



Maintain Learners' Motivation within Asynchronous E-Learning Environments: How Can Interactive Avatars Help?

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ABSTRACT

Due to COVID-19 pandemic the face-to-face learning process around the world have been stopped and the majority of the educational institutions have been transformed from traditional learning to e-learning. Therefore, both synchronous and asynchronous e-learning received more attention from the researchers. Although asynchronous e-learning seems to be economically the best option for institutions, keep learners motivated for the entire asynchronous e-learning process still one of the biggest challenges. In this context, the current study investigates the use of an interactive avatar to maintain the learner's motivation during the asynchronous e-learning process. This study suggested an architecture for asynchronous e-learning system that have the ability to detect learners' motivation and maintain their motivation during the learning process. One of the main components of the suggested architecture is the interactive avatar. Moreover, this study presents the structure of this interactive avatar to be able to interact with the learner to maintain their motivation.

Key words: COVID-19, E-Learning, Interactive Avatar, Asynchronous e-learning, Motivation Assessment

1. INTRODUCTION

Since the emergence of the Internet, the technology's role in education has grown and extensive changes have occurred. Utilizing the internet, learning can be delivered in two different methods. The first is the asynchronous method. This method allows the learner to acquire the knowledge at any time and in any place; they can learn in more repose way. There are many forms of asynchronous e-learning such as instructional websites, forum, and email. The second is the synchronous method where the teacher and the learner interact in real time. There are many forms of synchronous e-learning such as real-time web chats and video conferences [1].

Due to Coronavirus Disease (COVID-19) pandemic, in 2020 many educational institutions around the world had to transform their classes to the distance education environment. According to Bruscato and Baptista [2] students and teachers at different universities have a negative impression about distance education. However, distance education is the safest option during the pandemic [3]. As mentioned by Ebner and his colleagues [4], before COVID-19 for more than 30 years different forms of e-learning systems have been used and implemented around the world. Nonetheless, e-learning systems have often been used as a supporting method for the traditional classes; rarely found pure-online courses.

According to Bruscato and Baptista [3] both synchronous and asynchronous e-learning methods seem to be equally effective for students' learning, even though each method has different requirements. For synchronous learning, there is a need to connect the teacher with a group of learners simultaneously and it is better to have a small number of learners in each group to improve the interaction between the teacher and the learners. For asynchronous learning, teacher have to initially prepare and design the course materials and activities, he/she can also follow the learners' progress and answer their questions using Learning management system (LMS), forum, and/or email. Although synchronous e-learning includes direct contact between learners and teachers that is more similar to face-to-face interaction, asynchronous e-learning seems economically the best option for institutions.

Many studies clarified the importance role of motivation in the learning process and demonstrate that it's one of the crucial elements of education, as motivation considered as one of the main element that drive the learners' performance [5-8]. According to Hrastinski [1] learners felt more motivated during the synchronous e-learning process than

asynchronous e-learning, as synchronous e-learning interaction occurs directly between teachers and learner same as face-to-face interaction. One of the major motivational problems in asynchronous e-learning is drop-out rates that tend to be higher than traditional classes, because learners generally feel isolated and levels of interactivity in the learning process are often regarded trivial [9-10].

For decades, educators have seen the motivation as a design mater in e-learning process. In other words, a good instructional design and a proper pedagogical activities would motivate the learners [11]. Although it's important to design the e-learning systems to be motivated for students, maintain learners motivations for the whole learning process still one of the biggest challenges [12]. Even though teachers can interact directly with the learners and maintain their motivation during the synchronous e-learning and face-to-face learning, the direct interactivity in asynchronous e-learning environment to keep learners motivated is a more challenging process [13].

Being one of the major success factors of the learning process; there is an increasing interest by researchers in finding a way to maintain learners' motivation during the asynchronous e-learning process. In this context, there were efforts to construct knowledge on how to maintain the learners' motivation during e-learning process. Most of those efforts focus on forming some tactics or strategies to enhance learners' motivation within an e-learning process. Examples of such studies are: Hull and du Boulay [14], Arroyo et al. [15], Song and Keller [16], and Astleitner and Leutner [17]. However, those researches have many limitations, and it is difficult to apply their models to asynchronous e-learning. Thus, this research tries to investigate whether the interactive avatar can be used to maintain learners' motivation within an asynchronous e-learning process.

2. MATERIAL AND METHODS

2.1. Research Framework

The research framework, which can be seen in Figure 1, was constructed and linked based on Ramaha's research [18].

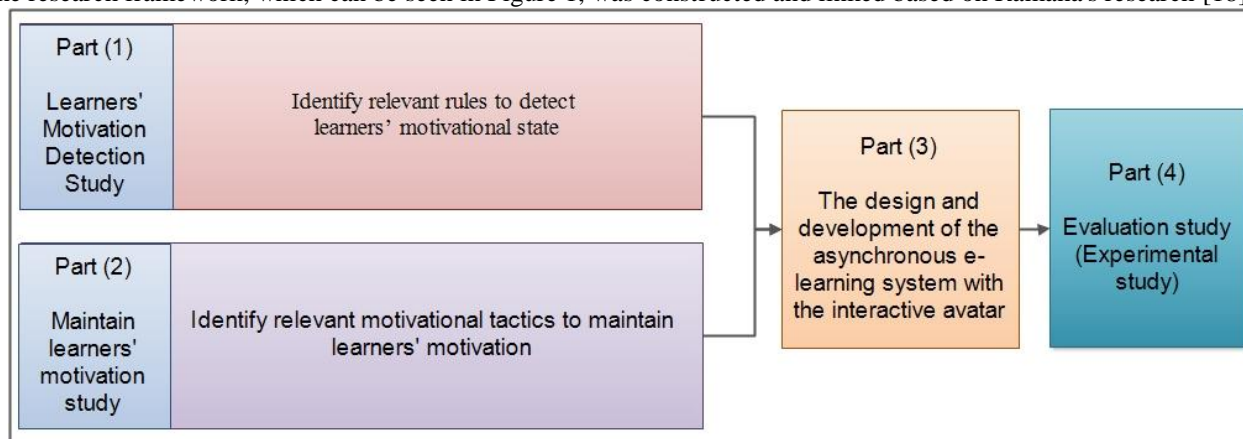


Fig.1 Research Framework.

The framework consists of four parts:

1. Learners' motivation detection: this part of the framework contains a set of rules to detect learners' motivational state. These rules adopted from Ramaha's research [18].
2. Maintain learners' motivation: this part of the framework contains a set motivational tactics to interact with the learners' depending on their detected motivational sate. These tactics also adopted from Ramaha's research [18].
3. The design and development of the asynchronous e-learning system with the interactive avatar: in this part in the research a web-based tutoring system (WBTS) had been developed to be able to detect learners' motivation depending on the rules from the first part. Moreover, an interactive avatar has been developed to be able to interact with the learner to maintain his/her motivation depending on the tactics from the second part.
4. Evaluation study: This part of the research involves an experimental study to evaluate if the interactive avatar was able to maintain learners' motivation within an asynchronous e-learning process.

2.2. System Architecture

Figure 2 shows the architecture of WBTS system. This architecture concentrates on the relationship between the learner and the system components.

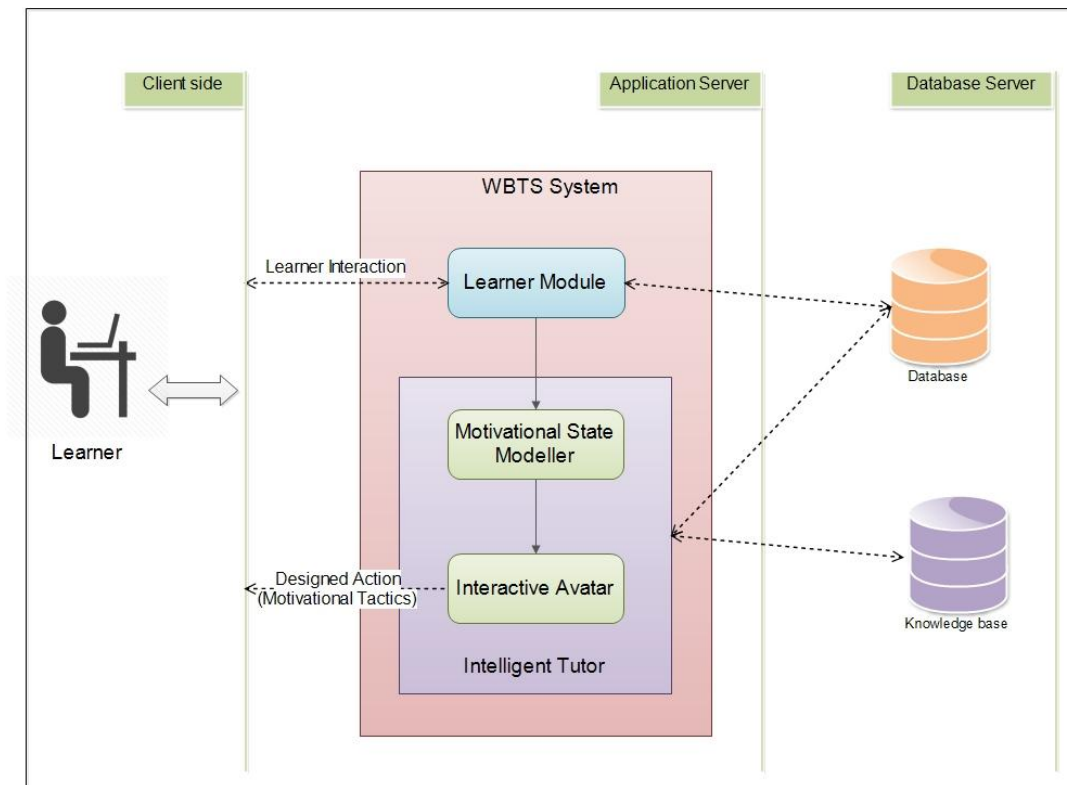


Fig. 2 System Architecture.

The architecture divided into three parts:

1. Client side: this part contains a web-based interface (website) that allow the learners to interact with the e-learning system.
2. Application server: contains the main components of the e-learning system and the connection between these components. It also represents the interface between the client side requests and the database server.
3. Database Server: contains the stored data and the knowledge based rules. The knowledge base has two types of the rules; motivational state rules and motivational tactics rules.

As shown in Figure 2, WBTS has three components to interact with the learners, then detect and maintain their motivation. These components are:

1. Learner Module: This module gathers information during the interaction between the learner and the system. These information include cognitive and learner's motivational state (log data). The cognitive information such as success or failure to answer a quiz, asking for help, and giving up. While, logs data examples are the exercise results, time spent answering the questions, whether the learner has received help or feedback, mouse movements, and learner's hesitation (the needed time to start the questions answering after opening the quiz). This module will save the gathered information in the WBTS database. Moreover, it will send this information to the "Motivational State Modeller".
2. Motivational State Modeller: This Modeller evaluates and analyzes the cognitive and logs information that come from the "Learner Module" to diagnose the learner's motivational state. Thereafter, the result of this diagnosing will be stored in the database. This modeller uses the adopted motivational state rules from Ramaha [18] to do this diagnosing. These rules stored in the "Knowledge Base".
3. Interactive Avatar: This component receives the motivational state of the learner from the "Motivational Modeller" and takes decisions about which motivational tactics' rules should be applied and when to apply it to maintain the learner motivation. This component uses the adopted motivational tactics' rules from Ramaha [18] to take these decisions. These rules also stored in the "Knowledge Base".

2.3. The Design of the Interactive Avatar

The interactive avatar that is shown in Figure 3 is an avatar that communicates with the learner and trying to keep learners motivated for the whole asynchronous e-learning process.

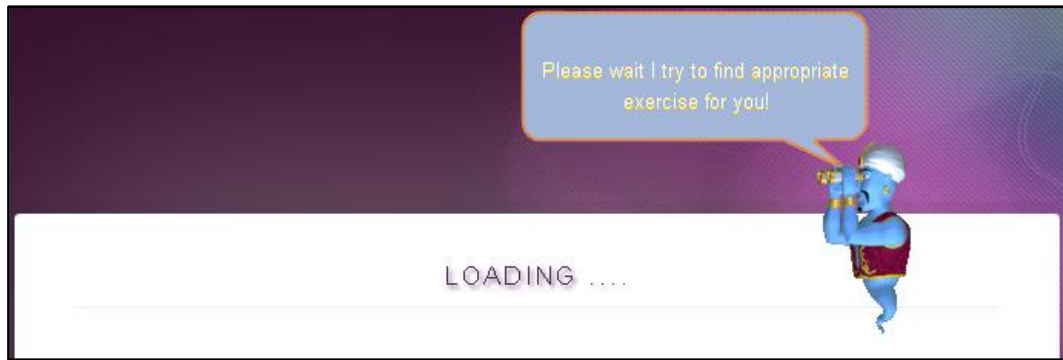


Fig. 3 Interactive Avatar

As mentioned in the previous section the avatar takes decisions about the way to communicate with the learner depending on a set of motivational tactics' rules from the “Knowledge Base”.

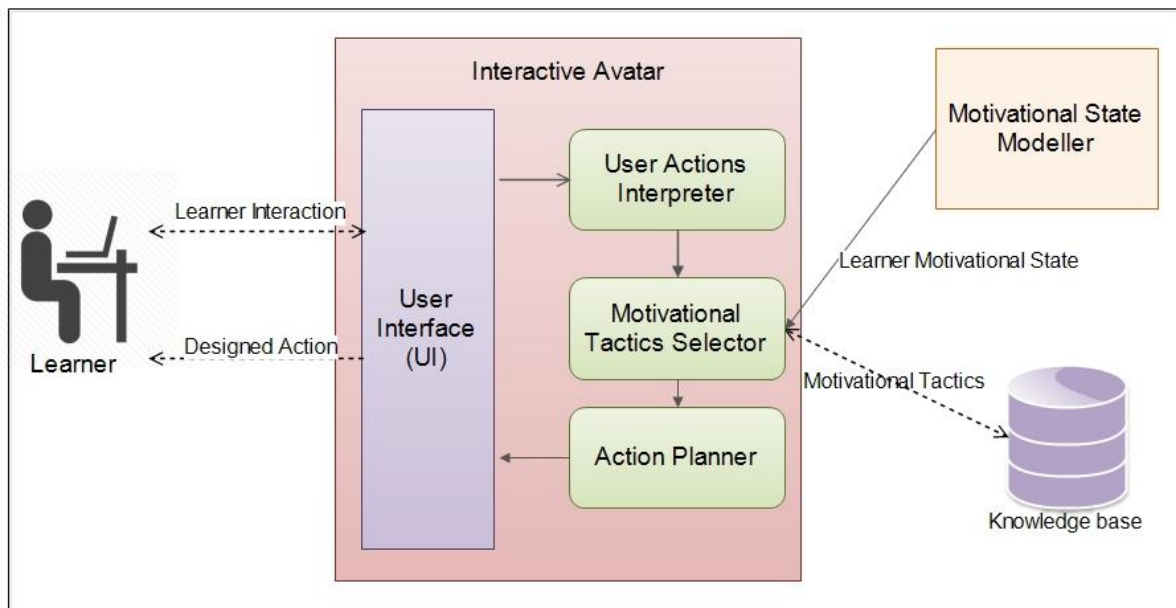


Fig. 4 Interactive Avatar

As illustrated in Figure 4, The avatar interprets user actions such as finished the given task successfully, failed to do the given task, give up the given task, and ask for help. Thereafter, Motivational tactics Selector selects the appropriate motivational tactics rule depending on the interpreted action and the learner's motivational state. Then the action planner prepares the designed action to interact with the learner.

Examples of the designed actions that could be taken by the interactive avatar:

- Provide the learner with performance feedback to reward his/her performance.
- Require more effort from the learner.
- Provide the learner with a same/more/less difficult task.
- Praise the learner’s effort.
- Ask the learner to continue with the task.
- Provide the learner with help.

Figure 5 shows a decision tree to explain the way of taking action by the action planner. This tree shows that this learner motivational state is high attention, low confidence, low satisfaction, and low effort. This learner finished the given task successfully. Depending on this information the planner applies the following motivational tactics: Reward the learner’s performance and provide him/her with performance feedback, require more effort from the learner, provide him/her with a same difficulty task.

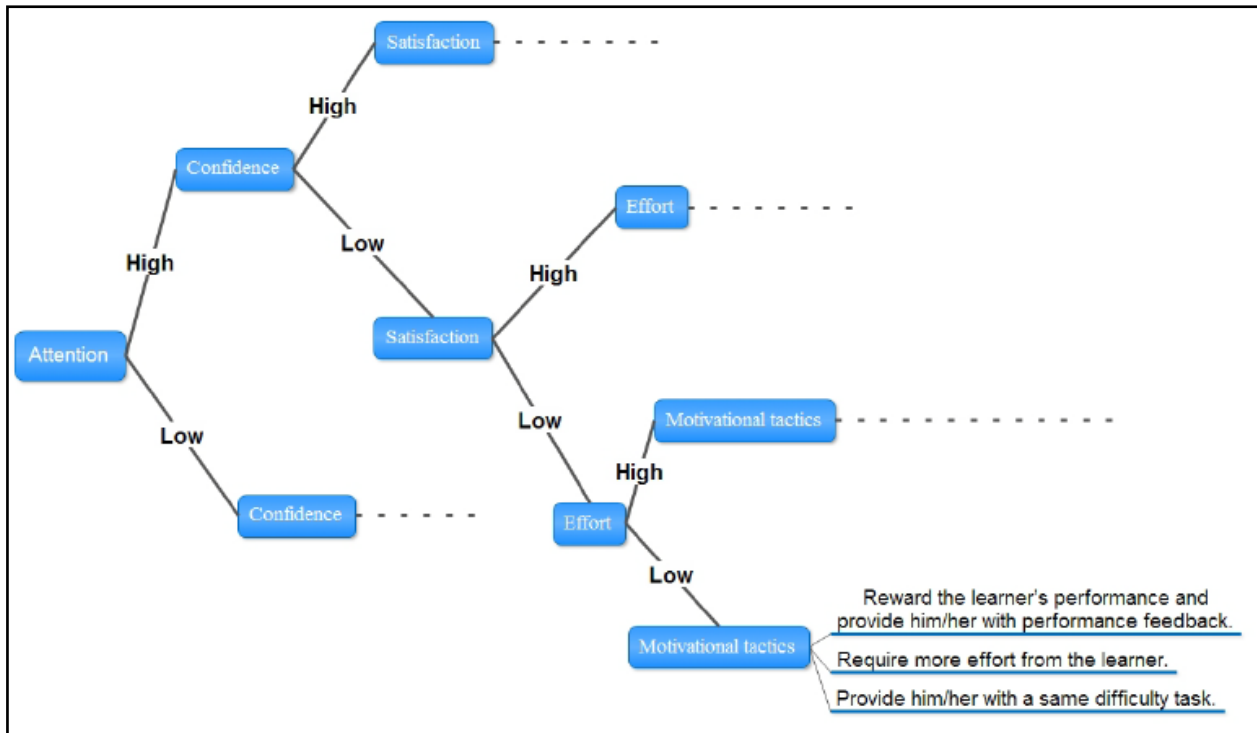


Fig. 5 Decision Tree for One of the Motivational Tactics' Rules.

Figure 6 represents an example of how the interactive avatar communicates with the learner trying to maintain or even enhance his motivation.

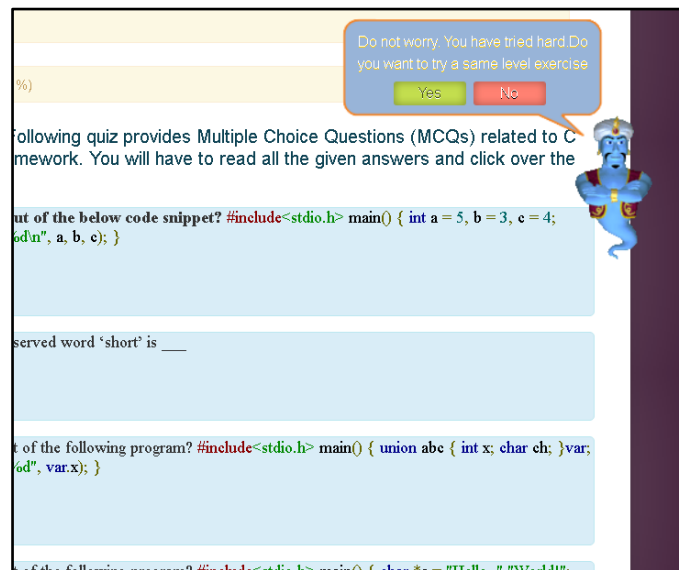


Fig. 6 The interactive avatar applying the motivational tactics.

2.4. Experimental study

As shown in the research framework (Figure 1) the fourth part of the framework is an experimental study, the aim of the experimental study is to evaluate the work of the interactive avatar and answer the question; if the avatar will maintain the learner motivation during the asynchronous e-learning process. In this context, we started to prepare two copies of a web-based e-learning system. The first copy will have the interactive avatar and the second copy will not have the avatar. Then we will do the experimental study on two groups; treatment group will use the first copy and control group that will use the second copy. The experimental study will have pre-test and post-test for the two groups to check if there are any significant differences in learners' perceived motivation between the two groups.

3. CONCLUSION

The traditional learning process has been interrupted around the world due to COVID-19 pandemic. Therefore, the learning process in most educational institutions has been transformed to the e-learning. Hence, E-learning is becoming much more important, and it gains more focus by recent studies. Being one of the best economic options for institutions this research study focused on asynchronous e-learning. Since that keeping the learner motivated for the entire learning process one of the biggest challenges, this study suggested the use of an interactive avatar to maintain the learner's motivation. This study presented the architecture of the suggested asynchronous e-learning system, including the interactive avatar and its structure. Moreover, after the literature review, this study selected a set of motivational state's and motivational tactics' rules that will help the system doing its job maintaining the learners' motivation. However, we are looking to complete an experimental study in the near future to evaluate the work of the suggested avatar.

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