

Research shows cue-giving robots help students learn

May 30 2012, by Nancy Owano

(Phys.org) -- The well-known fact is that humans can teach robots, but the newer turn in educational circles is all about how robots can teach humans. The stepped-up robots are “animated” and “adaptive” agents that communicate effectively with humans by using subtle, human-like cues to engage their listeners. Two researchers from the University of Wisconsin-Madison have demonstrated that such robots can improve how much students remember from their lessons.

The researchers believe that “embodied agents hold great promise as educational assistants, exercise coaches, and team members in collaborative work. These roles require agents to closely monitor the behavioral, emotional, and mental states of their users and provide appropriate, effective responses.”

Bilge Mutlu and Dan Szafir of the Department of Computer Sciences at the University of Wisconsin-Madison worked up a robotic teacher that could tell when students were losing focus and helped them re-engage with the lesson. They programmed a Wakamaru humanoid robot to tell students a story and then tested the students to see how much of the story they retained. Engagement levels were monitored using measurements from electroencephalography (EEG) to monitor learning and concentration.

Human teachers have strategies for “reviving” students’ waning focus by changing tone of voice or gesturing. When a significant decrease in certain brain signals indicated that the student's attention level had fallen,

the system sent a signal to the robot to trigger such human-like cues.

During the reading of a long Japanese folk tale, “My Lord Bag of Rice,” the robot similarly raised its voice or used arm gestures, pointed at itself or toward the listeners and used its robot arms to indicate a high mountain.

Students who were given cues by the robot when their attention span was fading were better at recalling the story than the other groups. The more successful group answered an average of nine out of 14 questions correctly; those who sat with a [robot](#) giving no human-like cues got 6.3 right.

The researchers are on to a line of investigation considered important as education expands to incorporate digital learning within live classrooms as well as online courses. “Virtual” teachers can be modeled toward human-like interactions with [students](#) through such nonverbal cues, which may support a better learning experience and results. That kind of focus has "significant implications for the field of education," according to Andrew Ng, director of Stanford University's Artificial Intelligence Lab. "The vision of automatically measuring student engagement so as to build a more interactive teacher is very exciting."

Earlier this month, Mutlu and Szafir presented a paper on the design of “adaptive agents” at the Conference on Human Factors in Computing Systems in Austin, Texas. Their paper was titled “Pay Attention! Designing Adaptive Agents that Monitor and Improve User Engagement.”

More information: Pay Attention! Designing Adaptive Agents that Monitor and Improve User Engagement - Paper, chi2012.acm.org/program/desktop/Session139.html

Abstract

Embodied agents hold great promise as educational assistants, exercise coaches, and team members in collaborative work. These roles require agents to closely monitor the behavioral, emotional, and mental states of their users and provide appropriate, effective responses. Educational agents, for example, will have to monitor student attention and seek to improve it when student engagement decreases. In this paper, we draw on techniques from brain-computer interfaces (BCI) and knowledge from educational psychology to design adaptive agents that monitor student attention in real time using measurements from electroencephalography (EEG) and recapture diminishing attention levels using verbal and nonverbal cues. An experimental evaluation of our approach showed that an adaptive robotic agent employing behavioral techniques to regain attention during drops in engagement improved student recall abilities 43% over the baseline regardless of student gender and significantly improved female motivation and rapport. Our findings offer guidelines for developing effective adaptive agents, particularly for educational settings.

via [Newscientist](#)

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