Task Model-based Usability Evaluation for Smart Environments

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Outline

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2. Usability Evaluation Method

   2.1 Phase 1: Modelling

   2.2 Phase 2: Test Planning

   2.2 Phase 3: Test Execution

   2.3 Phase 4: Analysis

3. User Guidance

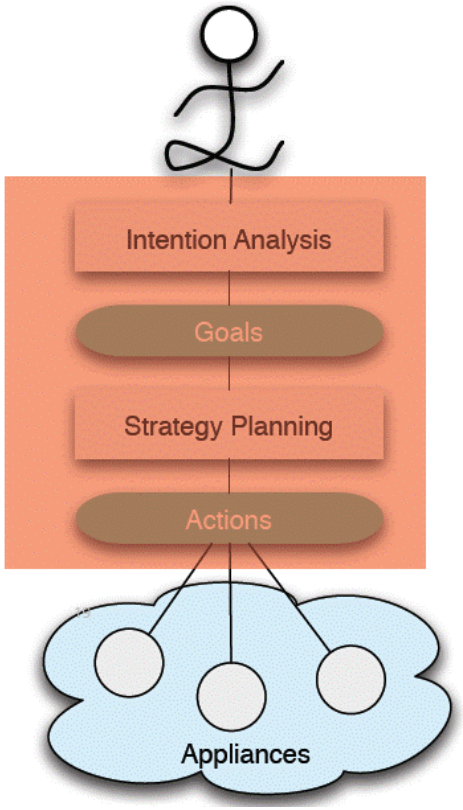
4. Conclusion & Future Work

1. Introduction - Smart Environment

- Smart Environment
  - Combines everyday appliances and environments to form an ensemble
  - Individual features are composed to build more complex features
  - Example:

1. Introduction - MuSAMA

- MuSAMA Project (14 PhD Students)
- Idea:



1. Introduction - Smart Environments

- Characteristic of Human-Environment Interaction:
  [Shirehjini: A Multidimensional Classification Model for the Interaction in Reactive Media Rooms, 2007.]
  - Explicit vs. implicit initiative
  - Function vs. goal-based
  - Direct vs. dynamic device selection
  - Macros vs. dynamic strategy planning
  - Modalities (e.g. speech, gesture, …)
  - Etc.
- Problems concerning the Usability Evaluation:
  - Users changing location → difficult to observe
  - Changing context influences the system behavior
  - Transitions between devices (one task, many devices)
    (starting a task on one device and finshing it on another devices)
  - Cooperative work (one task, many users)
    (accomplishing a task cooperatively)

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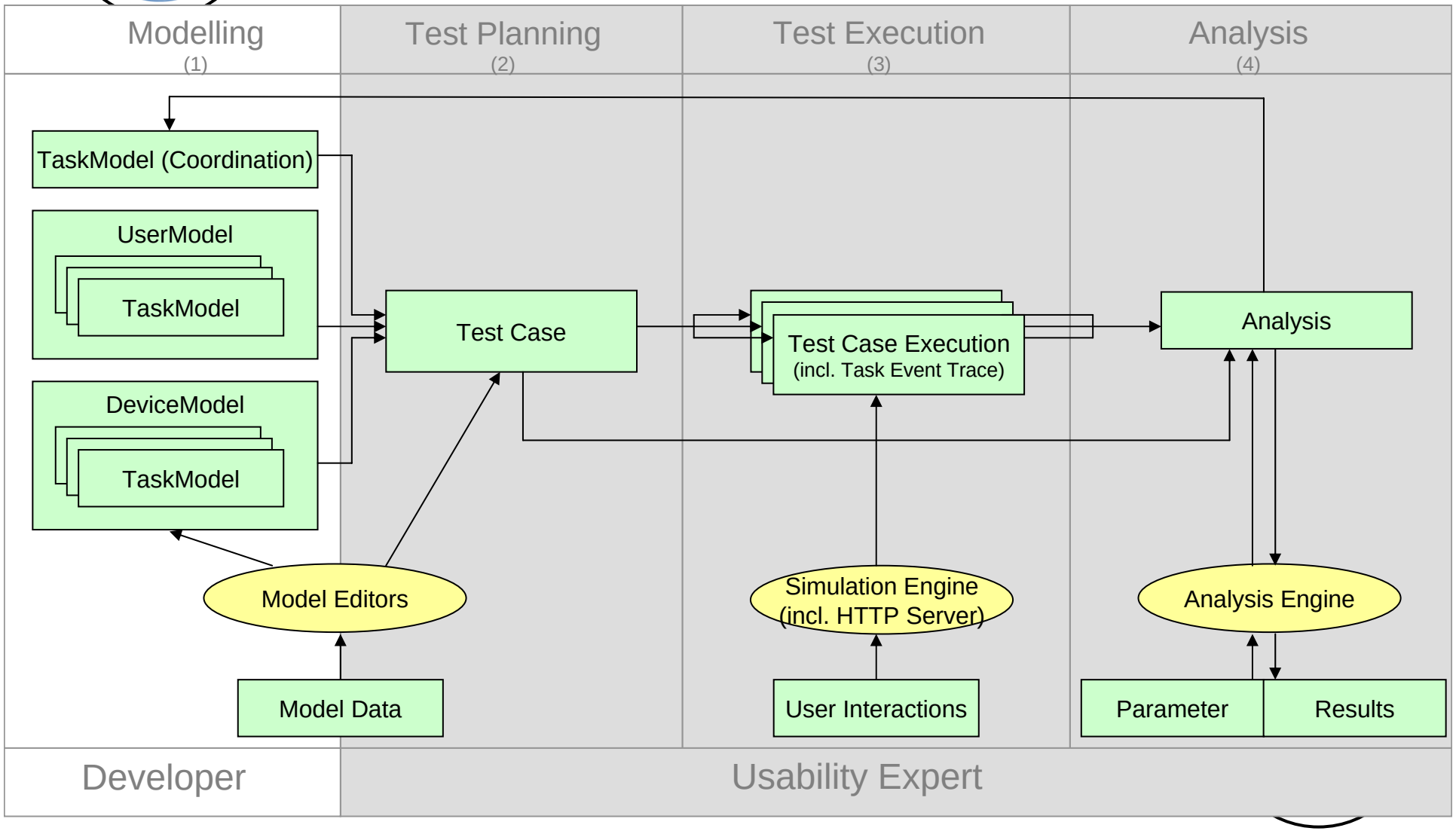
2. Usability Evaluation Method



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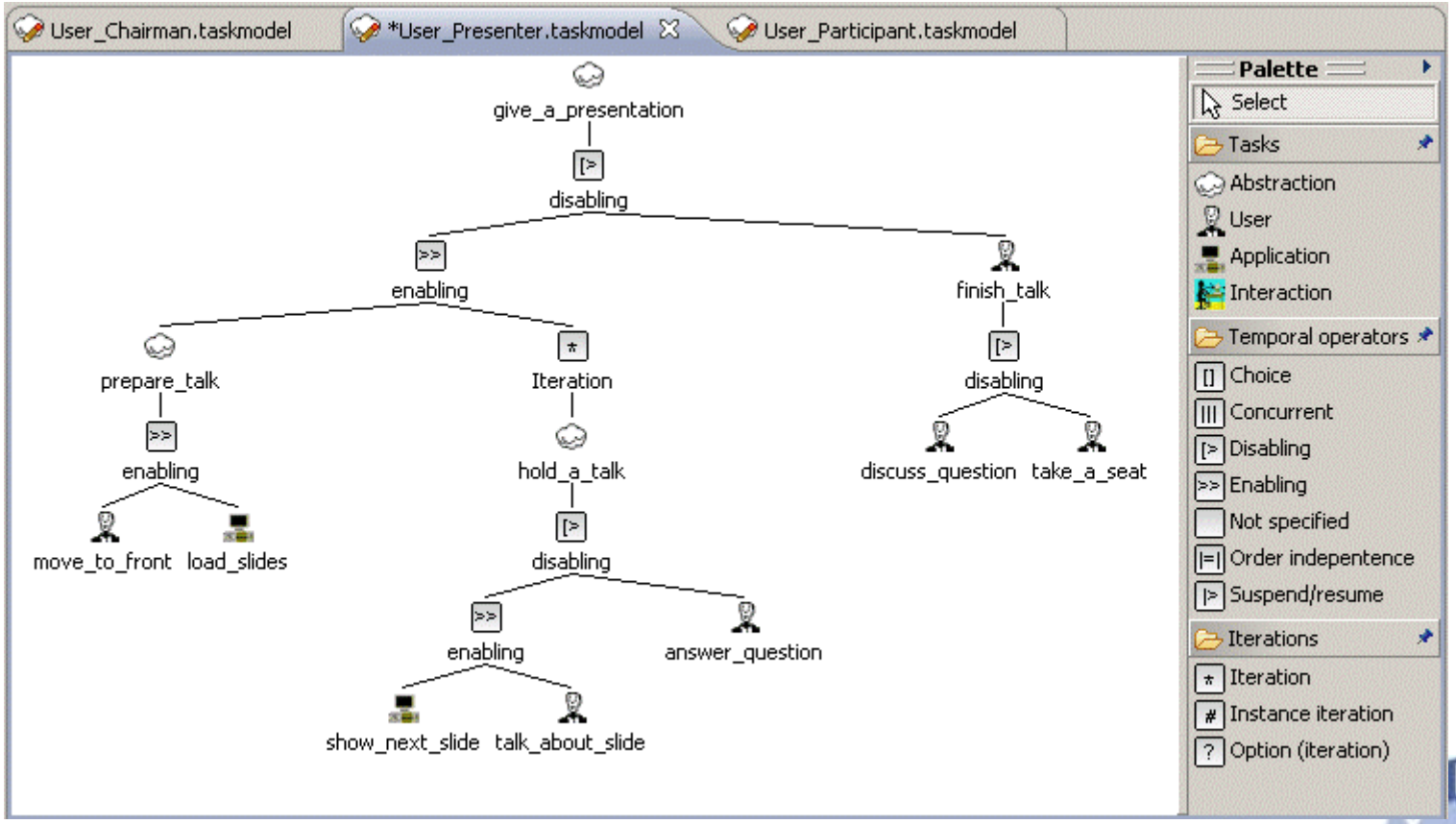
2.1 Modelling - Method

- Related work
  - Task Modelling (different notations: e.g. CTT, HTA, GOMS, …)
    [Limbourg, Vanderdonckt: Comparing Task Models for UI Design, 2003.]
  - Task Modelling for Smart Environments
    - Composing task model chunks to room task models
      [Trapp, Schmettow: Consistency in use through Model based User Interface Development, CHI2006.]
    - Interpreting task models at runtime
      [Feuerstack et al.: Prototyping of Multimodal Interactions for Smart Environments based on Task Models, AMI Workshop 2007.]
    - Modelling cooperative behavior with additional constraints
      [Wurdel, Propp, Forbrig: HCI-Task Models and Smart Environments, HCIS 2008.]

2.1 Modelling – Tool



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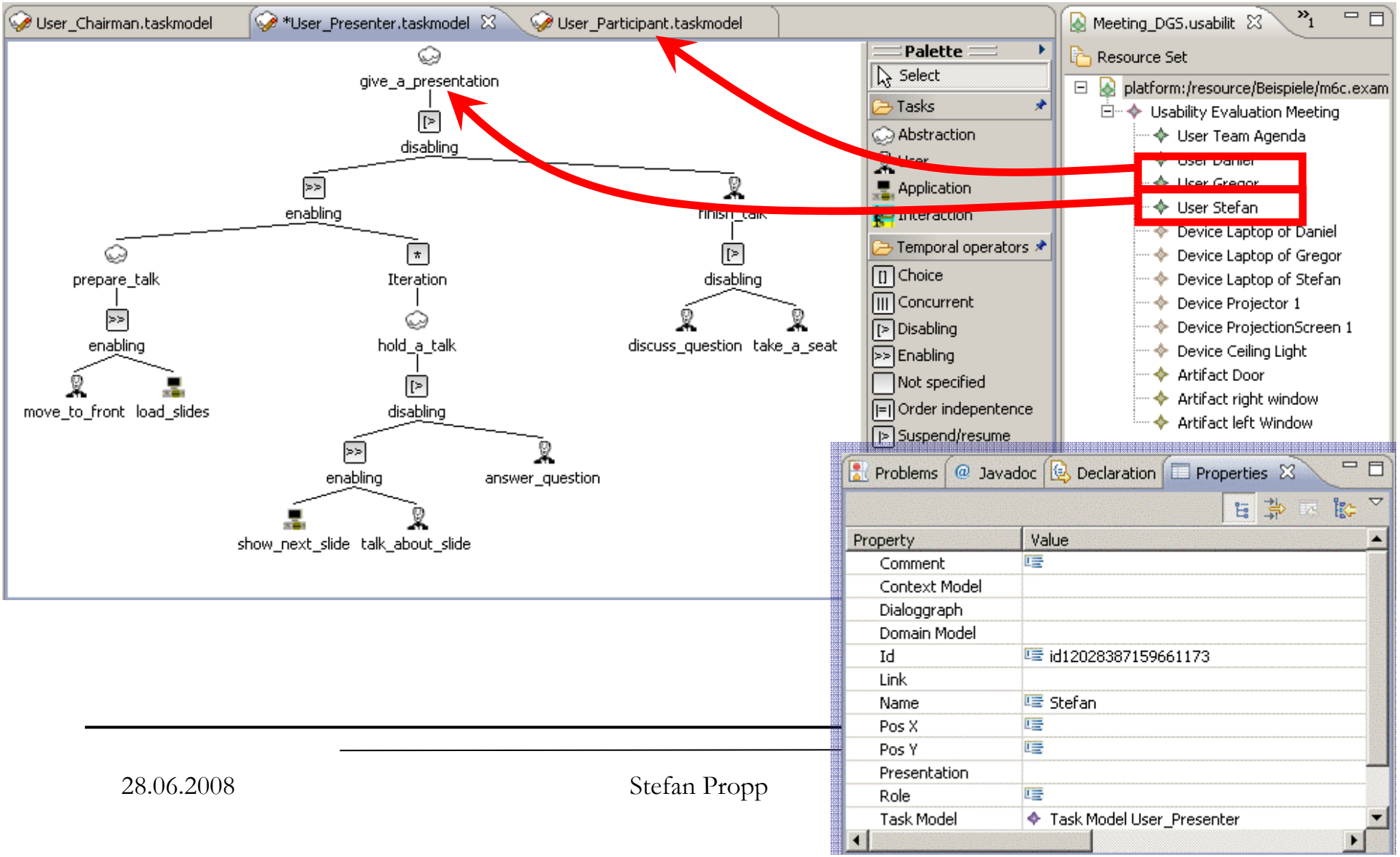
2.2 Test Planinng - Method

- „Usability Test Case“
  - Test plan with textual information
    (e.g. purpose, environment description, evaluation measures)
    [Rubin, J.: Handbook of usability testing. Wiley technical communication library, 1994.]
  - User and device models
    (in CTT like notation)

2.2 Test Planning - Tool



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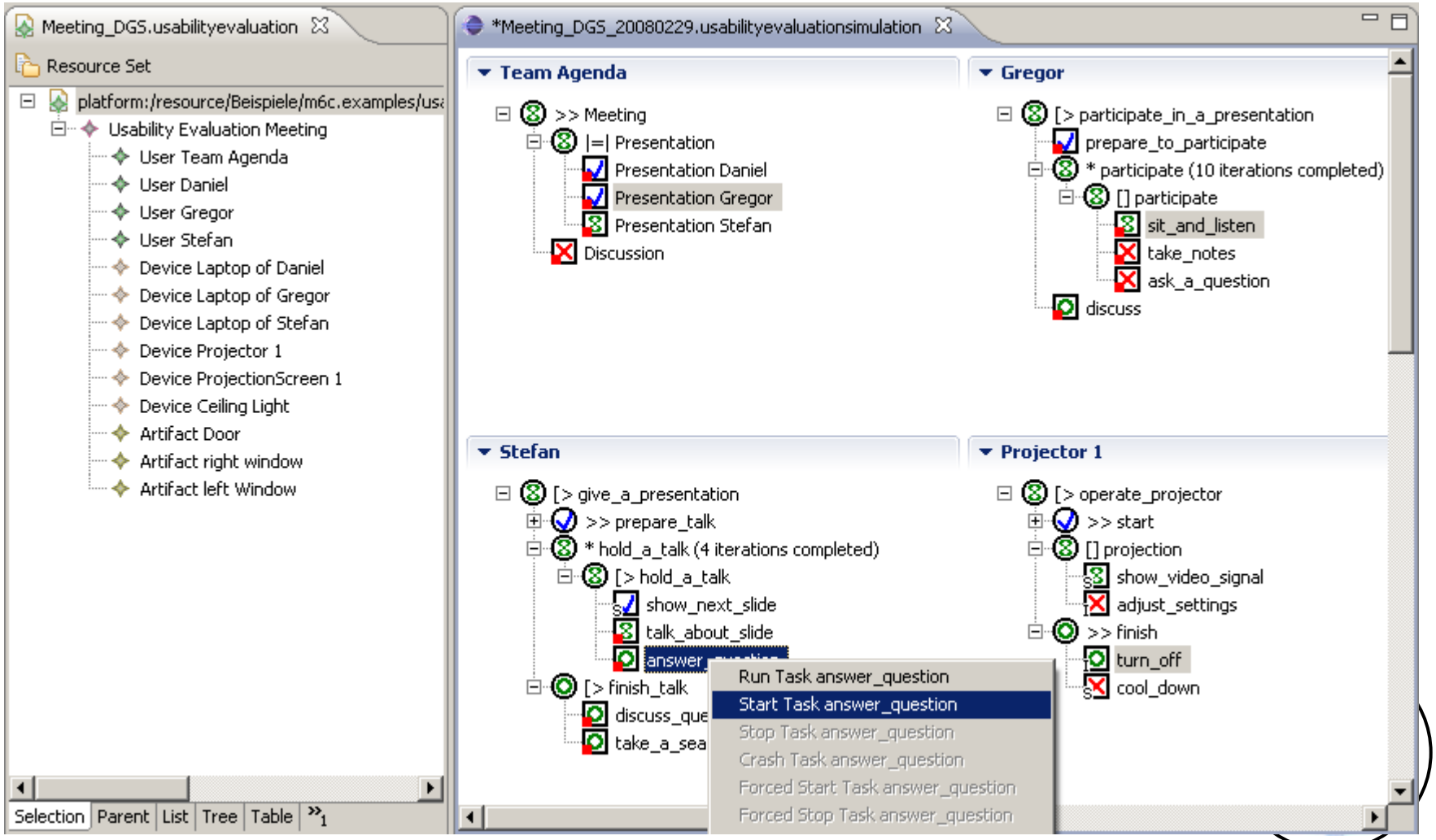
2.3 Test Execution – Method

Stages	early st. (Requirements analysis, Design)	later stages (Development, Deployment)
Test Object	models	running system
Process	interactively walk through the models (inspection, testing)	automatically: HTTP-connection to environment, manually: annotations of the expert (Testing)
Goal	validate models (in-consistent tasks or relations)	discover potential problems, for subsequent detailed analysis of videos etc.

- Related Work: [Klug: Computer Aided Observations of Complex Mobile Situations, CHI 2007.]

2.3 Test Execution - Tool



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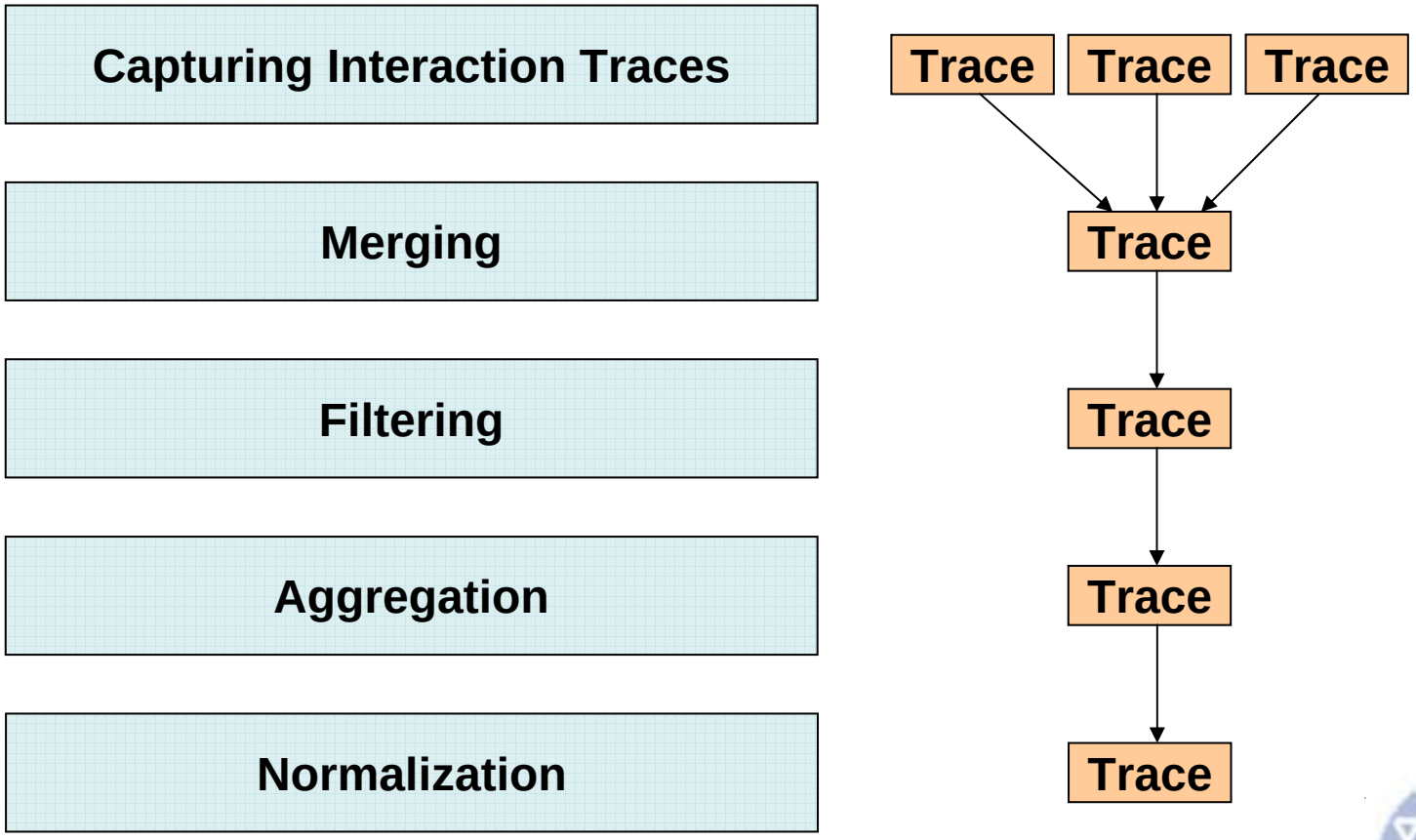
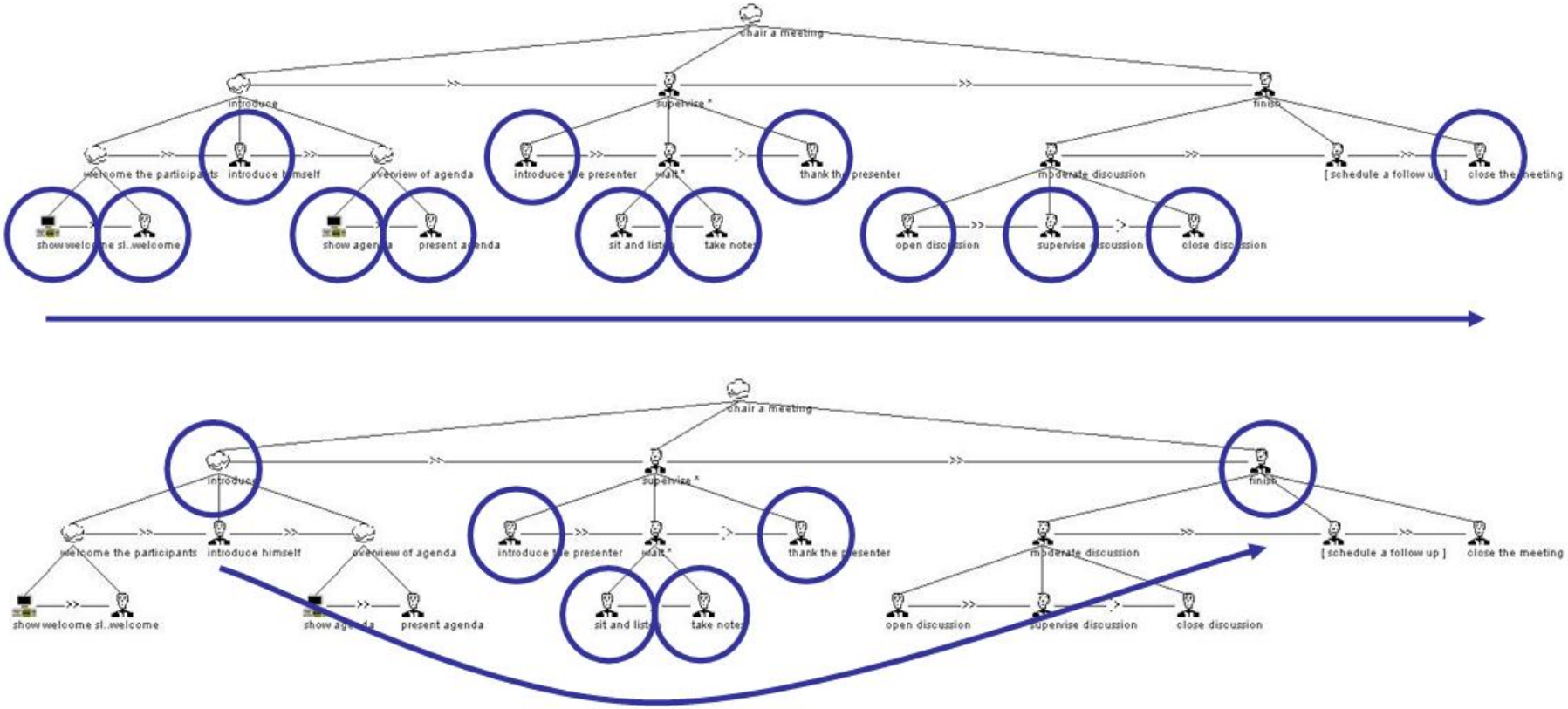
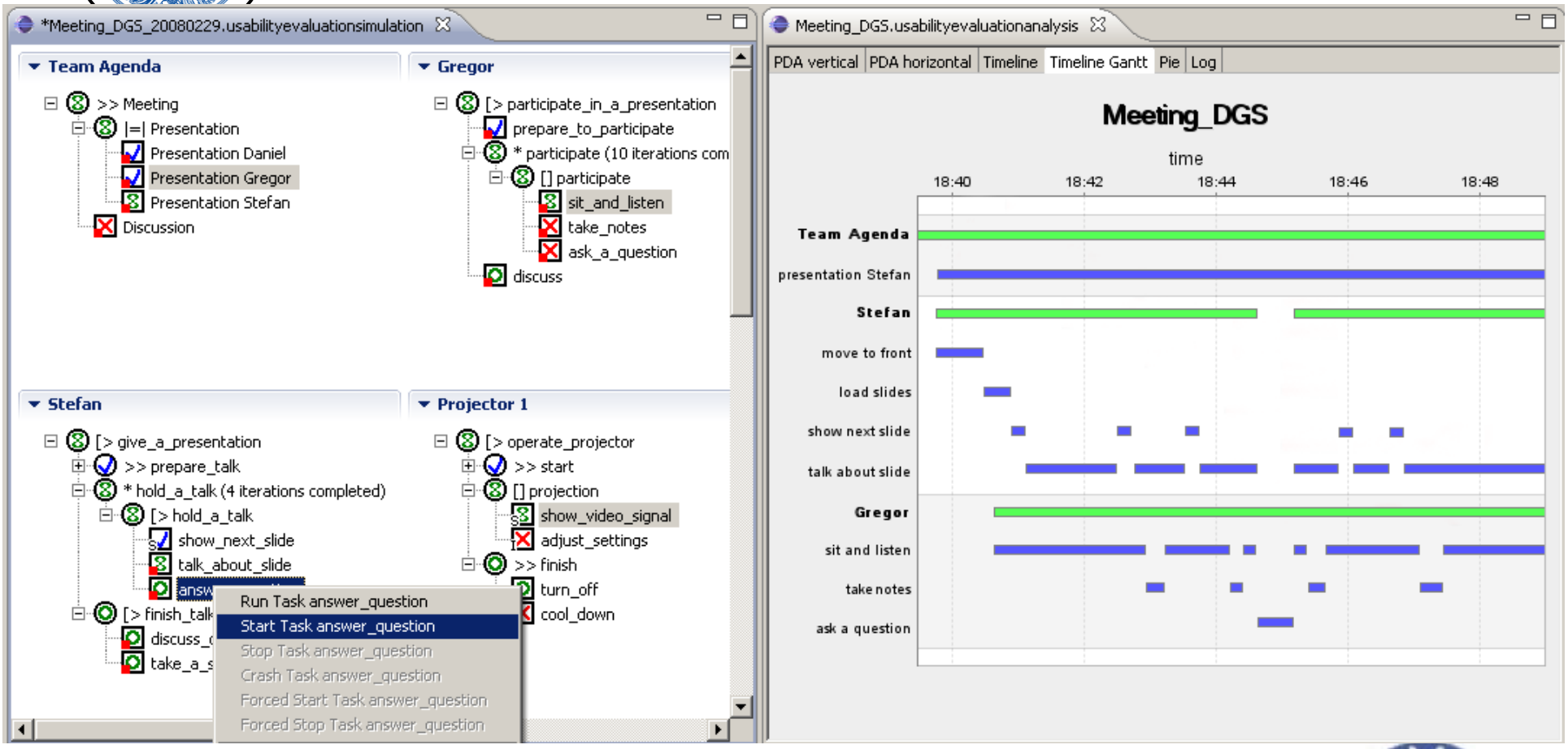
2.4 Analysis – Method (Pipeline)



Semantic Lens



2.4 Analysis - Tool



- Related work:
  - [Malý, I., Slavík, P.: Towards Visual Analysis of Usability Test Logs. Tamodia 2006.]
  - [Paternò, Russino, Santoro: Remote evaluation of Mobile Applications. Tamodia 2007.]

2.4 Analysis - Method

- Support the process of error discovery and error decomposition: “
  - (1) imprecise sensor values (e.g. wrong location values),
  - (2) misinterpretations of sensor values (e.g. when applying a faulty user movement model to clean the raw sensor data),
  - (3) intention recognition errors (e.g. when predicting the wrong user task) and
  - (4) planning errors (e.g. when delivering the wrong functionality)“

    [Wurdel, Propp, Forbrig: HCI-Task Models and Smart Environments, HCIS 2008.]

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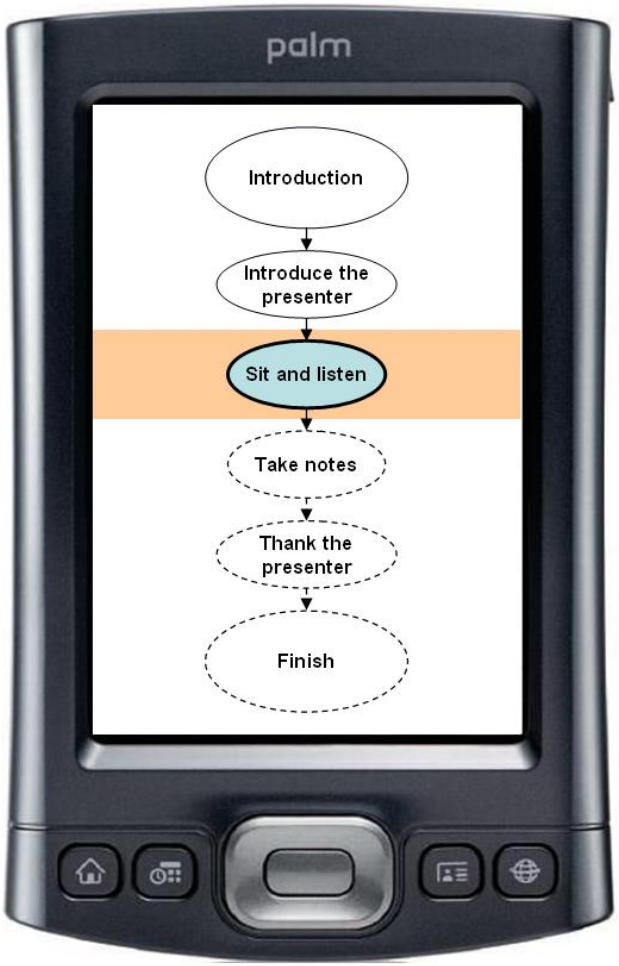

- Idea: interactions already captured, can be further used for guidance
- Visualizing the current state of task fulfillment
  - History: captured interactions
  - Future: (1) task models include temporal relations, (2) further annotations for probabilities
    [Giersich M., Forbrig P., Fuchs G., Kirste T., Reichart D., Schumann H.: Towards an integrated approach for task modeling and human behavior recognition. HCII 2007, vol. I, pp. 1109-1118, 2007.]
- Goal: visualize progress within the system transparently to improve user acceptance

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4. Conclusion & Future Work

- Usability Evaluation Method
  - Task-based approach of Usability Testing
  - Support of both: early and later development stages (simulation / execution)
  - Tool support integrates development and usability (conceptual and implementtational)
- Future Work:
  - Incorporation of further Sensor values (Ubisense location detection, device states, …)
  - Usability Test within our Smart Environment

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