BEHAVIORAL ANALYSIS OF LEARNERS ON AN ONLINE LEARNING PLATFORM

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Abstract: This paper introduces the study of the learners' behavior on e-learning platform to create profiles that regroup learners according to their behavior on the platform. This system can be used in the learner-agent of an intelligent tutoring system (ITS). Thus, this system will allow us to better understand the learner in a virtual learning environment to improve the learning situation by placing the learner at the center of the learning process.

Keywords: online learning platform, intelligent tutoring system, learning management system, behavioral analysis system, learner profile, learner behavior.

I. INTRODUCTION

It is clear that human interaction in a classroom is not the same in the particular situation of a user against a machine. His relationship to others and to the discipline is changed. The relationship: Teacher-Discipline-Student is replaced by the relationship: Teacher-Discipline-Media-Student.

For this reason, and to keep the interaction in a virtual learning environment, the receiver should not be a simple student but a learner. The difference is that the student is just a receiver of information. However the learner is an active and social person, is an actor in his own learning. The learner leaves - by using the pedagogical tools of the platform and the achievement of collective work (collaborative and cooperative) - a set of traces on the platform.

Our goal is to create a behavioral analysis system, able to use these traces to create profiles that clustering the learners who have the same behaviour. This can facilitate the creation of pedagogical assistances in an intelligent tutoring system.

II. INTELLIGENT TUTORING SYSTEM

An intelligent tutoring system (ITS) is a system that provides direct customized instruction or feedback to students without the intervention of human beings.

Intelligent tutoring systems consist of four different subsystems or modules:
- The interface module: provides the means for the student to interact with the ITS usually through a graphical user interface and sometimes through a rich simulation of the task domain the student is learning.
- The expert module: references an expert or domain model containing a description of the knowledge or behaviors that represent expertise in the subject-matter domain the ITS is teaching.
- The student module: uses a student model containing descriptions of student knowledge or behaviors, including his misconceptions and knowledge gaps.
- The tutor module: takes corrective action, such as providing feedback or remedial instruction. To be able to do this, it needs information about what a human tutor in such situations would do: the tutor model.

![Figure 1. The four modules of the ITS](image)

III. USING A BEHAVIORAL ANALYSIS SYSTEM INTO AN ITS

In a classical ITS, the pedagogical agent creates pedagogical assistance for learners based on their responses to tests (evaluation method). Our behavioral analysis system will be used by the student model of the ITS it focuses only on the behavior of learners to assist the pedagogical agent to create more specific pedagogical assistance for all learners including those who have not passed the tests.

Self (1988) said that the student model must answer four questions:
- What the learner can do?
- What the learner knows?
- What type of learner is he?
- What the learner has already done?

The most popular intelligent tutoring systems use three basic methods to answer these questions and then build a student model:
1. From the rules representing the behavior of the learner;
2. From the representation of errors that can be committed by the learner, i.e. a catalog of errors;
3. From the direct observation of learner behavior.

Our behavioral analysis system will contain basic profiles. It regularly chooses the appropriate profile for each learner. The pedagogical agent of the ITS chooses a pedagogical assistance for each profile regardless of learners who are present on the platform.
IV. BEHAVIORAL ANALYSIS SYSTEM DATA

The behavioral analysis system will be integrated into an online learning platform; this system will use the learner information extracted from the platform, as well as information on learner machine extracted from the web server on which the platform was installed.

4.1 Data from web server

The web server contains environment variables that provide all the information on the learner machine:

<table>
<thead>
<tr>
<th>Environment variable</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTP_USER_AGENT</td>
<td>Mozilla/5.0 (Windows; U; Windows NT 5.1; fr; rv:1.9.2.12) Gecko/ 20101026 Firefox/3.6.12</td>
<td>The browser and the operating system of client</td>
</tr>
<tr>
<td>REMOTE_ADDR</td>
<td>81.192.199.13</td>
<td>The client's IP address (e.g. used to find the country of the learner in open platform)</td>
</tr>
<tr>
<td>REMOTE_PORT</td>
<td>7653</td>
<td>The port being used on the user's machine to communicate with the web server</td>
</tr>
<tr>
<td>SCRIPT_NAME</td>
<td>/training/open.php</td>
<td>Contains the current script's path</td>
</tr>
<tr>
<td>REQUEST_URI</td>
<td>/training/open.php?course=1&amp;chapter=3</td>
<td>The URI which was given in order to access this page</td>
</tr>
<tr>
<td>QUERY_STRING</td>
<td>course=1&amp;chapter=3</td>
<td>The query string via which the page was accessed</td>
</tr>
<tr>
<td>HTTP_REFERER</td>
<td><a href="http://www.site.edu/training/view.php?action=open">http://www.site.edu/training/view.php?action=open</a></td>
<td>The address of the page which referred the user agent to the current page</td>
</tr>
<tr>
<td>REQUEST_METHOD</td>
<td>GET</td>
<td>Which request method was used to access the page; i.e. GET, HEAD, POST, PUT</td>
</tr>
<tr>
<td>REQUEST_TIME</td>
<td>1290517719</td>
<td>The timestamp of the start of the request</td>
</tr>
</tbody>
</table>

Figure 2. Using a behavioral analysis system into an ITS
4.2 Data from learning platform

The learning management systems (LMS) offer more details about learner and some statistics about using the pedagogical tools for each learner on the platform.

We can find a lot of information about learner on an online learning platform:
- Personal information of learner: age, sex, country…
- Statistics of results of self-evaluation.
- Behavioral Information:
  - Number of accesses to the platform;
  - Access period (morning, afternoon or evening);
  - Average duration of visits to the platform;
  - Number of visits to each page;
  - Duration of visits of each page;
  - Page that sent the learner to the current page;
  - Number of posts on the forum.

We have already started development of a Learning Management System called Manhali; this system will integrate the behavioral analysis system to offer a set of data and statistics about learners.

4.3 The Learning Management System: Manhali

Manhali (http://www.manhali.com) is a free, open source learning management system licensed under the GNU-GPL v3 and written in PHP/MySQL, it is installable and multi-language.

The project began in 2009 as a tutorial management system, useful for creating "How-to" Websites; the first published version was 0.8.27 Beta in August 2009.

Manhali arrived currently at version 1.1.2 RC, this version can manage training by several features: statistics, message manager, user manager, course manager, article manager, file manager, system configuration, poll manager, menu manager, front page manager, component manager.

We used the modeling language UML (Unified Modeling Language) for this project. Manhali environment provides a set of features for system users as shown in this use case diagram:

![Use Case Diagram of Manhali](image-url)
Manhali courses divided in parts, each part contains chapters, and each chapter contains several blocks and self-evaluation at the end.

The content of each block can vary between text, images, Flash animations, audio or video.

![Course structure diagram](image)

**Figure 4.** Manhali course representation

The collaboration diagram explains the various steps of creating a Manhali course:

![Collaboration diagram](image)

**Figure 5.** Collaboration Diagram of Manhali
V. CONCLUSIONS

The work presented in this paper focuses on behavioral analysis system and also the types of information that can be useful in this study and the resources used by the system.

The paper introduced the principle of an intelligent tutoring system, and also the use of our behavioral analysis system in the student module of an ITS, and the interaction between the student module and the tutor module of an ITS.

The next step is to determine the data used by our system and the integration of a data mining system that will be used to extract and organize this information so they are ready for a psychic and pedagogical analysis.

References