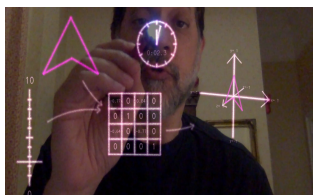Students test new learning technology

FULL STORY

EAGER: Cyberlearning with Co-Robotic Teachable Agents

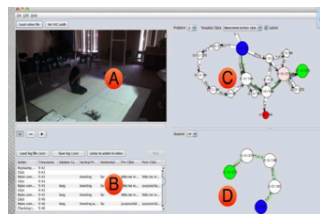Winslow Burleson (PI), Ken Perlin (Co-PI) Award ID#: 1941053

Chalktalk

NSF MRI Holodeck

Co-Robotics Teams

Cognitive, Affect, Social Analytic Tools

Challenges:

- Teachable agents have emerged from research on how students benefit from tutoring other students
- While there is evidence that these activities are successful at improving programming and robotics skills, the evidence on whether mathematics and science outcomes are improved is less convincing
- Most other efforts using the teachable agent paradigm to date have focused on agents in virtual environments, with few tangible examples
- This research will improve understanding of the unique affordances of a teachable robot with gesture-based interaction, going beyond typical tutoring support

Scientific Impact:

- We are investigating Mixed Reality gesture-based interaction for human-robot teams, to enhanced personalized motivational problem solving support.
- Open Learner models capture cognitive and social interactions, improving understanding of how to design diverse perceptual, cognitive and social features for multi-modal physical and virtual teachable robotic agents.
- We are developing collaborative participatory design strategies for ubiquitous co-robotics and MR storytelling and simulation-based interactions will generalize across domains.

Approach:

- ChalkTalk, a Mixed Reality (MR) gesture-based storytelling and simulation tool-kit has been integrated with Robotic-Teachable Agents for middle school Geometry (R-TAG)
- Teachable Robotic Agents support learning and team engagement with multi-modal embodied presence (physical, visual, tactile, spatial, and dialogue) via ChalkTalk.
- Analytic tools enable coding and personal response to learners' affective and cognitive states.
- We are conducting a 2x2 factor experiment investigating: (1) cognitive and social support; (2) cognitive support alone; (3) social support alone, and (4) no support conditions

Broader Impact – Education and Outreach

- Development of teacher professional growth opportunities that support increased attention to robotics in school settings
- Development and evaluation of education strategies to broaden participation of students from groups underrepresented in education pathways to careers in robotics
- We are engaging hundreds of minority and underserved middle school students in Co-Robotic STEM cyberlearning