UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

Masterprojekt: Feature-based and Scenario-based Comparative Analysis of Multi-level Modeling Tools

Semester: Wintersemester 2020/21

Sprache: Deutsch/English

Motivation:

The term multi-level modeling refers to modeling approaches aiming at representing multiple classification levels within a single body of model content. Different multi-level modeling approaches have been proposed, among them: potency-based multi-level modeling, multi-level object and relations, MultEcore, DeepTelos, MetaDepth, DeepJava, DeepRuby, as well as the Flexible Meta-Modeling and Execution Language (FMMLx).

There is a core set of ideas, which are common to all multi-level modeling approaches, such as, e.g.: (1) support for arbitrary-depth classification hierarchies, (2) relaxing the type/instance dichotomy, and (3) offering a deferred instantiation mechanism. However, each approach has (on purpose) a different focus. As a result, the approaches differ when it comes to, among others, (1) level of modeling discipline, (2) the way deferred instantiation mechanism has been designed and implemented, and (3) additional mechanisms and software tool support.

Regarding the latter, there are various modeling tools and frameworks that support multi-level modeling, such as Melanee, DeepTelos, MetaDepth, DeepJava, DeepRuby, Totem and XModeler. All of those tools, even if supporting the same family of approaches, pursue a different strategy with respect to, among others, creating and modifying a multi-level model, code generation and supporting model execution.

Beschreibung:

The main aim of this bachelor project is to conduct a feature and scenario-based comparison of selected existing tools supporting multi-level modeling. To this aim the students should:

1. Make themselves familiar with basic ideas of multi-level modeling.
2. Identify existing tools and check their availability/development status.
3. Prepare testing environment.
4. Select a set of features to be used to compare existing tools (encompassing, e.g., such criteria as: a way of modeling, support for modifiability and change propagation, support for definition of graphical notation, intuitiveness of user interface, persistency mechanism, code generation, code execution, multi-level features supported).

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5. Conduct a scenario-based comparison of the existing tools. The initial version of the scenario may be provided by a supervisor.
6. Perform a critical analysis of the maturity of the currently available tools.

Einstiegsliteratur:

Atkinson, C., Kühne, T.: The essence of multilevel metamodeling. In: Proc. of the 4th Int. Conf. on The Unified Modeling Language, Modeling Languages, Concepts, and Tools, pp. 19–33. Springer, London (2001)

Atkinson, C., Kühne, T.: Reducing accidental complexity in domain models. SoSyM 7(3), 345–359 (2008)

Atkinson, C., Kühne, T.: On evaluating multi-level modeling. In: L. Burgueno, et al. (eds.) Proc. of the 4th Inter. Workshop on Multi-Level Modeling (MULTI), pp. 274– 277. CEUR-WS.org (2017)

Atkinson, C., Gerbig, R., Kühne, T.: Comparing multi-level modeling approaches. In: MULTI 2014: Proceedings of the Workshop on Multi-Level Modelling co-located with ACM/IEEE 17th International Conference on Model Driven Engineering Languages & Systems (MoDELS 2014) Valencia, Spain, September 28, 2014, vol. 1286, pp. 53–61.

Frank, U.: Multilevel modeling – toward a new paradigm of conceptual modeling and information systems design. BISE 6(6), 319–337 (2014)

Jeusfeld, M.A., Neumayr, B.: Deeptelos: Multi-level modeling with most general instances. In: I. Comyn-Wattiau, K. Tanaka, I.Y. Song, S. Yamamoto, M. Saeki (eds.) Conceptual Modeling, pp. 198–211. Springer International Publishing, Cham (2016)

Kühne, T., Schreiber, D.: Can programming be liberated from the two-level style: Multi-level programming with deepjava. SIGPLAN Not. 42(10), 229– 244 (2007)

de Lara, J., Guerra, E.: Deep meta-modelling with metadepth. In: J. Vitek (ed.) Objects, Models, Components, Patterns, pp. 1–20. Springer Berlin Heidelberg, Berlin, Heidelberg (2010)

de Lara, J., Guerra, E., Cobos, R., Moreno-Llorena, J.: Extending Deep Meta- Modelling for Practical Model-Driven Engineering. The Computer Journal 57(1), 36–58 (2012)

Macias, F., Rutle, A., Stolz, V.: Multecore: Combining the best of fixed-level and multilevel metamodelling. In: C. Atkinson, G. Grossmann, T. Clark (eds.) Proceedings of the 3rd International Workshop on Multi-Level Modelling, CEUR Workshop Proceedings, vol. 1722, pp. 66–75. CEUR-WS.org (2016)

Macias, F., Rutle, A., Stolz, V., Rodriguez-Echeverria, R., Wolter, U.: An approach to flexible multilevel modelling. Enterprise Modelling and Information Systems Architectures 13, 10:1–10:35 (2018)

Neumayr, B., Schuetz, C.G., Horner, C., Schrefl, M.: Deepruby: Extending ruby with dual deep instantiation. In: L. Burgueno, J. Corley, N. Bencomo, P.J.

Clarke, P. Collet, M. Famelis, S. Ghosh, M. Gogolla, J. Greenyer, E. Guerra, S. Kokaly, A. Pierantonio, J. Rubin, D.D. Ruscio (eds.) Proceedings of MODELS 2017 Satellite Event, CEUR Workshop Proceedings, vol. 2019, pp. 252–260. CEUR-WS.org (2017)

Atkinson, C., Gerbig, R., Metzger, N.: On the execution of deep models. In: EXE2015: Proceedings of the 1st International Workshop on Executable Modeling co-located with ACM/IEEE 18th International Conference on Model Driven Engineering Languages and Systems (MODELS 2015) Ottawa, Canada, September 27, 2015, vol. 1560, pp. 28–33. RWTH, Aachen (2015).

Erwartete Ergebnisse: A report pointing to identified tools and rationale for selection, description of configuration/testing environment, the description and justification of designed comparison framework, results of the feature-based comparison, description of the scenario and assumptions taken as well as results of the scenario-based comparison, final assessment of the maturity of the tools as well as recommendation regarding their further development. Testing environment set up at a remote virtual machine. A set of models implementing the scenario. In addition, a final presentation of the project results is expected.

Gruppengröße: 2-4

Bewerbung: Please apply via email to the supervisor. Please attach a short letter of motivation (app. ½ A4 page) and a recent performance record ('Leistungsnachweis'). You can apply individually or in a group of 2-4 participants (in this case each person should still send a separate e-mail, however point to the other members of the group).

Bewerbungsfrist: November, 14th 2020, 11:59 p.m.