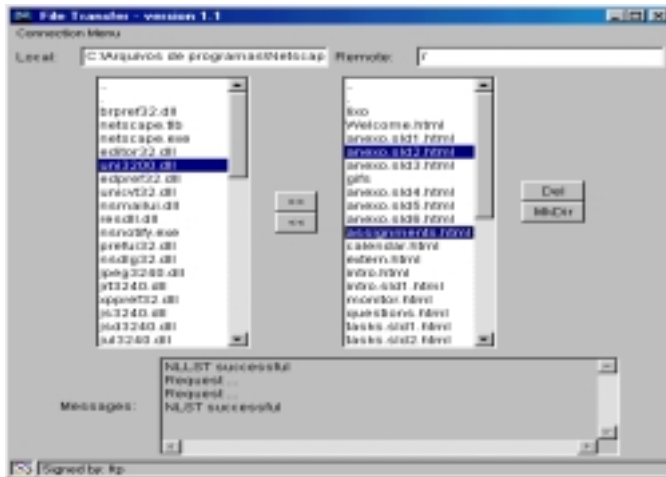Fig. 6. Interface for the student join the course

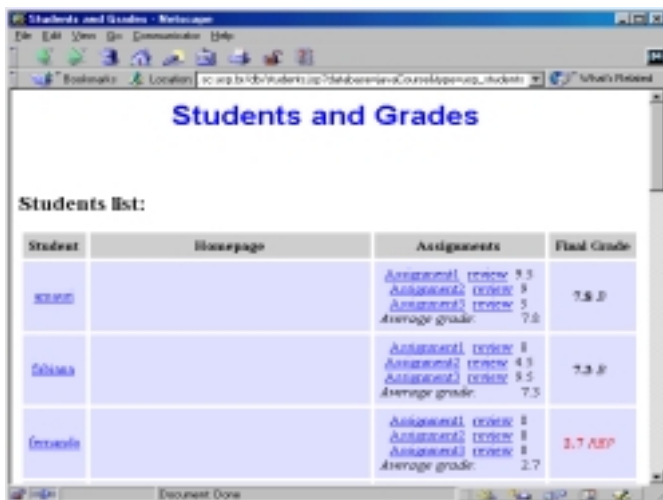

Fig. 7. Interface for transfering file to the course area

Fig. 8. Interface to the student visualize his grades

IV. CONCLUSION

This work presents the use of management tools developed in Java as a resource to be added to teaching material of online courses. These tools improve the student interaction with the course material and promote cooperative work among students. The teaching methodology behind these tools have as an objective motivate the students to actively participate in the courses. The tools have characteristics that allow them to be applied in several types of teaching activities over the Internet.

We believe that for the success of distance education courses using the multimedia resources of the WWW environment, the existence of specific graphic and intuitive tools for the management of these resources is fundamental.

REFERENCES

[1] AulaNet - Ajudando Professores a Fazer seu Dever de Casa. WWW: http://aulanet.les.inf.puc-rio/aulanet. Visited in august - 1998.
[2] S. Franklin, A. Graesser, "Is it an Agent or just a Program?: A Taxonomy for Autonomos Agents". *Third Workshop on Agent Theories, Architectures and Languages,*1996.WWW: http://msci.memphis.edu/~franklin/AgentProg.html. Visited in november,1998.
[3] P.M.Greenfield, *Eletronic Technologies, Education, and Cognitive Development".* Lawrence Erlbaum Associates, 1997
[4] N.R. Jennings, M. Wooldrige, *Agents Theories, Architectures, and Languages: a Survey*. Intelligent Agents, pp.55-67, 1995.
[5] D. Keegan, *The Foundations of the Distance Education*, London: Croom Helm, 1996.
[6] C.J.P. de Lucena, "Curso sobre Sociedade da Informação". WWW: http://www.les.inf.puc-rio.br/socinfo. Visited in march, 1999.
[7] Microsoft Homepage. WWW: http://www.microsoft.com.
[8] D.A. Moreira, L.T. Walczowski, "Using Software Agents to Generate VLSI Layouts". *IEEE Expert Intelligent Systems,*November/December, 1997.
[9] Netscape Homepage. WWW: http://www.netscape.com.
[10] M.G.C. Pimentel, J.B.Santos Jr., R.P.M. Fortes, "Tools for Authoring and Presenting Structured Teaching Material in the WWW". *Proceedings of the WebNet'98 Conference*, Orlando, November, 1998.
[11] J.B. Santos Jr., "Documentos Didáticos estruturados para o Domínio de Aplição Ensino: Modelagem, Autoria e Apresentação no Ambiente WWW". *Master Work*, Sao Carlos, October, 1998.
[12] R.H. Scapin, A. Garcia Neto, "Desenvolvimento de uma Ferramenta para Criação e Correção Automática de Provas na World Wide Web". *Anais do VIII Simposio Brasileiro de Informática na Educação*, v.1, pp.593-608, Sao Jose dos Campos, November, 1997.
[13]TopClass homepage. WWW: http://www.wbtsystems.com/spotlight/gallery.html. Visited in july,1999.
[14] WebCT Homepage. WWW: http://homebrew1.cs.ubc.ca/webct. Visited in march, 1999.