Multimodal E-learning on Note-Taking: A user Satisfaction Perspective

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Abstract: This paper introduces an empirical study to investigate the use of multimodal metaphors in e-learning application in particular within the area of note-taking. The aim of the study is to measure and compare the level of usability of these metaphors. In order to carry out this comparative investigation, two experimental interfaces were built and performed by forty users. In the first interface (textual interface), text, graphic and image were used to deliver information. The second version interface of the experimental tool (multimodal interface) offered a combination of multimodal metaphors (speech, video and avatar) to deliver the same information. The scope of this paper is to discuss the results that related to satisfaction only in terms of different aspects (ease of use, confusion, nervousness and overall satisfaction). The results obtained from this investigation have shown that the multimodal e-learning interface was found to be significantly more satisfactory than the textual interface.

Key-Words: E-learning, Usability, User interface, Multimodal Interaction.

1 INTRODUCTION
In the way that we need to find solution to the problems with the current visual user interface, Rigas et al, suggest that the use of multimodal metaphors in application learning interfaces can be more useful to communicate the information that ‘needs’ to be communicated to the user [1, 2, 3]. Also, they found that the use of speech and non speech in interface application helped the users to make fewer mistakes and reduced the time taken when accomplishing their tasks [4, 5]. Using multimodal interaction in a multiple interfaces including e-learning can enhance human-computer interaction [6]. In this experiment, we investigated the effect of including multimodal metaphors such as recorded speech, video and avatar with simple facial expressions to communicate data, and see how the addition of these metaphors affect the usability of an e-learning system [7, 8].

2 E-LEARNING
The main objective of the learning process is to develop the individual their maximum potential, and e-learning is a form of learning, which uses electronic applications to deliver learning experiences [9, 10]. Also, e-learning can be used as a collective term that describes learning with the use of internet technologies that allows learning to take place without being constrained by time or location [11]. Many benefits can be gained from e-learning accommodates individual needs, access to online learning from anywhere at anytime, each student devise their own tailor made learning program and reduce delivery the costs of delivering information [12, 13]. However, e-learning also has its limitations including reduced social and cultural interaction, technical issues and some courses can be difficult to simulate in e-learning applications. Therefore, the student’s usability in e-learning interfaces could be enhanced.

3 MULTIMEDIA METAPHRORS
A series of investigations in the use of multimodal metaphors in human computer interaction have taken place. These investigations prove that the usability of user interfaces can be enhanced when multimodal metaphors are included [14, 15]. Users will feel that they interact with e-learning applications more naturally when the visual and auditory senses are utilised in human computer interaction [16]. These auditory and visual senses can be used in e-learning environments to improve students’ achievement and enhance users’ attitude towards online courses by making the learning experience more stimulating [17]. Furthermore, it has also been proven that providing a multimodal learning environment makes learning more exciting and fun as learners enjoy interaction whilst being taught rather than boring textual delivery of information.
In this experiment video, speech, and avatar are used for enhancing efficiency, effectiveness of the interface, and users’ satisfaction. This study investigates comparison of the usability experience using the above mentioned modalities with visual-only interaction metaphors including text, graphic, and image.

4 EXPERIMENT
Two different interfaces of the experimental e-learning tool were empirically tested by 40 users. The first interface platform (textual interface), based on three input modalities, namely, text, graphic, and image was used to deliver information about note-taking. The second platform interface (multimodal interface) delivered the same information as the textual interface.
based on three input modalities: speech, video, and avatar. Users of the textual interface were required to make notes using either text, graphic, or image, and users of the multimodal interface were required to make notes using speech, video or avatar. For example, in the multimodal interface the participant was required to read and select a word from a passage of text and then make some notes relating to the selected word using speech. The same task was then replaced with recorded video for adding notes. In the third task, a human-like avatar was included in the multimodal interface to represent the recorded speech.

4.1 PROGRAM LANGUAGE
The experimental platform was developed using the visual basic programming language from Microsoft Visual Basic 6.0 because it was recommended to be useful software. This work was supported by the fifth Frameworks Programme. First frame box was the main interface which presented the output of textual interface text, graphic, and image; the others frames used as input of text, graphic and image. In the multimodal interface it was four frameworks programme. The first frame was the main interface that presented the output speech, video, and avatar.

4.3 PARTICIPANTS
Forty participants, consisting of under-graduates and post-graduates were selected to investigate the effect of including multimodal metaphors usability of e-learning interfaces.

A post-experimental questionnaire at the end of the experiment was answered by all participants. Participants were 15% of them had a bachelor’s degree, about 30% had doctor’s degree and the remaining percentage had master degree 55%. The participants have been grouped into three categories on the basis of age. The result shows that the majority are aged between 25 and 34 years old (43%) followed by those between 35 and 44 (38%) and the remaining percentage was over 35 years old.
The average genders of participants were 78% male and only 23% were females. The reason for a low number of female participants was due to scarcity of females meeting the criteria of English as a second language and some basic computer competency. The participants also had a scientific background and they were using the experimental platform for the first time.

4.4 METHODOLOGY
Three criteria were chosen for measuring the level of usability of the two interfaces: effectiveness, efficiency and users satisfaction. The relationship between the communication metaphors, used in the applied interface version, and each of usability parameters was required to be evaluated and discussed. Efficiency was measured by the time users took to complete the required tasks. The effectiveness was measured by the number of successfully performed tasks and the number of error made by users. Satisfaction was evaluated by the users’ responses to the post-experimental questionnaire. Therefore, the main hypothesis states that the multimodal e-learning interface, which used recorded speech, video, and avatar, would be more efficient, effective and satisfactory than the e-learning interface that used text, image, and graphic input modalities.

Figure 3 shows the average score of satisfaction
5. RESULTS AND DISCUSSION

The responses of users in both interfaces to the post-experimental questionnaire were used to measure their satisfaction. This questionnaire was scored 1-5 on the Likert Scale with fourteen statements regarding each interface, which fitted all experimental conditions, and the users were required to specify their agreement to these statements. These statements were mainly about the ease of use, confusion, nervousness usefulness of each metaphor and overall satisfaction. Users were asked to select their preferred interface and provide an explanation for their choice. The five points Likert scale was used for each statement in the questionnaire, ranging from 1- the value for strongly disagree, to 5- the value for strongly agree. The score of each statement for each user in the questionnaire was added together to create an overall user’s satisfaction. T-test was used to evaluate the significance of the difference between the two interfaces by the total number of scores to test the difference in the users’ satisfaction. The results show in figure 3 that participants were significantly more satisfied in all statements when using the multimodal interface than when using the textual interface (t = 2.94, cv = 1.68, p<0.05).

Consequently, statistical results showed that using multimodal metaphors in e-learning application, in particular within the area of note-taking, was found to be more satisfactory than the interface with text and graphics, and image.

6. CONCLUSION

This experiment investigated the use of multimodal metaphors in the interface of e-learning application. A combination of speech sound (recorded, video, and avatar was found to be significantly more satisfaction (in terms of ease of use, confusion, nervousness and overall satisfaction) than using text, graphic, and image only. Also, the results in this paper have shown that incorporating speech, video, and avatar can improve the usability of e-learning applications in particular within the area of note-taking.

References: