The Models for Agent-Oriented Analysis: Goal, Role, and Organisation Models

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Department of Informatics
Tallinn University of Technology
The purpose of the course

- To design by AOM a **software-intensive intelligent social product** that delivers the overall solution for the end user through interactions between different nodes and by following the execution loop of an abstract agent
Logistics

- Lectures on **Wednesdays at 10.00-11.30** in the **main building of TUT, lecture hall VI-229**

- Workshops/lab classes on **Wednesdays at 12.00-13.30** in the **ICT building of TUT at Raja 15, computer class IT-111**, and, if needed, also **IT-109**

- Consultation times by Prof Taveter: on **Wednesdays at 14.30 – 15.30** in the **ICT building of TUT at Raja 15, room IT-402**
Communication

- **Course webpage:** [http://maurus.ttu.ee/sts/?page_id=1242](http://maurus.ttu.ee/sts/?page_id=1242)
- **Course mailing list:** [aine.aom@lists.ttu.ee](aine.aom@lists.ttu.ee)
- **Joining the mailing list:** [http://lists.ttu.ee/mailman/listinfo/aine.aom](http://lists.ttu.ee/mailman/listinfo/aine.aom)
Miniproject

- Design and prototyping or simulation of a software-intensive social product (*up to 3 team members*)

- Range of topics:
  - Crowdsourcing applications
  - Intelligent digital assistants
  - Social applications

- Two Mektory ([http://www.ttu.ee/mektory](http://www.ttu.ee/mektory)) projects (*up to 5 team members*):
  - Healthminer
  - Phoenix
Why should I do a MeKtory project?

- Real-life problem
- More interesting and more fun
- International collaboration (Australia, USA)
- Some cash for team members if the project ends well
- Possibility for automatic exam accomplishment if the project ends well
- Possibility for follow-up projects and M.Sc. Theses and even PhD topics
Why shouldn’t I do a Mektory project?

- More responsibility
- Takes more time
- May grow beyond the term
Last time

- Positioning of the course
- The difference between product model and business model
- Business Model Competition
- The concept of model
- The Viewpoint Framework
- Overview of Agile Design by AOM
Why agile?

- We need to design a product fast
- We need to develop a prototype fast
Why social?

- Products that perceive their environment and interact
- Products that support people in their everyday activities → sociotechnical systems
Socio-technical system

- A software intensive system that has defined operational processes followed by human operators and which operates within an organization
- A system that contains both a social aspect, which may be a subsystem, and a technical aspect
Running example: Personal medical assistant
# The Viewpoint Framework

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What is model?

- A hypothetical, simplified description of a complex entity or process
- “A model should be as complex as it needs, but not more complex”, David Lorge Parnas
- What features...
  - are important?
  - can be ignored?
Examples of models

- A model of the solar system
- The model of a gold mine
- The model of a chemical plant
- Air traffic simulator:
Part III

GOAL MODELLING
## The Viewpoint Framework

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Concepts for goal models

- Goal
  - Functional goal
  - Quality goal
- Role
What is goal?

- Dream with a deadline 😊
- A particular state of affairs intended by one or more agents
Two kinds of goals

- Functional goal: a goal that captures one or more desired scenarios. Example: attend the lecture

- Quality goal: quality requirement of the achievement of the functional goal. Example: attend the lecture \textit{attentively}
What is role?

- Some capacity or position that the system requires in order to achieve its goals
- Examples
Goal model

- Hierarchy of goals
- Roles associated with goals
- Quality goals attached to goals
Goal model for personal medical assistant (1)
Goal model for personal medical assistant (2)

- Monitor health condition
  - Receive values on the measurements
  - Verify the measurements
  - Analyse the measurements
  - Generate alert messages

- Timely
- Up-to-date
- Quick
- Reliable

Monitor

Patient
Goal model for personal medical assistant (3)

- Diagnose health condition
  - Analyse medical history
  - Ask about genetic defects
  - Identify possible disease
  - Recommend healthy lifestyles

- Patient
- Physician
- Family Member
Tourist advisor
Goal model for tourist advisor

Value proposition

- Determine the location
- Point out sightseeing spots
- Recommend the spot
- Guide the tourist
- Rate the spot

- Precise
- Profile honoured
- Loved by locals

- Authentic

- GPS Service Provider
- Check tourist profile
- Check the rating
- Match tourist profile

- Reputation enhancing
Smart parking
Goal model for smart parking

- **Commuter**: Park smartly, Check the options, Optimal, Secure, Advantageous, Preferences honored, Quickly, Find a parking spot, Park the car, Leave the parking spot, Park the car, Leave the parking spot.

- **Parking Service Provider**: Check the options, Decide, Direct the driver, Register arrival, Initiate payment, Register departure, Stop payment.
  - **Up-to-date**, **Optimal**, **Maximal granularity**, **Accurate**, **Precise**, **Secure**, **Maximal societal welfare**.

- **GPS Service Provider**: Accurate, Precise, Register arrival, Initiate payment, Register departure, Stop payment, Parking Service Provider.
Fair grocery shopping

- Customers post the prices they paid for their groceries and QoS information
- A prospective shopper enters a grocery list and obtains a pointer to the store(s) with the lowest total price (and best service)
- Each customer has an app representing his/her interests and interacting with the agents of the other customers
- Results from initial experiments by Prof. Michael Huhns and Hongying Du: savings up to 21% can be obtained!
Goal model for fair grocery shopping

Value proposition

Join the system
Create shopping list
Find potential stores
Decide stores’ shopping baskets
Decide the route
Buy products
Exchange price and quality information

Store
Assistant
Customer

Societally
Advantageously

Easy
According to the need
Simple
Close
Minimal overall price
Optimal
Secure
Minimal participation

Quality products
Part IV

ROLE AND ORGANIZATION MODELLING
The Viewpoint Framework

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Role model

- Role models are orthogonal to goal models
- A role model consists of the following four elements to describe the role:
  - Role name: A name identifying the role
  - Description: A textual description of the role
  - Responsibilities: A list of responsibilities that the agent playing the role must perform in order for a set of goals and their associated quality goals to be achieved
  - Constraints: A list of conditions that the agent playing the role must take into consideration when exercising its responsibilities
Role model for Parking Assistant in smart parking

<table>
<thead>
<tr>
<th>Role name</th>
<th>Parking Manager</th>
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<tbody>
<tr>
<td>Description</td>
<td>The role of a commuter’s parking manager in the smart parking system</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Responsibilities</th>
<th></th>
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<tr>
<td>Obtain parking preferences from the commuter</td>
<td></td>
</tr>
<tr>
<td>Obtain destination from the commuter</td>
<td></td>
</tr>
<tr>
<td>Check parking service provider for parking spots</td>
<td></td>
</tr>
<tr>
<td>Express the destination and preferences</td>
<td></td>
</tr>
<tr>
<td>Negotiate with other commuters if needed</td>
<td></td>
</tr>
<tr>
<td>Receive from the parking service provider options for parking spots</td>
<td></td>
</tr>
<tr>
<td>Present the commuter with the options (including prices)</td>
<td></td>
</tr>
<tr>
<td>Decide one of the options</td>
<td></td>
</tr>
<tr>
<td>Direct the commuter to the parking spot</td>
<td></td>
</tr>
<tr>
<td>Inform the parking service provider about taking a parking spot</td>
<td></td>
</tr>
<tr>
<td>Leave the parking spot</td>
<td></td>
</tr>
<tr>
<td>Receive the charge</td>
<td></td>
</tr>
<tr>
<td>Inform the commuter about the charge</td>
<td></td>
</tr>
<tr>
<td>Inform the parking service provider about leaving the parking spot</td>
<td></td>
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<tr>
<td>Parking preferences by the commuter should be honored</td>
<td></td>
</tr>
<tr>
<td>Negotiations with other customers should be anonymous and fair</td>
<td></td>
</tr>
<tr>
<td>Driver should be directed to the parking spot with maximal granularity</td>
<td></td>
</tr>
<tr>
<td>Arrival and departure times should be accurately registered</td>
<td></td>
</tr>
<tr>
<td>Minimal possible parking charge should be chosen (e.g., -15 minutes)</td>
<td></td>
</tr>
<tr>
<td>Information exchange with the parking manager should be opaque and anonymous</td>
<td></td>
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## Role model for Commuter in smart parking

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<th>Role name</th>
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<tbody>
<tr>
<td>Description</td>
<td>The role of a commuter in the smart parking system.</td>
</tr>
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</table>
| Responsibilities | Provide the parking manager with the parking preferences  
|               | Provide the parking manager with the destination  
|               | Receive from the parking manager options for parking spots  
|               | Decide one of the options  
|               | Follow the directions by the parking manager  
|               | Park the car in the parking spot chosen  
|               | Accept the charge  
|               | Leave the parking spot |
| Constraints  | A car has to be parked in the parking spot chosen |
## Role model for Customer in fair grocery shopping

<table>
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<th>Role</th>
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</tr>
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<tbody>
<tr>
<td><strong>Description</strong></td>
<td>The role of customer in grocery shopping</td>
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| **Responsibilities** | Join the system  
                        | Create the shopping list  
                        | Pick products from the typical shopping list  
                        | Confirm the stores and shopping baskets suggested by the assistant  
                        | Confirm the route suggested by the assistant  
                        | Drive to the stores  
                        | Buy products  
                        | Register product information  |
| **Constraints** | To benefit from the product information posted by other customers, the customer must authorize posting of his/her product information. |
## Role model for Assistant in fair grocery shopping

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<tr>
<td><strong>Description</strong></td>
<td>The role of a customer’s assistant in grocery shopping</td>
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<tr>
<td><strong>Responsibilities</strong></td>
<td></td>
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<tr>
<td>Find potential stores</td>
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<tr>
<td>Decide and propose the stores and their respective shopping baskets</td>
<td></td>
</tr>
<tr>
<td>Decide and propose the route</td>
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<tr>
<td>Create the typical shopping list</td>
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<tr>
<td>Post price and quality-of-product information</td>
<td></td>
</tr>
<tr>
<td>Receive price and quality-of-product information</td>
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<tr>
<td><strong>Constraints</strong></td>
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<tr>
<td>Creating a shopping list should be simple and reflect the need by the customer</td>
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<tr>
<td>Potential stores must be close to the customer</td>
<td></td>
</tr>
<tr>
<td>The preferences by the customer must be honored when deciding the stores and their shopping baskets</td>
<td></td>
</tr>
<tr>
<td>The overall price should be as low as possible</td>
<td></td>
</tr>
<tr>
<td>Quality of products chosen should be as high as possible</td>
<td></td>
</tr>
<tr>
<td>Informing other customers should be secure and anonymous</td>
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<td>To post price and quality-of-product information, the customer must have scanned or inserted the product information</td>
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The organization model

The model that represents relationships between the roles of the socio-technical system

There can be different types of organizational relationships:

- Is controlled by
  - Between a „boss“ and his subordinates
- Is benevolent to
  - Between self interested roles
- Is peer to
  - Between equal roles
- Is dependent for resource
- ...
Organization model for personal medical assistant
Organization model for smart parking

Commuter

Parking Assistant

GPS Service Provider

Private Parking Service Provider

Municipal Parking Service Provider
Organization model for fair grocery shopping
Today

- Workshop on miniproject topics and on creating AOM analysis models with Microsoft Visio
Next time

On 27 February 2013:

- Presentations of goal and role models for miniprojects by student teams
MS Visio Stencils for AOM