Abstract

Massive Open Online Courses (MOOCs) (Ex, EdX, Coursera) have started an insurgency in advance education by giving chances to interested students to learn from the comfort of their individual locations at their desired pace. Though this is a step in the right direction, a lot remains to be achieved by these online platforms in coming close to the experience of traditional classroom teaching. However, an important and highly successful aspect of traditional classroom education/pedagogy, which is modulating content delivery based on understanding real-time student feedback, is conspicuously missing in such e-learning environments. One of the important aspects that is currently missing from these online education platforms is the live feedback from the teacher depending on the reactions of the student during a lecture. For example, in the middle of a lecture, if a student is not engaged or is confused, the instructor may seek to ask the student on what's wrong, and he/she might then choose to repeat the concept or request the particular student to meet him/her later in the day to clarify the doubt. Such situations currently cannot be handled by online MOOC platforms.

MOOC consist of static content and it is up to the student to find answers to doubts, either through the internet or through other forms of communication such as mailing the instructor or class forums which can often take longer to receive answers. One effective approach to bridge this gap between traditional classrooms and online MOOC platforms is to provide feedback to the system about the behavioral state of the students watching the lectures online. MOOC platforms could utilize the front-facing web cameras of these devices to gauge the behavioral state of the student during the course of the lecture. Among the various possible behavioral states, engagement can be considered the most fundamental state in a learning environment. Any other effective state, such as boredom, confusion, sleepiness, etc. gets reflected in the engagement levels of a student. One can conclude that the eye gaze can be associated as an indication of engagement, this approach to engagement determination has two major issues. To begin with, the eye gaze determination is in itself an unsolved problem. Second, it can be noted that eye gaze is not an essential condition for engagement, for example, a student may be analyzing and not making eye contact with the teacher. While engagement is very useful in e-learning, this work can also be applied in other application spheres, such as in advertising where it may help understand users' preferences better. Digital revolution has transformed the traditional teaching procedure and result analysis of the student engagement in an e-learning environment would facilitate effective task accomplishment and learning. Well, known social cues of engaged or not engaged can be inferred from facial expressions, body movements, and eye gaze pattern.

In this seminar, student's live videos are played and important cues are extracted to estimate variations in engagement level. Specifically, the computer vision-based methods in the automatic category that use facial expressions are examined in more details because they are found to be promising in the e-learning

environment. These methods are non-intrusive in nature, and the hardware and the software that these methods use to capture and analyze video data are cost-effective and easily achievable. Different techniques in the field of computer vision and machine learning are applied in these methods for engagement detection. The results of the study show that even these basic methods pose a significant challenge to current hardware and software-based tracking solutions.

Keywords: Engagement detection, Facial expression recognition, Action units, Emotion detection, Massive Open Online Courses (MOOCs).

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