

A Survey on Interactive E-learning Environment Using Animated Avatars

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Abstract— An investigative case study is made by considering the research work of eminent projects done by numerous researchers. All the research work analyzed here is done on interactive e-learning application. The researchers individual view point on the pedagogy domain they adopted is exclusively highlighted, in addition the factors they feel that should be enhanced substantially is studied in the paper. In this paper a comprehensive survey on design and development of a useful e-learning application, communication via multimodal interactive features, animated models teaching helping skills in an online environment, virtual agent's characteristics to be incorporated in an e-learning platform and enhancing learning with the aid of co-learner are discussed.

Index Terms— e-learning application, multimodal, pedagogy, virtual agents.

I. INTRODUCTION

With the advent of World Wide Web (WWW) it has been used in fields of information and communication technology. In addition to technical criteria's it is widely used as an educational medium for the purpose of imparting knowledge through distance and face-to-face learning. In general any learning session should provide adequate room for the learner to observe, interact and control the information being received, besides that there should be an option for a feedback. E-learning is one such methodology that utilizes information and communication technology (ICT) to assist learning effectively. A very high demand prevails for the development of web based e-learning applications among educational institutions and corporate companies for training their employees, since the web acts as a tool to display and access information relating to any particular subject irrespective of time constraints. As a consequence a cost-effective, appropriate, personal, interactive and immersive learning can be given to learners, independent of time and location.

In spite of the fact that web-based e-learning functions have been used extensively, the critical evaluation of their usability has been given less importance. Though a good framework is adopted for e-learning applications, very little attention is given in regards to the usability features.

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Besides that an additional intention of avoiding the usability features during the development stages is mainly because, usability evaluation is generally expensive and time consuming..

II. DESIGN AND DEVELOPMENT OF A USEFUL E-LEARNING APPLICATION

One of the principal aims of any learning system is to avoid any distraction in order to keep all the contents fresh in the learner's mind. The challenge involved in e-learning application is that the interactive system should not confuse the learners. In general an e-learning application is a simple automated exchange of pedagogical material, presented via interactive schemes and awkward interfaces. When learners prefer the classroom based training rather than the web based instructive training, it is quite evident that it is not the material presented that scares them off but it is because of confusing menus, unclear buttons or illogical links. [1].

According to the view point of Meliset *al.* & Weber (2003) [2] in order to design an e-learning system which is more usable two aspects have to be taken into account. One is technical usability and the other pedagogical usability. The former includes methods for ensuring a trouble-free interaction with the system, whereas the objective of the latter is to support the learning process. These two aspects are intertwined and the chief goal is to minimize the thinking strain developed as a consequence of the interaction with the system, thereby facilitating for a remarkable learning environment [2]. Thus it is crucial to evaluate the usability of e-learning application with giving adequate emphasis for the learners' perspective.

III. COMMUNICATION VIA MULTIMODAL INTERACTIVE FEATURES

Multimodal communication is one that exists between human and computer in which a few human senses are involved to make the interaction effective. Through this kind of interaction the limitations in the usability functions can be considerably reduced, also a wide range of information can be conveyed efficiently using different schemes. In addition to that the users are allowed to adopt the communication technology that suits their abilities. Therefore the learning experience is automatically enhanced by the support of Information and Communication Technology (ICT) which in collaboration with the certain modes like audio, visual, sense of touch and a few other channels integrates together for recognizing and extracting the delivered content. Since audio and video outputs complement

each other a variety of information can be passed on through it. Yet sound has a higher degree of flexibility since it can be heard without concentrating on the visual output. Vocal sounds can be used to represent the current status of the system by an audio feedback; additionally it helps users with vision impairment [3].

Generally speech sounds are classified into natural and synthesized speech. Speech sounds produced by speech synthesizers were not as clear as natural speech. Studies reveal that speech sounds in combination with other interaction modes, clearly improves the usability of interfaces they deal with by reducing the occurrence of errors as well as minimizing the duration of the tasks to be done. The ratio of success related to learning tasks was found to be higher when sound effects were incorporated into the learning environment.

IV. ANIMATED MODELS TEACHING HELPING SKILLS IN AN ONLINE ENVIRONMENT

The article described below gives valuable insights about the significance of animated agents in an online environment specially designed for teaching the essential helping skills needed for the professionals involved in human services.

Educators of human services, constantly face a lot of challenges when involved in helping their students to develop the communication skills and helping tendencies that is crucial for them, as they are mandatory for them to bring into play with their clients, colleagues and supervisors. Human service programs presented via distance learning face many difficulties because the educators struggle to design an interactive online course that would impart the necessary helping skills, in addition to a few practice sessions along with the evaluation of the skills acquired. In the distance learning set up even the traditional instructional methods such as role-plays, team work and even audio-visual tapes present some difficulties to establish. Added to these complications a large class which is common in a distance learning environment, increases the difficulties connected in teaching service skills [4].

To overcome these hurdles, educators may have to explore new methods which might provide opportunities for their students to learn and put into practice the helping skills suitable for the roles they play. The research work discussed here compares effectively three web-based systems designed to give online training for the students associated with human service program [4]. Out of these two used animated agents and one a script based (helper – client script) interaction.

V. ANIMATED AGENT'S CHARACTERISTICS TO BE INCORPORATED IN AN E-LEARNING PLATFORM

The research paper discussed below gives interesting inputs on how virtual agents can be incorporated in an educational atmosphere to improve the cooperative learning scenario. In a nut shell, the article addresses key issues related to the students behavior and practices in an online system, accordingly recommends a multi-agent framework.

Personification of a website involves the process of including a human element to it, means employing a virtual character to converse with the user. The advantage of this concept is that by using a human figure it is easy to manage the user's attention, thus allowing us to deliver the message we intended to share. Several projects have used virtual agents in presenting tasks particular to applications like e-learning, online commerce and helpdesks.

Pandzic [5] categorizes those under six segments as entertainment, education, communication, commerce, navigation and broadcasting [5]. On the other hand, Rist [6] categorized it on the basis of the mode of interaction between the users and characters [6].

The idea of creating a computerized character that talks to the system user started way back in the late 1960's. In 1967 Weizembaum [7] structured ELIZA, a program that was efficient enough to hold conversations with the system operator in the role of a psychotherapist [7].

"Rickenberg and Reeves (2000) [8] based on their study highlights that the existence of a character in a webpage in regards to a learning context will boost the user's confidence levels, at times it might increase his anxiety which can have both positive and negative impact". "De Angeli, Lynch and Johnson (2001) [9] also supports the idea behind the usage of customized characters, since the presence of a virtual stimuli, augments the communicative relationship between the user and computer". Few other researchers support that an animated figure can have positive effects on the students learning process. "Elliot (1999) [10] investigated the significance of adding emotional dimensions to virtual characters, and conducted studies how the virtual pedagogical representatives utilize their inbuilt intellect and reasoning capacity to sense the emotional state of the students and resolve their queries accordingly" [10]. The conversational knowledge which the agent poses to establish a smooth interaction with the user is by the means of Artificial Intelligence Mark-up Language (AIML). It consists of a database which has a pre-defined pattern and templates for all possible situations, even different moods are stored so that, when there is necessity the character reflects it in the stimulated environment [11].

The study carried out critically analyzed two aspects. First one concentrated on the social and emotional issues arising during the interactive stages; secondly, the feasibility of the multi-agent framework in which the virtual character is just a part of the entire architecture. It proposes that at present, the biggest challenge is to get to know the students' emotional state automatically. Currently only questionnaires are used to study the users' state of mind; hence all the research efforts might focus on these criteria in the near future [12].

VI. ENHANCING LEARNING WITH THE AID OF A CO-LEARNER

The communication aspect between the student and tutor is eventually improved when some additional qualities are embodied in them. The main feature among it is character believability which can be sculpted by inputs such as speech instead of scripts, three dimensional human like characters rather than cartoon or photographic images, even more effect can be felt when the behaviors of the characters are varied.

Likewise the different dimensions of the peer student can impact the student’s performance. The study assessed some qualities like completeness and supportive spirit, personalities – being reserved or outspoken and wisdom. The entire architecture is interrelated for instance when a student answers a question right, it boost his confidence and increases his happiness, this obviously affects the emotions of the co-learner.

A major challenge for learners using online educational applications is that they got to concentrate on two processes side by side. In one way they should be able to interact with the system, and in another way they should be able to extract the information being delivered. Therefore a complex interface might impede the success rate of the knowledge conveyed through system (Maldonado1, et al., 2005).

Since the presence of peer students has a positive impact on the student’s performance, future works are driven by the possibility of customizing a co-learner that will suit every student it communicates with, irrespective of limitations like age, social boundary, knowledge level, favoritism etc [13]. Although the challenges are many it is predicted that in due course of time peer learners can be efficiently utilized across diverse domains apart from the conventional educational domain, even there is a possibility of developing a structured arena when a group of co-learners exist thus contributing to enhancement of skills needed for group tasks.

VII. RESULTS AND DISCUSSION

The statistical data is presented in the diagrammatic representations. In cross examining the above charts it is very clear that the users gave good rating (5 on a scale of 1 to 5 where 1 is poor and 5 is excellent) to aspects like design and graphics, quality of audio, models teaching helping skills, characteristics of virtual agents and the interactive presence of co-learner. So it shows that the presence of co-learner has enhanced the course effectiveness noticeably. Thus it acts as a valuable input to the developers to incorporate a quality speech system, new communicational design along with a few additional traits to the animated co-learner agent in such a way that the user enjoys and gets actively involved in the session.

On considering the above discussions the performance rate, effectiveness rate and user satisfaction is boosted in the co-learners company and research works studied in literature review also endorses the very same idea. Due to this all on-going projects have incorporated a virtual co-learner character in the web based learning system. Besides that focus is laid on improving the human like emotional qualities and body languages of the animated virtual agents involved. Thus the outcome of all research works leads to the development of ideal humanoid virtual agents that are attractive and meets the expectations of the e-learners.

Research Works	Design & Graphics	Quality of Audio	Animated Models Teaching Helping Skills	Human like characteristics of virtual agents	Interactive presence of co-learner
1	2	2	3	1	4
2	1	3	1	3	1
3	4	1	2	2	2
4	3	4	4	4	3
5	5	5	5	5	5

Table 1. Performance evaluation of user rating

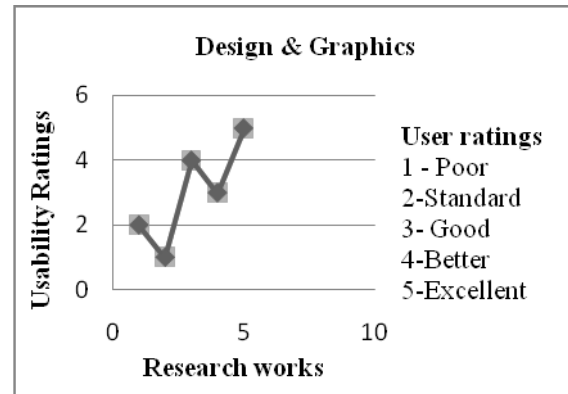


Fig. 1 Design & graphics

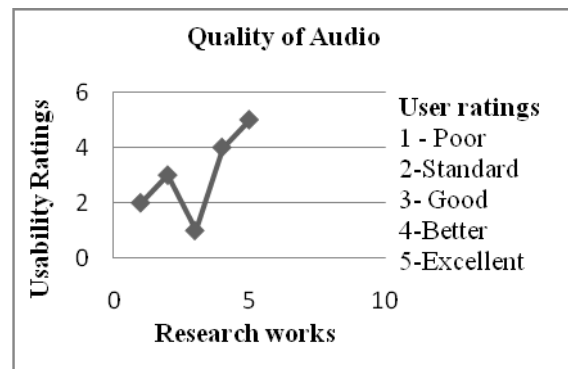


Fig. 2 Quality of Audio

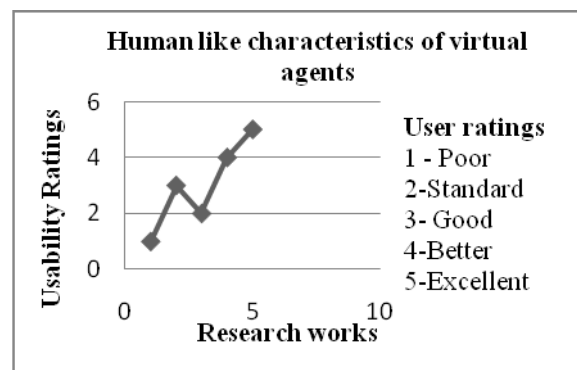


Fig. 3 Human like characteristics of virtual agents

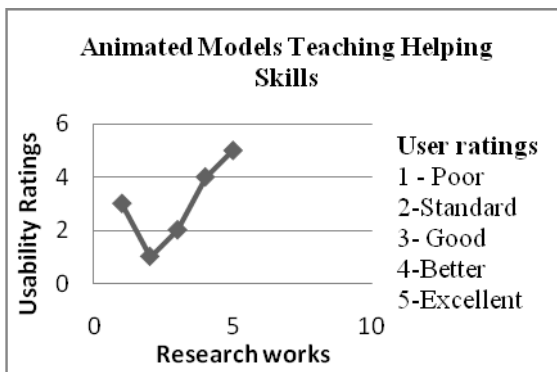


Fig. 4 Animated Models teaching helping skills

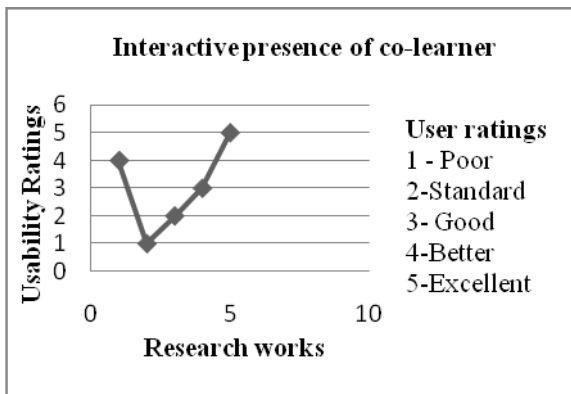


Fig. 5 Interactive presence of co-learner

VIII. CONCLUSION

Since greater learning gains were observed when the users interacted directly with the virtual agent and also co-learner agent had some kind of influence on the learner both these were clubbed together and a three way interaction (tutor-co-learner-user) was incorporated in the application to be studied. A two way interaction (tutor-learner) is also investigated to find out how the co-learner presence has positive or negative effect on the user's learning. So from this the concept of creating the tutor and co-learner agent with talking and facial expressions (eyes and lip movement) was evolved. Also in addition to the audio output a text format of the speech is presented to users by pictorial slides within the course module. Emotions were given to the virtual agents and the recall and recognition memory of the learner is calculated by quiz and questionnaire sections. This helps to analyze the usability aspects of efficiency, effectiveness and user contentment.

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