



Virtual Tutor: A Case of Study in University Aberta

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Abstract. The project VIRTUAL TUTORING – the virtual tutor as learning mediating artifact in online university education, is an ongoing project, with the main goal of analyzing the pedagogic impact of an anthropomorphic user interface on a typical distance learning environment targeted to support online higher education. It implies the development of 3D rigged avatars that should perform typical online tutor activities. The virtual tutor should mimic a human tutor, being a kind of emphatic interface between the student and the course module in Moodle. But more than this, the virtual tutor should give support in the learning process of the student, working as much as a guide inside the contents offered by the e-learning course. This paper gives an overview of the project present development status.

Keywords: Virtual tutor · E-learning · Avatar · Embodied pedagogical agents

1 Introduction

In this project, we want to analyze the pedagogic impact of anthropomorphic user interfaces, also named Embodied Conversational Agents (ECA) or “avatars”, on online learning (OL) environments that are based on learning management systems (LMS) and targeted for use in university level courses. The main idea behind the project is to understand how ECAs may be modeled/adapted as Virtual Tutors in LMS and make available online help and guidance to each individual student. A Virtual Tutor is analogous to a human tutor in that it can autonomously interpret each individual learning situation and effectively intervene, in face of the online knowledge domain and the student profile, in the learning process according to a given tutoring plan that encompasses a set of instructions given by the human teacher/tutor.

Generally, it is not well understood which properties an avatar must possess, in terms of its visual appearance, behavior, emotion, nonverbal expression, and function, to appropriately respond to the students’ requests and needs, when engaged in an online learning environment. In this project, an adaptable and interactive anthropomorphic interface will be implemented that is capable of supporting natural human-computer interaction, and which will be modeled as a Virtual Tutor, and evaluated for its efficiency and pedagogic impact as an online teaching-learning mediator artifact in the context of trial scenarios.

This project will encompass a set of three trial scenarios for virtual tutoring, one for each of the following areas: natural sciences; computer sciences; and social sciences. In these teaching-learning scenarios, the students will be engaged in virtual classrooms in either formal university graduation or post-graduation courses, where each student will have access to a particular instance of the Virtual Tutor. In these trials we will analyze the pedagogic impact of the application of virtual tutoring, taking special attention to the following central features:

- User-centered learning, measured in terms of the level of student autonomy within the learning process (e.g. the quality of the student's answers/contributions that were generated by suggestion of the virtual tutor; the self-exploitation of content that followed from the virtual tutor suggestions);
- Collaborative learning, measured in terms of the level of interaction within the virtual classroom and the quality of the student intervention and participation in group activities and online discussions that clearly resulted from the direct/indirect intervention or influence of the virtual tutor's actions;
- Teaching effort, measured in terms of the effective time spent by the human teacher/tutor to configure the virtual tutor plan, launch the virtual tutor and monitor it against the overall teaching-learning process;

It should be noticed that we conceive virtual tutoring as a complement to other actual online teaching-learning instruments/tools such as online forums, chatting, quizzes or virtual simulations. One of the main expected outcomes from this project is the design of a virtual pedagogic model for online teaching-learning that explicitly integrates application scenarios of the virtual tutors as a valuable mediating artifact/instrument.

2 Background

Kokane et al. [1] implemented a Learner Centered Design Approach of E-learning System using 3D Virtual Tutors. Further they enhanced their system using WebRTC Based Multimedia Chat system focusing especially young learners to interact with human tutors. They added live video lecture session by which students can interact with the tutor, besides the presentation of 3D virtual tutors' narrations of articles in the text form of live transcriptions of avatars' speech and timed quiz by which a real-life objective examination can be mimicked and thereby evaluating the performance of students. The general architecture of their system is illustrated in Fig. 1.

Soliman and Gueli [2] developed a prototype of an intelligent pedagogical (IPA) agent interacting with a learner and a learning object in natural science experiment in a virtual world while providing supporting multimodal communication abilities. The IPA has features of text chat based on the Artificial Intelligence Markup Language (AIML) and non-verbal communication abilities through gesture animation. According to them, a multimodal communication module is central to the IPA since IPA is the focal point of interaction with the learner and helps in improving engagement and believability. Figure 2 shows one of the available environments to the learners.

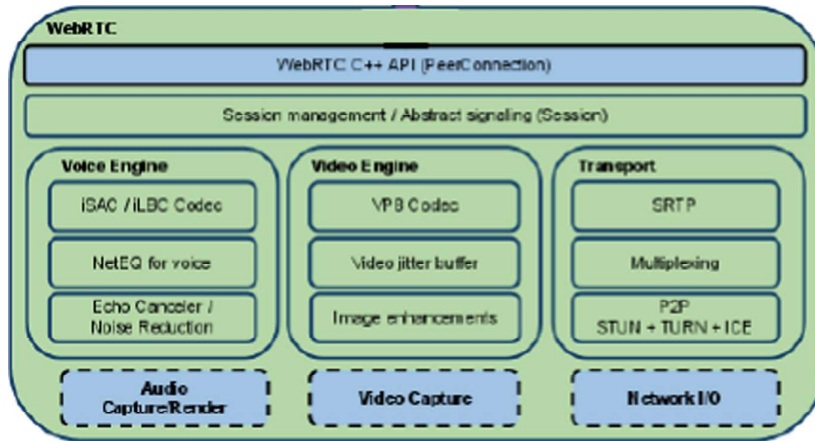


Fig. 1. System architecture [1]

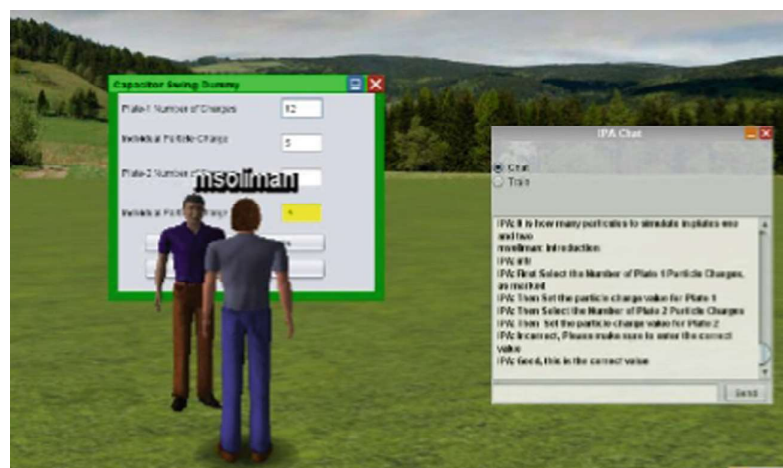


Fig. 2. A pedagogical agent monitors learner interaction [2]

Currie et al. [3] developed an Avatar-based system to guide students through the materials provided by a university student employability service. Based on the assessment, they realized that some of the parts of the information provided by the Avatar were considered by the employability representative to be too long for the hearing delivery. This was a highly relevant observation, which was the crux of nature and the role of Avatar-based interfaces. Clearly, a great advantage of the avatar is the ability to guide the end user to solutions through the interaction process, and to conduct this dialogue orally, helps to give a similar tone to human-to-human conversation. The environment is shown in Fig. 3.

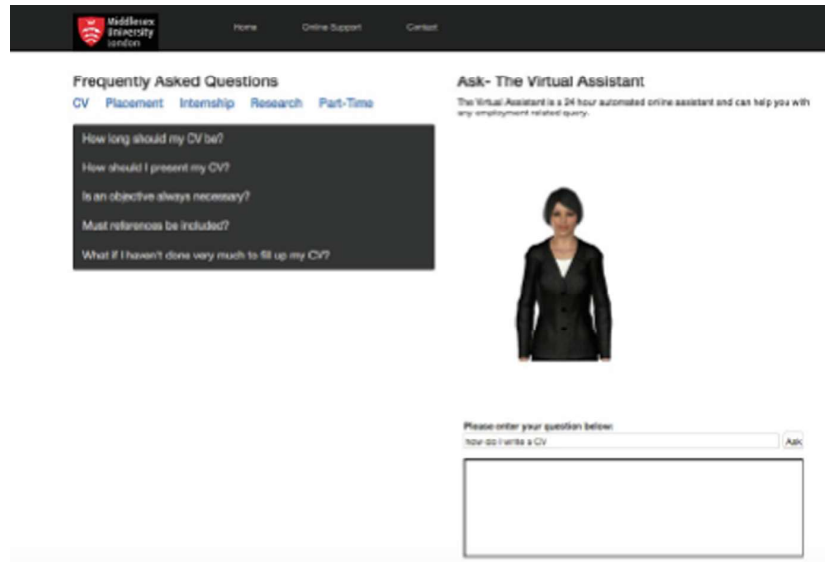


Fig. 3. Virtual assistant interface [3]

Online learning (OL) has grown in importance as a direct consequence of the rapid development taking place in information and communication technology (ICT). This development has pushed OL agents into finding new methods of teaching and learning that could explore the technological media to the limits that ICT could actually offer. Due to the evolution of OL, it is difficult to find a precise and current definition. Nichols [4] describes OL as “education that occurs only through the Web”, that is, it does not involve any physical learning materials issued to the students or an actual face to face contact. Pure online learning is essentially the use of eLearning tools in a distance education mode using the Web as the sole medium for all student learning and contact.” Even though this statement is still valid, OL has evolved to include aspects such as collaborative learning [5], connectivist learning [6], online participation [7], massive open online learning [8] or serious games, virtual reality or digital storytelling [9, 10].

The use of Embodied Conversational Agents (ECAs) as Virtual Tutors in real online teaching-learning scenarios is still a ground-breaking challenging since OL itself is still in its infancy. In spite of the achievements registered in the area of ECAs there is still a lack of virtual entities that can effectively give support to online teaching-learning. Very few experiments are referred in the literature. They have remained at a stage of limited demonstration and basic proof-of-concept, or expressive talking-heads where no actual pedagogic impact analysis has been carried on [11, 12].

3 Virtual Tutor Development

To start the development of the Virtual Tutor project, we made a detailed identification of the relevant requirements that it should satisfy, besides making an appraisal of existing solutions and/or approaches. In terms of pedagogical requirements, the most

significant indicated that the tutor should not be intrusive, although it should behave much as an advisor or reminder of significant activities. Because its deployment aimed to attend the requirements of the pedagogical model of University Aberta, several aspects must be regarded in order to guarantee the compliance of the Tutor's behavior with it.

We also evaluated what technological platform might be used to develop the Virtual Tutor interaction, considering that a 3D model was going to be created to represent the physical Tutor. Unity 3D™ [13] was the first choice because of its technological characteristics, making straightforward available the development for both a desktop and mobile platforms.

Further, it was decided to develop two distinct versions of the virtual tutor: one specific to be used in Moodle platform and other to be uploaded as a mobile app. The difference between these two approaches is sensitive. The first one is supposed to work as much as an adviser of what is available inside the e-learning course, alerting the student of his lack of activity in the forums or important evaluation milestones, besides highlighting any important resource or existing topic. The second one is much more oriented to work just as a reminder of relevant things that are happening inside the course. It does not include the presentation of the Moodle platform, running as a standard alone application on the mobile platform. Presently, only the Android™ [14] system operation is able to run the app.

In both cases, there are two tutors that appear: Mary and John, two young adult people. Both were obtained by digitizing the face and the bust of two real people. This procedure was done, in order to ensure that the aspect of the avatar is the closest to the real one of a person. We assumed, that in the future, the teachers themselves can be used as the basis for the virtual 3D model creation. The Avatars has 8 basic facial

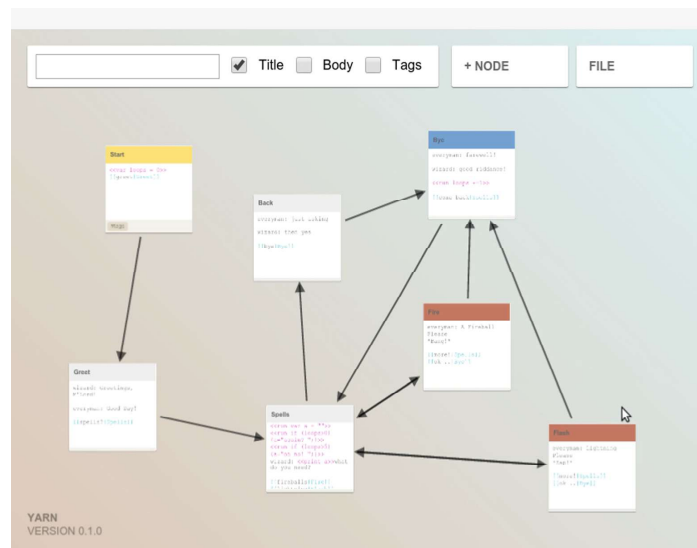


Fig. 4. YARN environment [15]

expressions (rigs) to express feelings such as approval, reprisal or neutrality. We also tried to make the transitions between facial expressions look as natural as possible, interpolating some casual gestures as nodding or gazing around.

The version of the virtual tutor that is available in Moodle is made up of a pop-up window with dialogs written in balloons and buttons, which allow the navigation through the area of the online course in question. You can also ask some questions to search for space content. The color of the buttons varies depending on the activation or relevance, or a kind of post-it may appear to draw attention to something in particular in the course area.

The mobile phone version works as an app that provides warnings regularly for the student. The simulation of an empathic behavior is one of the goals in both cases, in addition to the behavior of the avatar being modulated according to, for example, the notes that the student has, their participation in forums or based on a dialogue tree defined by the teacher.

4 Conclusions and Future Work

The Virtual Tutor project is still an ongoing one. We have to work on the artificial intelligence module in order to give much more support to automatic answers according to the e-learning course content and the student's performance. Some analytics should also be included to provide smart evaluations on students' interactions in the e-learning course area, based on Moodle's logs, for instance. Integration of databases used by both versions of the virtual tutor and the UAb's Moodle environment is also one of our priorities at this moment.

Presently, we are running tests with two different groups of students from University Aberta. The students are from the first cycle of the bachelor degree in psychology and environment sciences. In order to test the present version of the tutor, usability questionnaires were developed. They focused on evaluating the simplicity or not of the end-users interaction with the tutor.

Besides these questionnaires targeting on usability issues, there were also produced others, focusing on the empathic capabilities of the tutor. We wanted to know if the student, just looking at the facial expression of it, would be able to deduce if the virtual tutor was sending a positive, negative or neutral visual signal.

Finally, at this stage, it was also a goal to find out if the elaboration of the virtual tutor's dialogues by the teachers (real ones) was easy or not to do. Yarn Spinner, an open source implementation of the Yarn language was adopted to make dialogue in our virtual tutors (Fig. 4, illustrates the environment). It adopts a tree-node-tag approach to design the dialogue. We proposed that it was used to create dynamic dialogues to be used by the virtual tutor, according to the teacher and course needs.

The results of all these tests will help us to proceed in some corrections and enhancements of what we have accomplished so far. One of the significant goals and outputs of this project is to enrich the Moodle e-learning platform of University Aberta, and thus, to contribute to the evolution of its pedagogical learning model [16]. The continuation of the development of projects that prioritize the quality of the interaction

and attendance to the individualities of the eLearning student is a growing line in the investigations of the area inside University Aberta.

Acknowledgement. This project is financed by FCT - Fundação para a Ciência e Tecnologia, under the Grant FCT- PTDC/IVC-PEC/3963/2014.

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