



Supervisor's statement of a final thesis

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Thesis title: Implementation of the transformation of an OntoUML model in OpenPonk into its realization in a relational database
Branch / specialization: Software Engineering
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Evaluation criteria

1. Fulfillment of the assignment

- ▶ [1] assignment fulfilled
- [2] assignment fulfilled with minor objections
- [3] assignment fulfilled with major objections
- [4] assignment not fulfilled

The goals of the thesis are fully met. The results exceed the expectations.

2. Main written part

98/100 (A)

The textual part of the thesis is on an excellent level. The text is very well structured and clearly leads the reader from the presentation of the thesis context and related state-of-the-art, to the design of the target solution, to description of its realization, and to its evaluation and conclusion. The text can be easily followed and understood.

In the first part, the author summarizes the related standards and techniques ranging from the conceptual and data modelling, to UML and OCL languages, to the rules for the transformation of an OntoUML conceptual model into its realization in a relational database. In each section, all important concepts are clearly explained. In the next chapter - analysis, the author analyses the tools for the target implementation, elaborates on the changes of OntoUML since the supervisor's thesis realization this thesis builds upon and defines the requirements of the implementation of the automated transformation proposed in the supervisor's thesis. In the following chapters Design and Implementation, the suggested solution for the transformation engine and its implementation in OpenPonk is described, followed by the details of the actual implementation. Finally, the results are evaluated and demonstrated on a complex example and compared with the theoretical results in the supervisor's thesis.

The text of the thesis is very well written. The information flow can be easily followed and understood. The author utilizes various formatting concepts very well to denote various definitions, transformation rules, listings, and similar.

To point out some potential improvements:

- In section 5.2, lots of transformation rules is defined. However, their priority is not very clear. Explicitely pointing out that the rules are listed in the order of decreasing priority would help to make sure.
- In section 4.4, the individual data models are described and visualized in the form of class diagrams. However, the actual logic of the transformation is not described in the form of the implementation classes or a class diagram.
- SmallTalk is not a very well known programming language, so providing a bit broader introduction to the syntax (than in section 3.2.1) would help the reader to better understand the listings of code in the thesis.

3. Non-written part, attachments

100/100 (A)

The main result of the thesis is the implementation of the transformation of OntoUML conceptual models into their realization in the Oracle relational database. The results exceed the expectations, allowing the user to transform the model directly from the OpenPonk tool and browsing both the results and the intermediate models and scripts in the same tool.

The ultimate result of the transformation is an SQL script that can be used to create the individual constructs in the target database, including the tables with columns and PRIMARY and FOREIGN KEY constraints, but also other more complex constraints and triggers realizing the constraints derived from the initial OntoUML conceptual model. The implemented transformation is based on the supervisor's thesis and the rules proposed there. The author managed to implement all the rules and most of the proposed optimizations. The implementation is verified using several simple models and the complex model from the supervisor's thesis, proving the correct implementation resulting into the same transformed model.

Exceeding the original expectations, the student managed to implement the transformation as an integral part of the OpenPonk modelling tool. Also, all the intermediate models are implemented and integrated with OpenPonk so the user can browse them and search for eventual improvements of the model to achieve better results. Also, the implementation of the proposed optimizations exceed the original expectation.

For the realization, the student applied well chosen practices of software engineering, including code versioning, continuous integration, automated testing, and others.

4. Evaluation of results, publication outputs and awards

100/100 (A)

The results of the thesis are excellent. The tool OpenPonk was extended with the transformation of the OntoUML conceptual model into its realization in the Oracle relational database in the form of SQL scripts for creating the database constructs. The transformation itself is realized in the form of a generic transformation engine that can be reused in other transformations easily. Its realization and application for the transformation of the OntoUML model is very well described in the text of the thesis and

can be definitely published as a paper in a software engineering tools-oriented or transformation-oriented conference.

The resulting transformation can also be easily extended to allow the user to change the intermediate models and finish the transformation with these changes. As well, it can be generalized to transform the original model into different relational database (PostgreSQL, Maria DB), or even different realization model in general (Java, C#, object databases, graph database, etc.).

Finally, this tool allows for practical verification and demonstration of the research of the OntoUML modelling applicability in software engineering which leverages the research done in the Centre for Conceptual Modelling and Implementations at the faculty.

5. Activity of the student

- ▶ [1] excellent activity
- [2] very good activity
- [3] average activity
- [4] weaker, but still sufficient activity
- [5] insufficient activity

The activity of the student was excellent. The student developed an excellent solution in time with all the expected qualities and even more.

6. Self-reliance of the student

- ▶ [1] excellent self-reliance
- [2] very good self-reliance
- [3] average self-reliance
- [4] weaker, but still sufficient self-reliance
- [5] insufficient self-reliance

The student resolved the thesis on his own, without the need for guidance or help from the supervisor. The proposed and realized solution was consulted in progress to verify the goals but the student proved he can organize the work well and the delivered result exceeds the expectations in both the extent and the quality.

The overall evaluation

100 /100 (A)

The thesis is excellent.

The textual part documents the work done in the thesis very well, explaining the context, discussing the analysis of the needs and tools, presenting the proposed solution, and its realization. It is very well structured and easy to follow and understand.

The resulting implementation provides an extension of the OpenPonk tool for the semi-automatic transformation of an OntoUML conceptual model into its realization in Oracle relational database. The implementation is very good and the extent of the functionality exceeds the expectations. It has the potential for publication on a conference dedicated to SE tools or transformations of models.

The tool can be easily further extended for other transformations and can be used in the research done in the CCMi group at the faculty.

Instructions

Fulfillment of the assignment

Assess whether the submitted FT defines the objectives sufficiently and in line with the assignment; whether the objectives are formulated correctly and fulfilled sufficiently. In the comment, specify the points of the assignment that have not been met, assess the severity, impact, and, if appropriate, also the cause of the deficiencies. If the assignment differs substantially from the standards for the FT or if the student has developed the FT beyond the assignment, describe the way it got reflected on the quality of the assignment's fulfilment and the way it affected your final evaluation.

Main written part

Evaluate whether the extent of the FT is adequate to its content and scope: are all the parts of the FT contentful and necessary? Next, consider whether the submitted FT is actually correct – are there factual errors or inaccuracies?

Evaluate the logical structure of the FT, the thematic flow between chapters and whether the text is comprehensible to the reader. Assess whether the formal notations in the FT are used correctly. Assess the typographic and language aspects of the FT, follow the Dean's Directive No. 52/2021, Art. 3.

Evaluate whether the relevant sources are properly used, quoted and cited. Verify that all quotes are properly distinguished from the results achieved in the FT, thus, that the citation ethics has not been violated and that the citations are complete and in accordance with citation practices and standards. Finally, evaluate whether the software and other copyrighted works have been used in accordance with their license terms.

Non-written part, attachments

Depending on the nature of the FT, comment on the non-written part of the thesis. For example: SW work – the overall quality of the program. Is the technology used (from the development to deployment) suitable and adequate? HW – functional sample. Evaluate the technology and tools used. Research and experimental work – repeatability of the experiment.

Evaluation of results, publication outputs and awards

Depending on the nature of the thesis, estimate whether the thesis results could be deployed in practice; alternatively, evaluate whether the results of the FT extend the already published/known results or whether they bring in completely new findings.

Activity of the student

From your experience with the course of the work on the thesis and its outcome, review the student's activity while working on the thesis, his/her punctuality when meeting the deadlines and whether he/she consulted you as he/she went along and also, whether he/she was well prepared for these consultations.

Self-reliance of the student

From your experience with the course of the work on the thesis and its outcome, assess the student's ability to develop independent creative work.

The overall evaluation

Summarize which of the aspects of the FT affected your grading process the most. The overall grade does not need to be an arithmetic mean (or other value) calculated from the evaluation in the previous criteria. Generally, a well-fulfilled assignment is assessed by grade A.