University of Zurich[UZH]

RERG

Requirements Engineering II

Assignment 5

Formality and Quality

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I. Task

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 authentification subsystem of an ATM (automated teller machine) (a) in Z, (b) with a statechart and (c) with a Petri net. Assume that you have two predicates `cardIsValid` and `pinCodeIsValid` for determining whether the user's card and pin code are valid.

II. Reading List

Mandatory reading

[Gunter 2000] proposes a reference model for the specification of requirements and [Harel 2004] explains the meaning of semantics. [Lindland 1994] and [Moody 2003] introduce and evaluate a framework for assessing the quality of models.

Theme-specific reading

[Jackson 2006], [Parnas 2010]: Limitations of Formal Methods
[Berry 2002], [Polak 2002]: Formal Methods in Practice
[Evans 1998], [Evermann 2005]: Formal Semantics for UML

III. Questions

- What are the 5 artifacts involved in the development of software?
- How is a system related to its environment?
- What are the main elements of a modeling language?
- Has UML formal semantics? Why? What does it imply?
- What are the three components of semiotics? How can they be used to evaluate the quality of models?
- Is such an evaluation effective?

IV. Themes for Presentation

Themes will be assigned by the assistant who tutors this course; your group can apply for a theme.

A. Limitations of Formal Methods

According to [Parnas 2010], what should be changed in current formal methods to increase their use in practice? What are the main difficulties in formalizing the environment of a software system? How can these difficulties be addressed?

B. Formal Methods in Practice

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? Why was automatic code generation from a formal requirements specification successful in the situation described in [Polak 2002]?

C. Formal Semantics for UML

In [Evans 1998], what are the main steps in formalizing a modeling language like UML? What is the ontology proposed by Bunge? What are the main concepts in this ontology? How can it be used to formalize UML? What is the key difference between the formalization proposed by the pUML group ([Evans 1998]) and the ontological approach presented in [Evermann 2005]?

References

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Evans, A., R. France, K. Lano, B. Rumpe (1998). The UML as a Formal Modeling Notation. *1st International Workshop on the Unified Modeling Language (UML'98)*. Mulhouse, France. 336-348.

Gunter, C., E. Gunter, M. Jackson, P. Zave (2000). A Reference Model for Requirements and Specifications. *IEEE Software* **17**, 3 (May/Jun. 2000). 37-43.

Harel, D., B. Rumpe (2004). Meaningful Modeling: What's the Semantics of "Semantics"?. *IEEE Computer* **37**, 10 (Oct. 2004). 64-72.

Jackson, M (2006). What Can We Expect from Program Verification?. *IEEE Computer* **39**, 10 (Oct. 2006). 65-71.

Lindland, O., G. Sindre, A. Solvberg (1994). Understanding Quality in Conceptual Modeling. *IEEE Software* **11**, 2 (Mar. 1994). 42-49.

Moody, D., G. Sindre, T. Brasethvik, A. Solvberg (2003). Evaluating the Quality of Information Models: Empirical Testing of a Conceptual Model Quality Framework. *25th International Conference on Software Engineering (ICSE'03)*. Portland, Oregon, USA. 295-305.

Parnas, D. L. (2010). Really Rethinking 'Formal Methods'. *IEEE Computer* **43**, 1 (Jan. 2010). 28-34.

Polak, W. (2002). Formal Methods in Practice. *Science of Computer Programming* **42**, 1. 75-85.