*Journal of Universal Computer Science, vol. 16, no. 17 (2010), 2291-2292
submitted: 16/8/10, accepted: 27/8/10, appeared: 1/9/10 © J.UCS*

Foundations and Practices of Unified Modeling Language

J.UCS Special Issue

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Since the emergence of the Unified Modeling Language (UML) in 1996, the UML has become the de-facto standard language for modeling software systems and been widely used in various areas including enterprise information systems, web applications, and business modeling. The extension mechanisms in the UML further stretch its application to specific domains such as the security domain and the distributed domain by allowing one to define domain specific elements. The recent version of UML 2.0 has become more voluminous and detailed to support various aspects of software and a wide range of domains.

Although the UML provides various diagrams for capturing different aspects of a software system, not all of them need to be applied in most cases. There exist many extensions of the UML. However, they are often used independently and not well integrated. Therefore, heuristics, design guidelines, and lessons learned from experience are important for the effective use of UML 2.0 and to avoid unnecessary complication. Also, approaches are needed for better managing UML 2.0 and its extensions for synergistic effects of their use and to prevent them from being overly complex.

Regarding the specification and use of the UML, since its first edition in 2005, the International Workshop on Foundation and Practices of UML (FP-UML), held in conjunction with the International Conference on Conceptual Modeling (ER), has become one of the most relevant forums to synergistically connect the research community and industry practitioners in the area of theory and practice of the UML. In 2009, the workshop received 12 quality papers from Brazil, Spain, USA, Belgium, Netherlands, Cuba, Chile, and Canada, of which only 5 papers were accepted.

Consolidating theories and foundations of the UML and their applications and experiences, this special issue includes three extended papers invited from FP-UML'09 and seven papers received from an open call for papers. In the three extended papers, Rosado *et al.* propose a UML-based process for developing Grid Computing systems, Choi *et al.* use the UML for representing the semantics of math educational standards to facilitate the allignment of educational standards in the education domain, and Sun *et al.* present a model transformation engine based on the MDA framework leveraging model-level verification. In the other seven papers, Dang *et al.* propose an approach based on Triple Graph Grammars and the Object Constraint Language for describing relation of models at different abstraction levels, Laguna and Marqués use UML packages to represent the structure of the variability models in the product line domain for improved traceability of configuration decisions, Giachetti *et al.* present a process for generating UML profiles defining domain-specific modeling through an extension of association, Oliveira *et al.* propose an approach for managing variability in the product line domain using UML profiles, Kim *et al.* present formal models characterizing behaviors at different levels in Model-Driven Architecture to facilitate semantic transformation between levels, Lu *et al.* propose an approach for formalizing UML class diagrams and design patterns to support verification of pattern conformance, and Aguilar *et al.* present a modeling framework for supporting Web engineering based on MDA. These papers are all rigorously and impartially reviewed by three or four reviewers who are leading researchers in the area.

Finally, we would like to thank all the authors who revised and extended their papers from FP-UML'09 and those who made the initial submission for this special issue and the reviewers for their hard work in reviewing these extended papers two times and providing critical and constructive comments which helped authors in improving their papers. Absolutely, all of them have contributed to having this special issue of a high quality. We hope the readers will enjoy reading this issue and find the content beneficial to their research.

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August, 2010