A Conceptual Modeling Method to Use Agents in Systems Analysis

Kafui Monu

Sauder School of Business
University of British Columbia
Outline

- Motivation / Background
- Proposed Research
- Conclusion and Current Status
Motivation

- Area of Interest: System Analysis
- Topic: Understanding the domain
- Traditional aspects of systems analysis
  - Data, processes, events
  - ER, DFD, BPM, UML
  - Problem with representing the business context
- Representing the actor
  - “Agent” proposed as a new conceptual construct in systems analysis (Yu 2001)
Background

- Agents
  - Software intelligent agents from AI
  - Social, autonomous, and adaptive (Wooldridge 1999)
  - These conceptualizations be used in systems analysis!
- Agent concepts are not well defined (Drogoul et al. 2002)
- Intelligent agents as a modelling paradigm
  - Used systems theory and BWW ontology to understand the agent as a system (Monu et al. 2005)
  - Useful for understanding agents but does not have sufficient detail to act as a modelling methodology
The Conceptual Agent

World

Agent

Simulator
- Perception
- Goals
- Belief

Effector
- Procedure
- Resources
- Capabilities

Learning

Reasoning

Action
Conceptual Agent Diagram

**Resident**
- **Goal**: Administer the process
- **Procedure**: Direct adequate vouchers to the Head Chef
- **Reasoning**: If the voucher is greater than 30 hours old then Direct adequate vouchers to the Head Chef
- **Actions**: Give voucher to head chef

**Office**
- **Goal**: Administer the process
- **Procedure**: Direct adequate vouchers to the Head Chef
- **Reasoning**: If the voucher is greater than 30 hours old then Direct adequate vouchers to the Head Chef
- **Actions**: Give voucher to head chef

**Head Chef**
- **Goal**: Provide meals to the residents
- **Procedure**: Create voucher list, Create guest/extra meal list, Restrict vouchers
- **Beliefs**: Meal popularity, Number of vouchers to restrict
- **Learning Criteria**: If the report on leftovers for a meal is little and bulletin board feedback on the meal is positive then it is likely that the meal is popular. If meal popularity is high and there was an event that day then it is likely that the number of vouchers to restrict for the meal should go up
- **Reasoning**: If the voucher is greater than 30 hours old then Create voucher list. If the extra meal request is greater than 30 hours old then Create guest/extra meal list. If the meal is popular and some vouchers need to be restricted then restrict vouchers
- **Actions**: Create voucher list, Put the name of the voucher on the resident meal information, Create guest/extra meal list, Tell, Restrict vouchers. Tell residents that a specific meal has a number of restricted vouchers

**Servers**
- **Goal**: Give food to the residents
- **Procedure**: Serve food, Inform about meal
- **Reasoning**: If resident is not on the list or if the name on the voucher is on the list then Serve food. If there are few leftovers from the current meal then inform about meal
- **Actions**: Serve food, Tell the resident that they can have the food, Inform about meal. Make sure the report on leftovers gives the number of meals left and then

**Report on leftovers**

**Current Meal**

**Meal Information**

**Extra meal request**

**Mailbox**

**Voucher Mailbox**

**Voucher restriction message**

**Current Meal**
Research Inquiries

- What are the precise constructs of a conceptual agent needed to represent actors in systems analysis?
- How can these constructs be used in systems analysis?
- How useful is the methodology in gathering requirements and aiding the development and maintenance of information systems?
Research Tasks

- Develop grammar (constructs)
  - Agent constructs are needed to represent actors
- Develop method
  - Guidance needed to create agent models of consistent quality
- Case studies
  - Test the methodology in an environment
- Empirical tests
  - Test the quality of the methodology with different users
    - Usage – the experience modellers have using the methodology
    - Useful – the methodology can represent business domains
# Breakdown of tasks

<table>
<thead>
<tr>
<th>Methodology component</th>
<th>Development and Proof of Concept</th>
<th>Usage Studies</th>
<th>Usefulness Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammar</td>
<td>Essay 1</td>
<td>Essay 1</td>
<td>Essay 3</td>
</tr>
<tr>
<td>Method</td>
<td>Essay 2</td>
<td>Essay 3</td>
<td>Essay 3</td>
</tr>
</tbody>
</table>
## Empirical Study Details

<table>
<thead>
<tr>
<th>Usage</th>
<th>Usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grammar</strong></td>
<td></td>
</tr>
<tr>
<td>Observation of novice users modelling actors in a domain (Vitalari &amp; Dickson 1983)</td>
<td>Comparative read study with domain experts (Gemino &amp; Wand 2004)</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td></td>
</tr>
<tr>
<td>Observation of modellers using the method (Vitalari &amp; Dickson 1983)</td>
<td>Write Study with modellers with two groups. (Bera &amp; Wand 2007)</td>
</tr>
</tbody>
</table>
Essay 1: Conceptual Models

- Statements about agent concepts and their relationships
- Information system perspectives
  - Data, process, and behaviour oriented models
- Agent models
  - Structural, dynamic, interactive
- Validation
  - Proof of concept: Case Study
  - Usage: Observational study of actor modelling
Essay 2: Conceptual Agent Modelling Methodology

- Development of modelling rules
  - Integrity rules – ensure that the models are correct
  - Mapping rules – aids in translating the domain to the constructs
- Development of method
  - Guide modellers to create agent models that conform to the rules
- Case studies
  - Post hoc analysis – investigation of previous diagrams
  - Domain understanding - knowledge acquisition study
Essay 3: Empirical Work

- Usefulness of grammar
  - Read study
  - Comparison with i* diagram

- Usage and usefulness of method
  - Usage
    - Observation of users using the method
    - Measure breakdowns caused by method
  - Usefulness
    - Compare method and no method
    - Measure breakdowns mitigated by method
Conclusion

- Agents can be used to understand business context
- Proposed research contributions
  - Definitions of agent constructs that can represent actors
  - Methodology to use agents to model actors
  - Validation of new methodology
- Current status
  - Conduct usage and usefulness studies of method
  - Conduct usefulness study for grammar
Thank You