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Towards measuring learner's concentration in E-learning systems

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Abstract:

Due to the advantages of e-learning platforms, many universities and schools around the world had adopted e-learning platforms in their educational systems. Students appreciate using e-learning platforms because of the advantages that offers like time flexibility, location flexibility and fast access to courses documents. However the major problem that they have with e-learning platforms is the difficulty to maintain concentration and focus during the learning time. The absence of teacher leads students to feel free to use phones, navigate in web sites, and play video games and by consequence they lose their focus and they couldn't understand the course.

In the traditional way of learning, teachers are face to face with students so they know how to keep them engaged in a lesson and how to get them back on track when they lose focus. Those ways used by teachers to keep students engaged are difficult to be implemented in e-learning systems. That's why many studies had aimed this problem and try to find the best ways to implement those methods to maintain learners' concentration during the use of e-learning platforms. There are many solutions under studies such as using cameras, brain waves, blood oxygen, heartbeat and blood pressure to detect when students are losing focus to activate an action to get the focus back. In this paper we will focus on the different methods for measuring students' level of concentration

Keywords **— E-learning, concentration, skin temperature, web camera, EEG signals.**

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I.   INTRODUCTION

Compared to traditional face to face learning [1], E-learning had offered either for teachers and students many advantages. E-learning gives teachers possibility to share courses, quizzes and multimedia files. They can also share online discussion with students which can lead to build good relationship between teachers and students. Furthermore, E-learning offers to students more flexibility to consult courses anywhere with a considerable flexibility of time, it also reduces travel time and travel costs for off-campus students. In addition, e-learning allows students to retain more information than with traditionally instructor led training due to the variety of elements combined to e-learning such as videos, audios, simulations or webinars that reinforce the learning message, [2] Despite all the advantages of E-learning, e-learning platforms had neglected a very important element in the learning operation which is the control of students' intention during the use of the platform in order to keep students engaged.

We need to keep in mind that when students are using e-learning platforms, there is no teacher to supervise and alarm the student to give more intention to the course, so the learner can quickly feel bored and sleepy and by consequence learner find a difficulty to take the course.

Many researches are interested by this problem and try to find solution to control students' intention by analysing their behaviour and motivation using cameras, brain waves, blood oxygen, heartbeat and blood pressure.

In this paper we will present different measuring methods of learner concentration. The organization of this paper will be as follows. Section 2

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introduces e-learning evolution over the time. Section 3 shows the relation between a successful e-learning and learner concentration. Section 4 presents different methods of measuring learner concentration level. The last section concludes the paper and provides future directions for further research.

II. E-LEARNING EVOLUTION

E-learning can be defined by the use of telecommunication and technology to deliver education and training knowledge. Before 1983, As stated by Kiffmeyer(2004), the learning method was Instructor-Led Training (ILT) in which learners can interact with teachers and with themselves, this way of learning needed more costs for travelling and lodging. After 1984, with the apparition of computers, PowerPoint and cd-rooms, more transportability had been given to courses which makes students free to consult their courses anytime and anywhere, and by consequence they can save learning time and cost. The disadvantage of this way of learning was the lack of student-instructor and student-student interaction. This problem had been solved after thanks to the apparition of web technology in 1994. With streaming, media players, mailing, etc. The course had become more illustrated and more interactive. The problem of this method was the web additional costs due to the law band-width and the high price of internet access.

After 2000, with the evolution of web technologies, network, band-width access and lowing of internet cost, learning had become in live with a good interaction teacher-student and student-student.

III. SUCCESSFUL E-LEARNING AND LEARNERS CONCENTRATION

To benefits from advantages of e-learning evolution and to have a successful e-learning, there must be a good learner satisfaction. Because when a learner is satisfied his intention increases to continue using the e-learning course. To ameliorate learner satisfaction many studies had been established. Sun, Tsai, Finger Chen and Yeh(2008)

had done an empirical investigation of the critical factors influencing learner satisfaction, and had found that factors influencing learner satisfaction can be categorized into six dimensions:

learner dimension, instructor dimension, course dimension, technology dimension, design dimension and environment dimension. Controlling these factors can considerably increase students' satisfaction. But even if all those factors are taken into consideration in the e-learning system, student can lose his concentration during the course because of familiar or health problems, the use of mobile phone during the course or browsing web pages for fun during learning. Knowing that teachers cannot grasp the real learning situation during e-learning courses, students will not follow course evolution and as a result they will learn nothing. Therefore, it's very important to find a method that allows instructor to know student concentration level and by consequence alarming him about his concentration level.

IV. METHODS OF MEASURING LEARNER CONCENTRATION

Many researches are interested incontrolling learner concentration during learning and had developed several methods to measure it.

A. Skin temperature indicator

According to an experiment done by Nomura, Hasegawa-Ohira, Korosawa, Hanasaka, Yajima and Fukumura (2012), Skin temperature (ST) is one of the indicators that can be used to detect student involvement in e-learning courses.

ST variation reflects changes in blood stream in a non-stressing behavior. Having a close relationship between blood stream and "the choice of behaviors", a variation of skin temperature implies a change in student use of e-learning materials.

Nomura, Hasegawa-Ohira, Korosawa, Hanasaka, Yajima and Fukumura (2012) had used integrated thermistor into the mouse to measure student temperature without stressing users, the analysis of the values measured combined with real observation of student intention had shown that

there is a relationship between skin temperature variation and students intention.

B. *Visual attention recognition*

Visual attention recognition (VAR) is one of the most used ways to measure user's intention. The first step of VAR is to capture each second user's pictures. The second step is to analyze them with software to detect students that had loss concentration.

According to a VAR experiment done by Rakahashi and Arita (2014), the accuracy of results is about 83%.

C. *EEG Signal for attention recognition*

EEG signals can also reflect user intention by measuring human brain signals with mobile brainwave sensors. The use of this indicator to determine level concentration of students is viable because humans in general cannot control their fluctuations in their EEG signal (Ning-Han, Cheng-YuandHsuan-Chen, 2013).

According to an experiment done by Ning-Han, Cheng-Yu and Hsuan-Chin (2013), the accuracy of this method is about 76.82%.

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V. CONCLUSIONS

Measuring student's concentration during learning is very important to ameliorate learning quality and efficiency; many research works had found methods to measure student's intention. Those methods can be explored in further researches to find suitable methods to alarm students about their concentration level without stressing them.

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