Attention Analysis Of Candidates For Creating Virtual Interactive E-Classroom

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Abstract

Abstract: To overcome the difficulties posed by more traditional and conventional learning methods, more and more organizations and institute are turning to e-learning to offer their employees an effective means of increasing their knowledge and understanding. E-learning offers organizations/institute the ability to deliver education independent of time and place. One of the major reason e-classroom cannot achieving proper required result is due to the lacking interest of student in classes and lectures. In this paper we are trying to propose and attention analysis model to track and maintain the attention level of students, this system concentrate on the Facial and eye behaviour of candidates whose values are uncertain w.r.t. to time, and to solve this uncertainty we are proposed to use Fuzzy logic.

Keywords: component; formatting; style; styling; insert (Minimum 5 to 8 key words)

1. Introduction

Nowadays, E-learning systems are widely used for education and training in universities and companies because of their electronic course content access and virtual classroom participation. E-Learning has its origins in computer-based training (CBT), which was an attempt to automate education, replace a paid instructor, and develop self-paced learning. Students have shown a great adaptability to this kind of studying. Namely, E-learning has proven to be a very popular and acceptable way of studying, owing to its flexibility, as well as its higher degree of innovativeness in terms of introducing new and contemporary programs in comparison to traditional faculties [2].

E-learning is purely technology-enhanced learning via internet and customized intranets. Because of the technological revolution, the education system has got tremendous changes in the later part of 90s [4].

Whenever we talk about E-classroom or E-learning, one thing which directly comes in our mind is an education through electronic media. E-classroom is gaining popularity due to their effective ability to provide world class teaching pedagogy using internet resources. E class room system not only provides world class teaching facility to candidates it also offers interactive and effective collection of course material that is not possible with traditional teaching pattern (face to face interaction) between students and teacher.

By E-learning research, we mean primarily research into, on, or about the use of electronic technologies for teaching and learning. This encompasses learning for degrees, work requirements and personal fulfilment, institutional and no institutionally accredited programs, in formal and informal settings. It includes anywhere, anytime learning, as well as campus-based extensions to face-to-face classes. E-learning includes all levels of education from pre-school to secondary/high school, higher education and beyond [3]. Recent advances in

multimedia and communication technologies have resulted in powerful learning systems with instructional video components. The emergence of non-linear, interactive digital video technology allows students to interact with instructional video. This may enhance learner engagement, and so improve learning effectiveness [5].

Widely used E-classroom are

(a) A –View: (Amrita Virtual Interactive E-Leaning World) this is one of the best initiative of MHRD and IIT Bombay which is spread over entire India they are trying to improve the technological backbone of our country.

(b)NPTEL – National program for Technological Enhanced E-Learning System. That is joint initiatives of Indian Institute of technology and Indian Institute of Science. No doubt the study material of both the institute is very effective to improve the skills of students as well as beneficial for faculty development program.

The successful implement of E-classroom faces many challenges some of them are listed below.

1. High speed internet connectivity at both ends to maintain the synchronization
2. Need of high quality camera and audio, video devices
3. Good quality LED LCD monitor, projector is required to cover the whole e class room

Apart from above mention challenges biggest challenge in E-classroom is that do actually students are taking benefit or just misuse of entire E-resources if they will not utilize E-learning contents properly we need to check their attention during E Classes. Attention analysis is required at both ends.

In this paper we proposed attention analysis model to analysis the interest level of students in E-classroom. Eye and facial expression are two important attribute of human being to analysis their attention. Eye contact helps to regulate the flow of communication. It signals interest in others and increases the speaker's credibility. People who make eye contact open the flow of communication and convey interest, concern, warmth, and credibility. It is important to remember that some cultures view direct eye contact as being aggressive and facial expression also very helpful to convey the attention status of students. Hence, we need to pay extra attention toward the eye and facial behaviour to ensure the success of E-education system and make it more effective than face to face teaching.

1.1. NEED OF E-CLASSROOM

Electronic base learning is known as E-learning. A learner learns the instructional contents through the electronic technology. E-learning allows learners to access electronic course contents through the network and study them in virtual classrooms. It brings many benefits in comparison with conventional learning paradigm, e.g., learning can be taken at any time, at any place (e.g., campus, home, and train station).

Level of E-learning There are four levels of E-learning, from the very basic to advance level. These levels are:

Knowledge database

It is most basic level of E-learning probably we have seen in software sites offering indexed explanation and guidance for software questions also gives the step by step instructions to perform specific task. We can find out the database by typing a keyword or phrase.

Online support

Online support is the second level of E-learning. Function of online support is almost similar to knowledge database. It comes in the form of online bulletin boards, chat rooms, email, or live instant – messaging supports. Mostly targeted questions are asked in it which has the more immediate answers

Asynchronous training

Third level of E-learning is asynchronous training. Self-learning is essential in this level; either it is CD ROM based, network based, internet based or intranet based. It is known as most traditional way of E-learning. You may contact instructor through online discussion board and email or it may be totally self-study with links to reference materials in place of live instructor

Synchronous training

Most advance level of E-learning, live instructor is available for everyone to negotiate their problems in a predefine time. Everyone can communicate with each other. This type of training takes place through internet web sites, audio or video conferences, internet telephone.

E-classroom systems that support Synchronous type E-learning are one of the most important technique to impart quality education with the help of e learning system we can provide worldwide information to all the remotely located groups of student, those who are not able to get opportunities of IITs, NITs, and other world class faculties.

2. Related Work

Researchers are trying to improve the e- Classroom more effective, some of them are trying to convert the course content in local language, similarly trying to add more features to make live classroom by adding questioning session in between lectures to make it effectives as traditional teaching method. Human activeness level can be determined by various

attributes, Eye and facial expression are most important attribute. Some of the related works carried out by researchers are

The Fatigue Detector

As the human fatigue increases, his/her eye blinks and mouth opening tends to last longer. The system can determine the blink rate by counting the number of consecutive frames in which the eyelashes remain closed. The area of black pixel region in open mouth and closed mouth are different. Similarly the area of the black pixel region in the case of open eye is different from that of closed eye. These areas of eye and mouth regions are given inputs to the fuzzy inference system. The fatigue detection system is Mamdani fuzzy inference system with two inputs and one output as shown in Figure 1 (a) (b) & (c). The eye and mouth tracker outputs are given as inputs to the fuzzy inference system. Three partitions are made on eye tracker output so it has three membership functions named with the linguistic variables blink, sleepy and slept and two partitions are made on the mouth tracker output so it has two membership functions named with the linguistic variables normal and yawn. The sample rules could be

If (Eye Blink) and (Mouth is Normal) then (Output is FIT)(1)

If (Mouth is yawn) then (Output is Fatigue)(1)

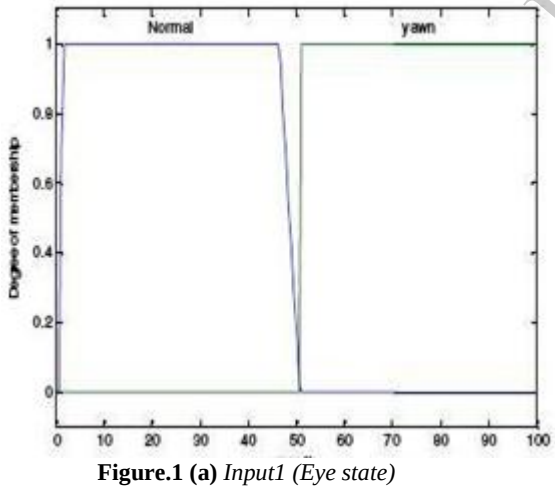


Figure.1 (a) *Input1 (Eye state)*

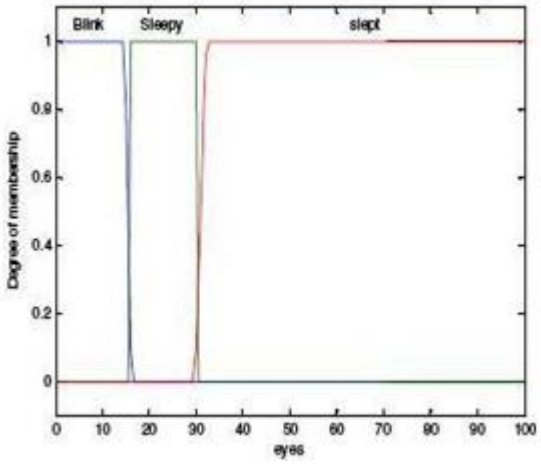


Figure.1 (b) *Input2 (Mouth state)*

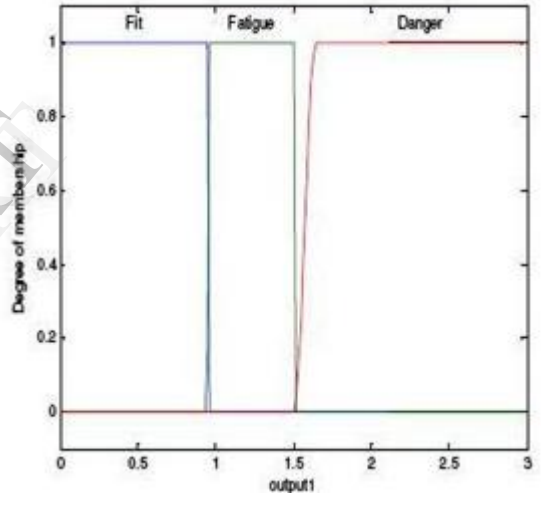


Figure.1(c) *Output of the fuzzy system (fatigue state)*

To compute the final output centroid defuzzification is proposed. Figure 2(a) and Figure 2(b) shows the fatigue detector when the person is normal and fit for driving & also shows how the system signals a "fatigue alert" when the eyes have been closed for many consecutive input frames and/ or mouth is open for many consecutive frames (3-4 seconds)

Figure.2 (a) *Output1*

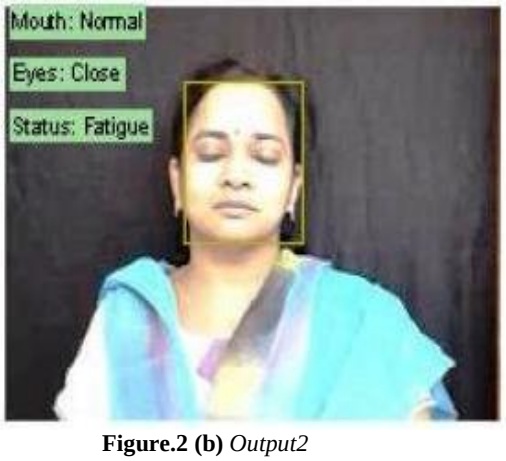


Figure.2 (b) *Output2*

This Fuzzy based Fatigue Monitoring system is tested with Human of different skin colour, with facial hair and of different gender. The system is able to complete the eye localization and tracking at 15 frames per second. For small head-movements, the system rarely loses track of the eyes and mouth. Under these circumstances, the system was able to detect prolonged eye blinks and yawning in 95% of the times and it produced occasional false alarms. For better results system need is to add the capability of auto-zoom on the eyes, once they are localized. This would avoid the trade-off between having a wide field of view in order to locate the eyes and a narrow field of view in order to detect fatigue

As we know that teacher is available online and watching the activities of students if they found that students are not interested in the learning, this creates problem for teachers to maintain the mood and their flow of teaching.

3. Proposed Work

The success of E-classroom depends only on the proper attention of students, otherwise entire E-learning resources become useless.

We have proposed a conceptual model for attention analysis to keep students alert during the lectures

(A) Eye tracking system: keep watching/tracking the eyes and its activity of student, attention level of student can be check. Eye tracking system can be implemented in two different ways

Eye Blinking Analysis: In this technique system track the eye blinking ration of student. Camera will capture the eyes image and calculate the no of times eyes blinking. And match the current data with standard, and alert the student of particular seat no. (If the student is sleeping i.e. no eye blinking)

Eye movement Analysis: Gaze includes looking while talking and listening. The length of a gaze, the frequency of glances, patterns of fixation, pupil dilation, and blink rate are all important cues in nonverbal communication.

Some students are not feeling sleepy but not paying attention to the lectures, this situation will not make any noticeable change in eye blinking ration. But with the eye movement of student the system will recognize their area interest. Like if student is not paying attention on screen, he will start looking here and there. And if this movement is continuous or frequently the student will get alert

(B)Facial Expression analysis: The face as a whole indicates much about human moods. Facial expressions, more than anything, serve as a practical means of communication. Facial expressions usually communicate the quality and nature of emotions. Faces convey many signals (i.e., gaze or expressions) essential for interpersonal interaction. A classic spatial cueing paradigm was used to assess whether different facial expressions may cause differential orienting response times and modulate the visual response to a peripheral target [11].

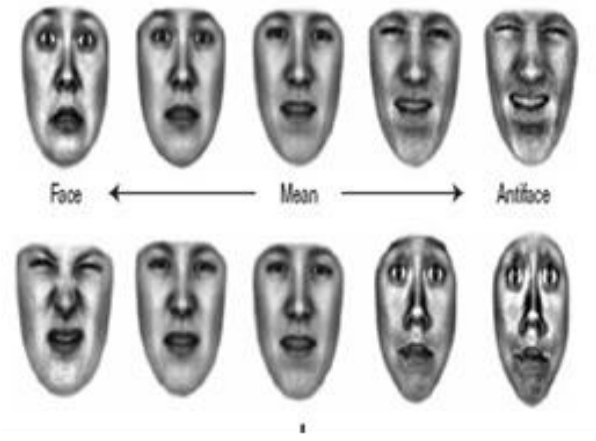
Assumptions for proposed E-Classroom

(i) Class strength is fixed

(ii) Every student is identified by seat number.

(iii) To avoid disturbing the whole class only drowsy student at particular seat will be notified.

(iv) The lecturer at the other end is also notified about the inattentive student, so that they can make their some personal tries to make that student alert toward the class like asking questions to that individual, etc.



3.1. WORKING MODEL OF ATTENTION ANALYSIS SYSTEM

1. Every students are allotted their seat
2. The system will periodically scan the facial expression and eye pattern of student.
3. Data is stores to their respective tables and for each student separately
4. Current data of each student is matched with the already given standards.
5. If the irregularity or much difference in between both the data for long time then
6. Alert the student at particular seat. Notify the lectures about that student. Go to Step2

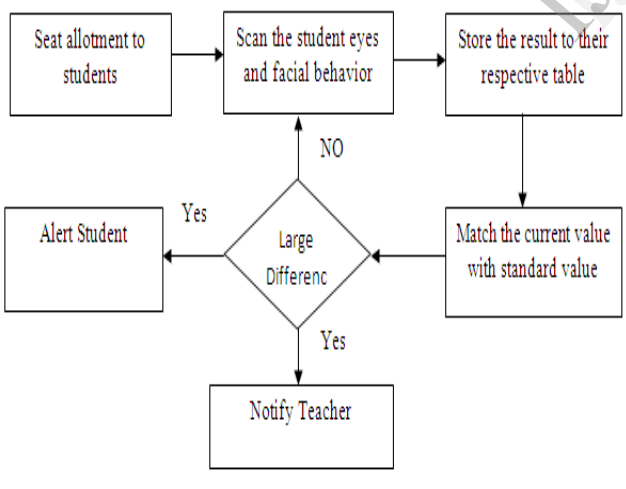


Figure 3. *Attention Analysis System Model*

Eye blink and facial expression are uncertain attribute of human being. Fuzzy logic is excellent mathematical tool to handle uncertain attributes. Normal Blinking patterns of human eye varies, we are considering 3 membership functions to measure level of alertness of student.

Range sensor will detect the parameter for following membership function based on membership values system will alert the particular student

Drowsy: Drowsiness detection for drowsiness detection each frame is observed to check whether the eyes are closed or open. Thus, the eye blink frequency is determined and if the eye blinks increases beyond the normal limit, the alarm is activated. Also if the eyes are found closed for consecutive 5 to 6 frames the system decides that the eyes are closed and give a fatigue alert. Thus in this approach the fatigued state of the students is detected with the help sensor [8]

Active: when the student is properly active/ interested in the lecture the eye blinking pattern will be normal. Generally, between each blink is an interval of 2–10 seconds; actual rates vary by individual averaging around 10 blinks per minute in a laboratory setting. However, when the eyes are focused on an object for an extended period of time, such as when reading, the rate of blinking decreases to about 3 to 4 times per minute [10].

Sleeping: Sleeping state of any student will be stated when sensor will not sense any eye blinking pattern for 5-6 frame. And the alert will generate.

The sample rule for proposed fuzzy system could be given as follows.

I. If (Eye Blink) and (Mouth is Normal) then (Output is aware, Do nothing).
II. If (Mouth is yawn) and (eye Blink) then (Output is inattentive, ready to alert the student).
III. If (Mouth is normal) and (No blink) then (Output is sleep, alert the student)
IV. If (Mouth is yawn) and (no blink) then (Output is sleep, alert the student).

4. Conclusion

Students have shown a great adaptability to this kind of studying. Namely, E-learning has proven to be a very popular and acceptable way of studying, owing to its flexibility, as well as its higher degree of innovativeness in terms of introducing new and contemporary programs in comparison to traditional faculties. Since E-learning has enabled a higher degree of interactivity among professors and students and easier study material. This is also common experiences that study without any monitoring makes the student careless toward the class and their studies hence supervision is required to make them aware and alert throughout the lectures.

The proposed attention analysis system for E-classroom will be surely helpful in making the education more effective , efficient and successful by checking and maintaining the attention of students in e-class .By the using the eye and facial behavior, that are considered as strong media for reading their interest level.

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References

[1] N.G.Narole , P.R.Bajaj, "A Neuro-Genetic System Design For Monitoring Driver's Fatigue: A Design Approach". Ijssst, Vol. 10, No. 5 Issn: 1 1 473-804x Online, 1473-8031 Print
[2] Mirjana Radović-Marković "Advantages And Disadvantages Of E-Learning In Comparison To Traditional Forms Of Learning". Annals Of The University Of Petroşani, Economics, 10(2), 2010, 289-298 289
[3] Richard Andrews And Caroline Haythornthwaite "Introduction To E-Learning Research" Ch01.Qxd 18/5/07 12:39
[4] Sangeeta Kakoty, Shikhar Kr. Sarma. "Expert System Applications In E-Learning Environment: Analysis On Current Trends And Future Prospects". Expert System Applications In E-Learning Environment: Analysis On Current Trends And Future Prospects. International Journal Of Internet Computing, Volume-I, Issue-1, 2011
[5] Dongsong Zhang, Lina Zhou, Robert O. Briggs, Jay F. Nunamaker Jr. "Instructional Video In E-Learning: Assessing The Impact Of Interactive Video On Learning Effectiveness". Information & Management 43 (2006) 15–27. Doi:10.1016/J.Im.2005.01.004.
[6] Anna Rita Bentivoglio, Susan B. Bressman, Emanuele Cassetta, Donatella Carretta, Pietro Tonali, And Albert0 Albanese. "Analysis Of Blink Rate Patterns In Normal Subjects". Movement Diwrders Vol. 12, No. 6, 1997, Pp. 1028-1034 0 1997 Movement Disorder Society.
[7] Christopher Peters, Carol O' Sullivan "Attention-Driven Eye Gaze And Blinking For Virtual Humans"
[8] Preeti Bajaj, Narendra Narole, Mandalapu Sarada Devi "Research On Driver's Fatigue Detection" Intelligent Transportation Research Group G. H. Raisoni College Of Engineering, Nagpur, India. Human Centered Transportation Systems. June 2010
[9]Http://Www.Sciencedaily.Com/Releases/2010/04/100429153959.Htm
[10] Http://En.Wikipedia.Org/Wiki/Blink
[11] Silvia Rigato Goldsmiths, University Of London, Uk Enrica Menon University Of Padua, Italy Valentina Di Gangi University Of Padua, Italy "The Role Of Facial Expressions In Attention-Orienting In Adults And Infants" Internation Journal Of Behavioral Development. March Issue 2013.

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