

# **Intelligent Tutoring Systems for III-Defined Domains: Assessment and Feedback in III-Defined Domains**

## **WORKSHOP CHAIRS**

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# Defining “Ill-defined problems”

## Ill-defined problems typically:

- lack formal methods to verify solutions;
- lack widely accepted domain theories characterizing relevant concepts and relations;
- involve designing novel artifacts rather than verifying existing results;
- rely on open-textured concepts subject to debate;
- do not decompose into independent subproblems.

## 3 types of ill-defined problems:

- Open-textured problems:
  - rely on open-textured concepts for their structure and definition.
- Open-specified problems:
  - have unstated specifications or goal criteria.
- Open-structured problems:
  - lack clear substructure allowing for definition of partial solutions or subproblems.

## Solution processes in ill-defined problems cycle through:

- Recharacterize problem to specify undefined components, identify constraints, or select among alternatives;
- Explore consequences of given characterization in the problem space;
- Justify characterization in terms of relevant concepts or principles and to deflect anticipated attacks.

From Lynch, Ashley, Pinkwart, Alevan (submitted) “Concepts, Structures, and Goals: Redefining Ill-Definedness”

# ITS Development in Ill-Defined Domains

	ITS 2006	AIED 2007	ITS 2008
Medical diagnosis		√√	√
Legal reasoning	√	√√	√
Intercultural relations	√		√
Ethical reasoning	√		√
Language learning: vocabulary, grammar	√√	√	√
Programming: Object-oriented design; logic programming; Database design	√√√		√
Robot arm operation			√
Causal reasoning in public policy		√	
Psychology		√	
Inquiry learning in sciences	√√		

# Methods for Assessment and Feedback in ITSs for Ill-Defined Domains

- Adaptive feedback on students':
  - discussion posts based on simplified model of good posts, to tutee directly and indirectly via peer moderator (Walker, Ogan, Alevan, Jones)
  - selected actions in student-modified versions of pre-analyzed ethics narrative (Hodhod, Kudenko)
- Automatic generation of cloze (multiple choice) questions
  - with better-quality distractors (Pino, Heilman, Eskenazi)
- Compare student's:
  - solution to template of solutions-plus-variations (Moritz, Blank)
  - problem-states-visited with mined patterns of partial problem spaces (Fournier-Viger, Nkambou, Mephu Nguifo)
  - diagrammatic reconstructions of arguments in terms of feedback-related features (Lynch, Pinkwart, Ashley, Alevan)
- Support self-assessment with expert decision map, visual representation of overall problem-solving process (Gauthier, Naismith, Lajoie, Wiseman)

# Schedule

9:00 - 9:15	<b>Introduction:</b> Kevin D. Ashley
9:15 - 10:15	<b>Opening Session*</b> <i>1. Two Approaches for Providing Adaptive Support for Discussion in an Ill-Defined Domain</i> Erin Walker, Amy Ogan, Vincent Aleven, Chris Jones <i>2. Interactive Narrative and Intelligent Tutoring for Ethics Domain</i> Rania Hodhod and Daniel Kudenko
10:15 - 10:35	<b>Coffee Break</b>
10:35 - 12:15	<b>Prelunch Session*</b> <i>1. A Selection Strategy to Improve Cloze Question Quality</i> Juan Pino, Michael Heilman, and Maxine Eskenazi <i>2. Generating and Evaluating Object-Oriented Designs for Instructors and Novice Students</i> Sally Moritz and Glenn Blank <i>3. General Discussion</i>
12:15 - 1:30	<b>Lunch</b>
1:30 - 2:30	<b>Post-lunch Session*</b> <i>1. A Sequential Pattern Mining Algorithm for Extracting Partial Problem Spaces from Logged User Interactions</i> Philippe Fournier-Viger, Roger Nkambou and Engelbert Mephu Nguifo <i>2. What Do Argument Diagrams Tell Us About Students' Aptitude Or Experience? A Statistical Analysis In An Ill-Defined Domain</i> Collin Lynch, Niels Pinkwart, Kevin Ashley and Vincent Aleven
2:30 - 2:50	<b>Tea Break</b>
2:50 - 4:00	<b>Closing Session*</b> <i>1. Using Expert Decision Maps to Promote Reflection and Self-Assessment in Medical Case-Based Instruction</i> Geneviève Gauthier, Laura Naismith, Susanne P. Lajoie, and Jeffrey Wiseman <i>2. Closing Discussion</i>

\*Paper presentations: 20 minutes each with 10 minutes for questions and discussion.