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**Instituto de Ciências Matemáticas e de Computação**

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Education Courses over the Internet**

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**N<sup>o</sup> 60**

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# Use of Software Agents to the Management of Distance Education Courses over the Internet

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**Abstract.** This work presents a proposal for a group of tools – WebCoM (Web Course Manager) - to the management of courses in the WWW (World Wide Web) environment. The goal of this proposal is centered around 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 users interact with the agentes through graphic interfaces, and the agents execute users's specific orders. In this case, the agents become assistants in the management and interaction processes with the course.

**Resumo.** Este trabalho apresenta uma proposta de um grupo de ferramentas – WebCoM (Web Course Manager) para o gerenciamento de cursos no ambiente WWW (World Wide Web). O objetivo desta proposta está centralizado no desenvolvimento de ferramentas que permitem que os professores gerenciem as atividades didáticas diárias dos cursos. Tais ferramentas devem oferecer suporte também aos estudantes com mecanismos de interação com as atividades do curso definidas pelos professores. O uso do conceito de agentes de software é justificado pela necessidade de isolar professores e estudantes das tarefas de baixo nível do gerenciamento. Os usuários interagem com os agentes através de interfaces gráficas, e os agentes executam as ordens específicas do usuário. Neste caso, os agentes se tornam assistentes do processo de gerenciamento e interação com as atividades.

## 1 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 informa-

tion 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 [1][2].

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 incorporated 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 remodeled. 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) [3].

Being like this, the course creation process for the Internet can be subdivided in two stages: creation/presentation 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, the WebCoM.

## **2 Distance Education Context**

Currently, authors have a large group of tools for authoring and presentation of WWW materials that are very powerful and versatile. Two commercial examples are the FrontPage from Microsoft [4] and the Composer from Netscape [5].

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 [6]. 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 people without much knowledge about the WWW environment use it in the creation of courses [7]. 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 [8][9]. The tools TaskBuilder and QuestBuilder are used to create exercises as part of teaching material. They offer the possibility of using multimedia resource such as text and images. The tool HyperBuilder is used in the creation and presentation 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 [10], 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 homework through e-mail. There also the tool WebCourse that is applied to development and automatic correction of electronic questioners [11].

In general, in the context of the computers use in education, there are different tools and environments for the creation and presentation 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 of the WebCom come to fill this management gap. They are intended to complement the capabilities of creation tools, like the HyperBuilder [8], without limiting them. The teachers are free to create their teaching materials in others authoring tools.

### **3 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 homework, 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 the WebCoM 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 of the WebCoM 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 [12], there are a group of properties that allow us to classify the agents in five main types [13][14]:

- **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 the WebCoM, the assistant agents type is used because they adapt better to this proposal. The assistant agents of the WebCom 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 realization 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 using other tools.

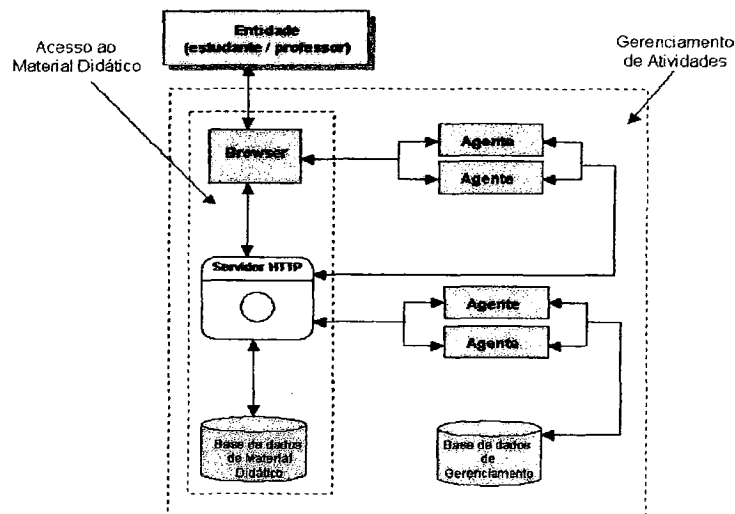


Fig. 1. Basic architecture of the project's components.

Using the tools of the WebCoM 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 a physical disk space can be saved for the students' homework. The teacher can also create class of students and define different activities for each class in separated. The figures 2, 3 and 4 present some illustrations about the process of a course and class creation.

**Course**

Course Name:  Edit Date:

Absolute path of the HTML documents on server disk:

Path of the HTML documents on WWW link:

Homework Directory:

Name to Database:

Navigation:

Buttons:

Footer: Unsigned Java Applet Window

Fig. 2. Definition of basic information about the course in the management area creation.

**Activities**

Type of Activities:

- Assignments: Description: this type of activitie is realized in groups of students. Each assignment can have one or various projects that can be realized by... Number:
- Reports: Description: this type of activitie is realized by only one students. Each report is one project two or more students can realize the same p... Number:
- Tests: Description: this type of activitie is realized by only one students and the student don't deliver final results to teacher. This activitie is a exer... Number:

Navigation:

Buttons:

Footer: Unsigned Java Applet Window

Fig. 3. Definition of types and number of course activities in the class creation.

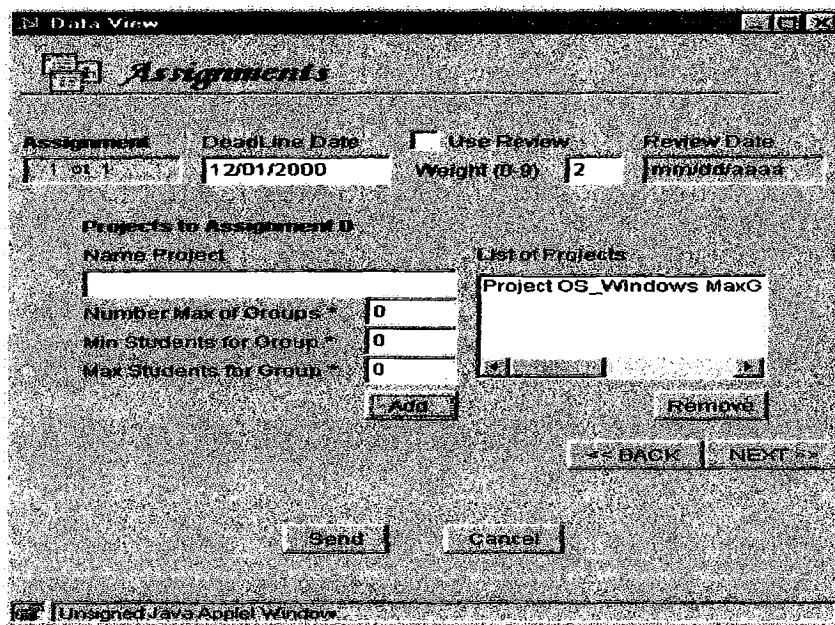


Fig. 4. Definition of properties for one activity assignment in the class creation.

The teaching methodology supported by the management tools of the WebCoM 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.

The **Assignments** are the types of activities that "induce" the cooperative work, because they allow the execution of homeworks to groups of students and the writing of reviews for these homeworks by other groups. These activities should generate reports posted in the site of the course.

The **Reports** are activities done individually that should also generate a reports posted in the site.

The **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.

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. There are tools for transfer of files, formation of work groups, alteration of pass-



words, search grades and calendars and others. The figures 5, 6, 7 and 8 present some tools interface for the students interaction.

The screenshot shows a web browser window with a form titled "Add Candidate". The form asks the user to "Please fill in your personal details:" and includes the following fields: Last name, First name, Middle names, Address, Zip Code, City, State, Country, Phone, E-mail, and Home Page. Each field is represented by a horizontal text input box.

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

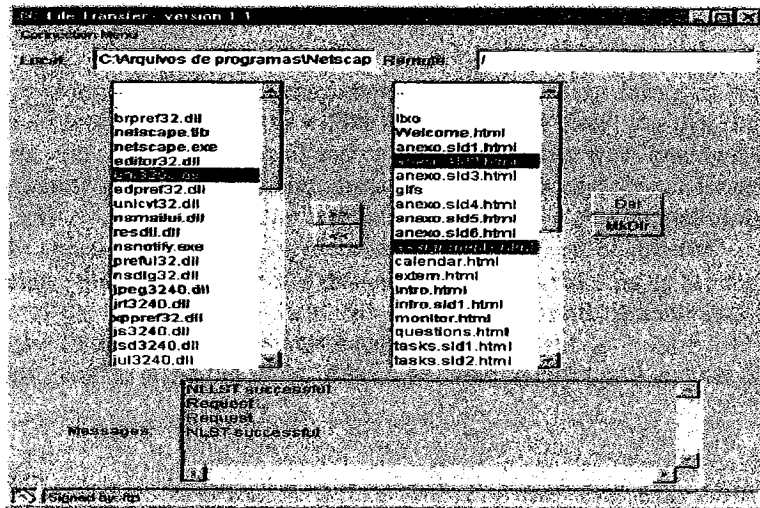


Fig. 6. Interface for the student transferring reports and other files to the course area.

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## SÉRIE COMPUTAÇÃO

- 059/2001 OLIVEIRA, M.C.F.; LEVKOWITZ, H. – Visual data exploration and mining: a survey.
- 058/2001 SOARES, M D.; FORTES, R P M; MOREIRA, D A – Version–web : a tool for helping web pages version control.
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