

Intelligent Tutoring Systems

Intelligent User Interfaces

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Readings

- Conati et al, *On-Line Student Modeling for Coached Problem Solving Using Bayesian Networks*, UM'97
- Rickel & Johnson, *Integrating Pedagogical Capabilities in a Virtual Environment Agent*, AA'97

Basic Concepts

- Goals/tasks (to be learned)
 - usually about learning skills, not facts
 - e.g., how to solve physics problems
 - not the capitols of the 50 states
- Student model
 - generic component
 - specific to student
- Pedagogical strategies
 - what order to present problems
 - when to intervene

Basic Processes

- Tutorial presentation
 - text, graphics, dialogue, VR, etc.
 - may be manually authored or dynamically generated (or mixture)
- Assessment
 - formative: during learning (can adjust system behavior)
 - summative: final result
 - diagnosis, plan recognition
 - knowledge tracing

Basic Processes (cont'd)

- Data mining
 - analyzing logs using machine learning techniques
 - to improve cognitive models
 - to improve pedagogical strategies

Strong vs. Weak Cognitive Modeling

- All modern systems have some (cognitively oriented) *representation* of what is to be learned, which is separate from the tutorial *presentations*
 - vs. early CAI systems “interactive page turners”
 - *Strong version:*
 - system capable of solving domain problems itself
 - tutorial presentations created automatically
 - *Weak version:*
 - abstract cognitive representation (e.g., skill names)
 - but tutorial presentations are *authored*

Other Important Issues

- Reuse across domains
 - generic “middleware” vs. domain-specific systems
 - requires better knowledge representation
- Authoring tools (for human developers)
 - crucial for scaling up to real deployment
 - authoring of cognitive models
 - most demanding for strong models
 - authoring of presentations
 - for weak model systems

Other Important Issues (cont'd)

- Dealing with uncertainty
 - many sources of uncertainty
 - ambiguity in plan recognition
 - unknown student knowledge state
 - speech recognition error ?

Readings

- Conati et al, *On-Line Student Modeling for Coached Problem Solving Using Bayesian Networks*, UM'97
 - Bayesian network is “weak” representation, but which deals very well with uncertainty
 - But network derived *offline* from strong representation (rule-based solver)
- Rickel & Johnson, *Integrating Pedagogical Capabilities in a Virtual Environment Agent*, AA'97
 - “strong” modeling approach
 - does not deal with uncertainty