

Distance Learning with Intelligent Agents

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MITRE Sponsored Research

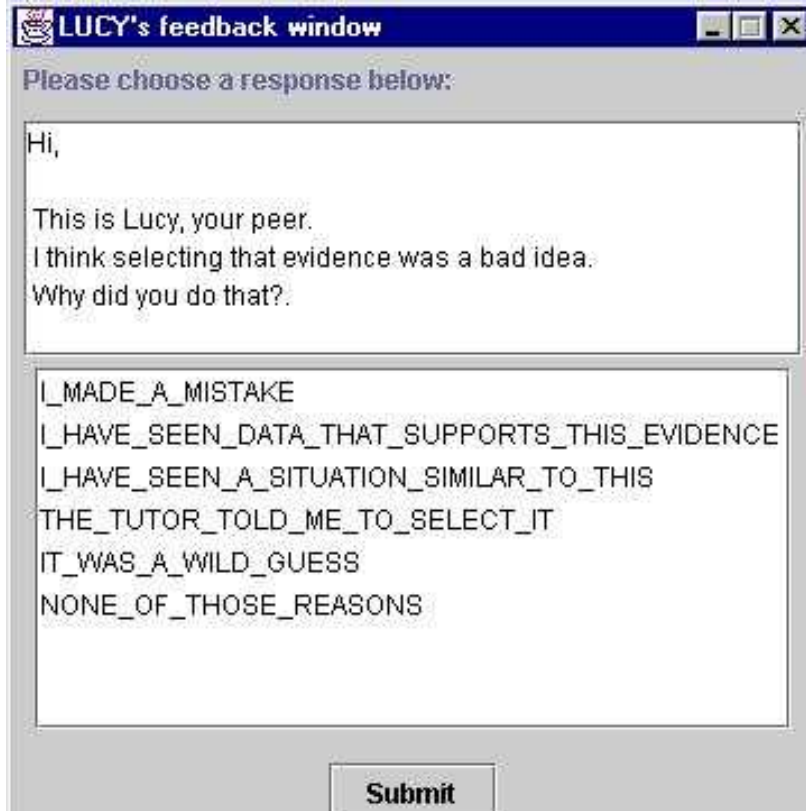
The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue to the left of the text.

**MITRE
Technology
Program**

Problem

- **The changing military environment, where threats, procedures, and equipment are not consistent, is forcing modification in existing military training programs that train only for specific tasks rather than competencies.**
- **Classroom learning improves significantly when students participate in structured learning activities in small groups of peers. As the U.S. military moves from schoolhouse instruction to Web-based distance learning, students risk losing this important contact with other students.**

Background



The screenshot shows a window titled "LUCY's feedback window". Inside, there is a text area with the following text: "Hi, This is Lucy, your peer. I think selecting that evidence was a bad idea. Why did you do that?". Below this is a list of radio button options: "I_MADE_A_MISTAKE", "I_HAVE_SEEN_DATA_THAT_SUPPORTS_THIS_EVIDENCE", "I_HAVE_SEEN_A_SITUATION_SIMILAR_TO_THIS", "THE_TUTOR_TOLD_ME_TO_SELECT_IT", "IT_WAS_A_WILD_GUESS", and "NONE_OF_THOSE_REASONS". At the bottom of the window is a "Submit" button.

An intelligent agent acting as a peer can take charge by assuming a more inquisitive and directive role.

- ...
- **LuCy: Hi! This is LuCy, your peer. I think selecting that evidence was a bad idea. Why did you do that?**
- **Sarah: I have seen data that supports this evidence.**
- **LuCy: What data do you think is related, Brad?**
- **Brad: IMINT Report that helicopters are flight-ready.**
- **LuCy: I agree.**
- **Sarah: Okay.**

Objective

- To develop and incorporate *a simulated peer* into *a rich, multi-person collaborative distance-learning environment* to facilitate both group and individual learning
- To infuse and assess *instructional roles in the simulated peer* to promote effective learning

Activities

- Investigate dialogue-understanding techniques to capture the essence of student-to-student communication (FY01)
 - ✓ Group learning experiment (30 subjects)
 - ✓ Dialogue role prediction model (80.3% accuracy)
- Develop a simulated peer whose behavior is governed by multi-agent interaction (FY02)
 - ✓ Joint NSF proposal with Univ. of Pittsburgh on spoken collaborative learning dialogue
 - ✓ Reasoning engine using Protégé knowledge representation system and JESS expert system
 - ✓ Pierce, an intelligent agent peer
- Explore detection and repair of ineffective collaborative distance learning (FY03)
 - ➔ Dialogue effectiveness prediction

Highlight

Are group members learning effectively?

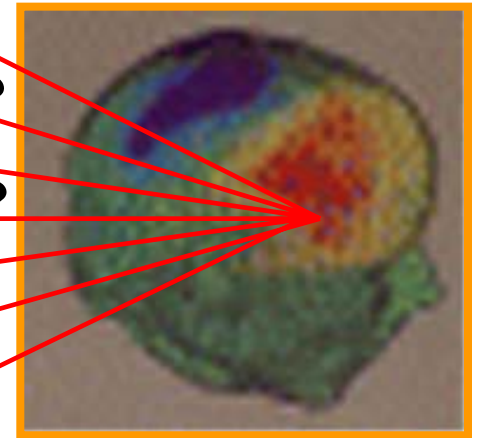
What underlying communication is occurring?

What group dynamic interactions are observed?

What roles are being played by participants?

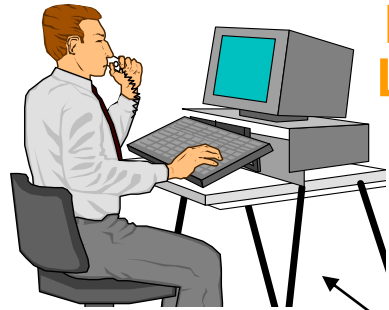
What pedagogical interventions make sense?

What role should I assume?



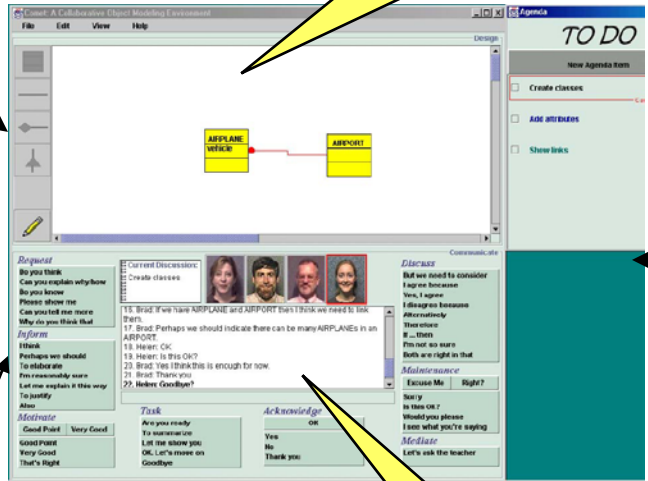
Peer Agent
Planner

Demonstration

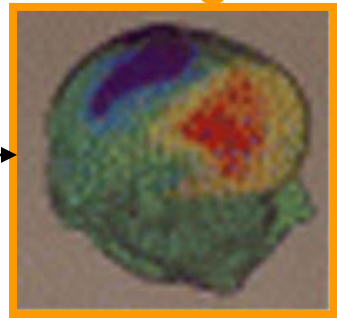


Human Learner

White Board



Peer Agent



Human Learner

Chat

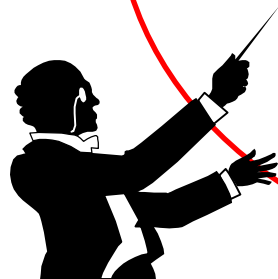
Watch a Peer Agent promote effective collaborative learning

Impacts

- **Army Intelligence School program on companion-based learning using this and prior MSR research**
- **Collaborative learning agent reasoning engine**
- **Expanded intervention model**
- **Refereed publications (2 conference papers, FY01; 2 conference papers, 3rd under review FY03)**
- **Related prior year MSR journal paper now 16th most cited in the International Journal of AI in Education (<http://www.cbl.leeds.ac.uk/ijaied/top100.html>)**
- **Public release collaborative software**

Future Plans

Predict collaborative learning effectiveness through dialogue characteristics



Orchestrate and test effective learning with collaborative instructional agents



Govern role playing and intervention of simulated peer with multi-agent analysis