

Subject: nomination SPLC MIP Award

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Dear members of the MIP Award Selection Committee,

we nominate the following paper for an SPLC Most Influential Paper Award:

Andreas Classen, Patrick Heymans, Pierre-Yves Schobbens, Axel Legay, and Jean-François Raskin, *Model Checking Lots of Systems: Efficient Verification of Temporal Properties in Software Product Lines*, as appeared in the proceedings of the 32nd International Conference on Software Engineering (ICSE'10), ACM, 2010, 335–344.

<https://doi.org/10.1145/1806799.1806850>

We strongly support this paper since we believe it deserves the award for many reasons. First of all, this paper was the first to consider features at first-class citizens in behavioral SPL modeling, resulting in the first rigorous account of behavioral variability and an associated rigorous family-based verification method.

This paper introduced the notion of a Featured Transition System (FTS) to the community, allowing scalable SPL modeling. Concretely, they extended labeled transition systems with features in order to concisely describe and analyze the combined behaviour of a family of behavioral models. The paper also introduced dedicated family-based model-checking techniques that have enriched model-checking algorithms by offering a means to verify whether a property is satisfied by an FTS, in which case it is also satisfied by every product of the SPL, and if a property is violated, then the algorithm not only reports a counterexample but also the products of the SPL that violate the property.

Overall, by carving out the right concept, this paper paved the way for a vast amount of research on formal analysis (testing, model checking, etc.) of behavioral variability models, and contributed to their dissemination in industrial settings. A number of SPL analysis tools nowadays accept FTSs as input format. In fact, FTSs have become the de-facto standard formalism for the formal analysis of behavior of models with variability.

While citations alone are not sufficient to merit the MIP award, it is impressive to note that the paper has already received 318 citations (according to Google Scholar) as of October 1, 2019, and its extended version published in the IEEE Transaction on Software Engineering in 2013 already received 175 citations.

We support the nomination of this paper in the strongest possible manner, as it gave rise to significant advances in formal analysis of variability in the behavior of SPLs and configurable systems in general. This year's best paper at SPLC on *Static Analysis of Featured Transition Systems* is a prominent example. Other recent examples of papers building upon FTSs, in mainstream journals and conferences on formal

approaches to software engineering, are the following:

- Maurice H. ter Beek, Ferruccio Damiani, Stefania Gnesi, Franco Mazzanti, and Luca Paolini, *From Featured Transition Systems to Modal Transition Systems with Variability Constraints*. In Proceedings of the 13th International Conference on Software Engineering and Formal Methods (SEFM'15). LNCS 9276, Springer, 344-359.
- Harsh Beohar, Mahsa Varshosaz, and Mohammad Reza Mousavi, *Basic behavioral models for software product lines: Expressiveness and testing pre-orders*. Science of Computer Programming 123, 2016, 42-60.
- Maurice H. ter Beek, Erik P. de Vink, and Tim A. C. Willemse, *Family-Based Model Checking with mCRL2*. In Proceedings of the 20th International Conference on Fundamental Approaches to Software Engineering (FASE'17). LNCS 10202, Springer, 2017, 387-405.
- Harsh Beohar, Barbara König, Sebastian Küpper, and Alexandra Silva, *Conditional transition systems with upgrades*. In Proceedings of the 11th International Symposium on Theoretical Aspects of Software Engineering (TASE'17). IEEE, 2017, 1-8.
- Maurice H. ter Beek, Ferruccio Damiani, Stefania Gnesi, Franco Mazzanti, and Luca Paolini, *On the expressiveness of modal transition systems with variability constraints*. Science of Computer Programming 169, 2019, 1-17.
- Mahsa Varshosaz, Lars Luthmann, Paul Mohr, Malte Lochau, and Mohammad Reza Mousavi, *Modal transition system encoding of featured transition systems*. Journal of Logical and Algebraic Methods in Programming 106, 2019, 1-28.
- Sami Lazreg, Maxime Cordy, Philippe Collet, and Patrick Heymans, Sébastien Mosser, *Multifaceted Automated Analyses for Variability-Intensive Embedded Systems*. In Proceedings of the 41st International Conference on Software Engineering (ICSE'19). ACM, 854-865.

Individual email confirmation on this joint nomination is provided from each of us.

Sincerely,

Maurice H. ter Beek (ISTI-CNR, Pisa, Italy)
Philippe Collet (University of Nice Sophia Antipolis, France)
Carlo Ghezzi (Polytechnic University of Milan, Italy)
Mohammad Reza Mousavi (University of Leicester, UK)
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