



## Requirements Engineering II

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## Assignment 7: ADORA and the Role of Formality in RE

### 1. Tasks

#### Individual Tasks

- Read the mandatory items in the reading list
- Be prepared to answer the questions given below in class

#### Group Tasks

- Prepare a 15 minutes presentation (5-10 slides) on the theme assigned to your course group. Browse/read additional papers and/or web pages where necessary.
- Specify the problem given in the case study below in ADORA (section 5). The focus of the model shall be on the handheld device. Where necessary, ask the tourist guide expert for advice or make and document assumptions. For creating the models, you have the choice between using the ADORA tool (section 6), any general-purpose drawing tool, or paper-and-pencil.

Hints:

- Start with a type scenario that specifies how a tourist interacts with the tourist guide system.
- Model the components that are needed to provide the functionality of the tourist guide system.
- Model the data and the behaviour of the components with objects and states.

Tourist guide and ADORA expert: Tobias Reinhard (<http://www.ifi.uzh.ch/rerg/people/reinhard>).

### 2. Reading list

#### Prerequisites

It is assumed that you are familiar with the basics of statecharts and Petri nets. You may want to refresh your knowledge by studying the slides on this topic in the course Informatik II (Part a: Modeling, Chapter 7 on 'Verhaltensmodelle' [Glinz 2006]). If you can't read German, read the sections on statecharts and Petri nets in a software engineering textbook.

#### Mandatory reading

[Glinz 2002] discusses the use of statecharts for requirements specification. Sections 7-12.1 of [Jacky 1997] discuss a set-based approach for requirements specification. [Glinz, et al 2002] provides an overview of ADORA.

#### Theme-specific reading

[Polak 2002], [Berry 2002]: Practice and Limitations of Formal Methods  
[Seybold et al 2005], [Glinz, et al 2007]: Scenario-Driven Modeling with ADORA.  
[Reinhard et al 2007] and [Reinhard et al 2008]: Layout of ADORA Models.

### 3. Questions

- What are the basic concepts of state-based requirements specification?
- What are the basic concepts of a set-based specification language such as Z?
- What are the basic principles that ADORA is built upon? What are the main differences between ADORA and UML? How can incompleteness be modelled explicitly in ADORA?

### 4. Themes for presentation

(Will be assigned by the research assistant who tutors this course; your group can apply for a theme)

#### A. Practice and Limitations of Formal Methods

(Why was automatic code generation from a formal requirements specification successful in the situation described in [Polak 2002]? Why are formal requirements specification techniques not broadly used in practice? In a given project, how do we decide how much formality is needed for requirements specification?)

#### B. Scenario-Driven Modelling with ADORA

(What is the purpose of simulating scenarios? How can scenarios be simulated in presence of not fully formalized and incomplete system specifications? To what degree does such simulation require formal requirements specification?)

#### C. Layout of ADORA Models

(What is Fisheye zoom? What are its advantages and limitations compared with traditional explosive zoom? What are the challenges related to the implementation of Fisheye zooming and how can they be addressed?)

### 5. Case Study

Assume you are working for a company who wants to develop and market a location- and context-sensitive tourist guide system [Davies et al. 2001]. The following requirements have been elicited so far:

The tourist guide consists of an electronic hand-held device that offers the following facilities to the visitors. The rough requirements are as follows:

For the initialization of the tourist guide a set of preferences and interests is entered by the tourist to generate and propose interesting suggestions for tours of the city and cultural events to visit;

Having initialized the device, the user can choose from the following functions of the tourist guide.

- a) City Information: Retrieve information about the city, including information about the current location. The retrieved information depends on the preferences, interests and position of the user.
- b) Surprise: The device suggests randomly an activity for the tourist. The activity is chosen according to a, c, d, e.
- c) City Tours: Provide route guidance to help visitors move between locations on the tour. The route is chosen according to the position of the preferences, the interests and the position of the user.
- d) Walking Route: The device suggests a walking route. The route is determined according to the preferences, interests and the position of the system.
- e) Cultural Event: The device suggests a cultural event or museum to visit. The suggestion is chosen according to the preferences, interests and position of the user.

Access Services: Access external services, such as hotel and theatre and ticket reservations.

The handheld device locates its position by using a GPS receiver. The position needs to be updated every 20 seconds.

## 6. The ADORA tool prototype

The ADORA tool prototype can be freely downloaded (see Web resources below). The tool requires Eclipse and Java 2 (JDK 1.5). Please note that the simulation features described in [Glinz, et al 2007] are not included in the current version of the tool.

### References

- Berry, D.M. (2002). Formal Methods: The Very Idea. Some Thoughts About Why They Work When They Work. *Science of Computer Programming* **42**, 1. 11-27.
- Davies, N. K. Cheverst, K. Mitchell, and A. Efrat (2001). Using and Determining Location in a Context-Sensitive Tour Guide. *IEEE Computer* **34**, 8. 35-41.
- Glinz, M. (2002). Statecharts For Requirements Specification – As Simple As Possible, As Rich As Needed. *ICSE International Workshop on Scenarios and State Machines: Models, Algorithms and Tools*, Orlando, May 2002.
- Glinz, M., S. Berner, S. Joos (2002). Object-oriented modeling with ADORA. *Information Systems* **27**, 6. 425-444.
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- Glinz, M., C. Seybold, S. Meier (2007). Simulation-Driven Creation, Validation and Evolution of Behavioral Requirements Models. *Dagstuhl-Workshop Model-Based Development of Embedded Systems (MBEES 2007)*, Dagstuhl, Germany.
- Jacky, J. (1997). *The Way of Z: Practical Programming With Formal Methods*. New York: Cambridge University Press.
- Meier, S., T. Reinhard, C. Seybold, M. Glinz (2006). Aspect-Oriented Modeling with Integrated Object Models. *Modellierung 2006*. Innsbruck, Austria.
- Polak, W. (2002). Formal Methods in Practice. *Science of Computer Programming* **42**, 1. 75-85.
- Reinhard, T., S. Meier, M. Glinz (2007). An Improved Fisheye Zoom Algorithm for Visualizing and Editing Graphical Models. *2<sup>nd</sup> International Workshop on Requirements Engineering Visualization (REV'07), in conjunction with RE'07*. New Delhi, India.
- Reinhard, T., S. Meier, R. Stoiber, C. Cramer, M. Glinz (2008) Tool Support for the Navigation in Graphical Models. *30<sup>th</sup> International Conference on Software Engineering (ICSE'08)*, Leipzig, Germany.
- Seybold, C., S. Meier, M. Glinz (2005). Simulation-based Validation and Defect Localization for Evolving, Semi-Formal Requirements Models. Proceedings of the 12th Asia-Pacific Software Engineering Conference (APSEC 2005), Taipei, Taiwan.

### Web resources

The ADORA tool and an installation guide for the tool can be downloaded at  
<http://www.ifi.unizh.ch/req/research/projects/adora/tool/download/>  
[http://www.ifi.unizh.ch/req/adora/adora-help/about/software\\_updates.html](http://www.ifi.unizh.ch/req/adora/adora-help/about/software_updates.html)

Further help about the ADORA tool can be found at  
<http://www.ifi.unizh.ch/req/adora/adora-help/>  
Please note that this is a work-in-progress document.

First steps in the ADORA tool can be found at:  
[http://www.ifi.unizh.ch/req/adora/adora-help/gettingstarted/how\\_to\\_startup\\_adora\\_editor.html](http://www.ifi.unizh.ch/req/adora/adora-help/gettingstarted/how_to_startup_adora_editor.html)