Knowledge-Based Web-Enabled Agents and Intelligent Tutoring Systems

Oghenekaro Durojaiye, Brian D. Hanson, Jr., David E. McKnight
The Author

Dr. Selwyn Piramuthu

Frank L. Weyenberg Term Professor
Full Professor

University of Florida,
Warrington College of Business

Department of Information Systems and Operations Management
I. Introduction

Main Points - The desire for computer-based learning has invoked the need for the following:

1) A lifelong education in response to increasingly rapid technological and social change

1) A demand for nontraditional learning environments

1) The overall flexibility this learning provides both the student and the teacher
II. Intelligent Learning Environments
Agents from Intelligent Learning Environments

Definition: An artificially intelligent program that interprets data from its environment and provides feedback from what it comprehends based upon a knowledge repository.
Agent-based Learning Environment Advantages

The Human-based approach does not allow flexibility for the following:

1. Time needed
2. Convenience
3. Adjusting interaction preferences
4. Encouragement to reflect on the thinking process
5. The presence of a willing collaborator
Single- vs Multi-agent systems

Lesson Plan
Plan Updates
Content

Interaction
Feedback

Learning Quality Monitor
Lesson Planner
Explainer
Tester

Knowledge Base Manager

Learning quality monitor
Explanation Feedback
Test results
III. Intelligent Multi-agent Pedagogical System Framework
Framework Diagram

- Web Interface
- Knowledge Base Info (KB)
- Knowledge Base Manager
- Knowledge Sources (KS)

Roles:
- Learning Quality Monitor
- Lesson Planner
- Explainer
- Tester

Processes:
- Learning quality monitor
- Explanation Feedback
- Test results
Monitoring Active Learning

LQM monitors active learning
Non invasive manner

Sensors monitor events
Occur via the Web Interface Agent

LQM gathers information

Web Interface agent

Sensory monitors

Learning Quality Monitor

S(y/n)
T(1)
T(s)
B
S
F(F1/F2)
TABLE II
EXAMPLE DATA SET FOR LQM AGENT

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<th>Student#</th>
<th>S</th>
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<th>Tₛ</th>
<th>B</th>
<th>F₁</th>
<th>F₂</th>
<th>Tₚ</th>
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- Used to learn existing patterns in data
- Schedule lessons effectively
- Decision rules
Deciding if Learning was Effective?

IF \( B = 0 \), THEN \( \text{Learning\_Effective?} = \text{N} \)
IF \( B > 0 \) & \( T_1 \leq 40 \), THEN \( \text{Learning\_Effective?} = \text{N} \)
IF \( B > 0 \) & \( T_1 > 40 \), THEN \( \text{Learning\_Effective?} = \text{N} \).

- Decision rules
- Backtracking (B1) and time spent (T1)
- Accuracy and Complexity
IV. Discussion

Web-based learning is flexible

Engaging graphical interface

Face-to-Face vs. Virtual/Sim

Monitor progress non intrusively

Tailor lesson plan according to student

Knowledge base stays current
References