

Automated Forgetting and Uniform Interpolation: Three Tools (Abstract of Invited Talk)

Renate A. Schmidt

School of Computer Science, The University of Manchester, UK

Forgetting eliminates symbols from a knowledge base so that consequences over the remaining symbols in the signature are preserved. In logic the problem has been studied as the uniform interpolation problem. Uniform interpolation is a notion related to the Craig interpolation problem, but is stronger.

In computer science the importance of forgetting can be found in the knowledge representation literature, specification refinement literature and the area of description logic-based ontology engineering. In ontology-based information processing, forgetting allows users to focus on specific parts of ontologies in order to create decompositions and restricted views for in depth analysis or sharing with other users. Forgetting is also useful for information hiding, explanation generation, semantic difference computation and ontology debugging. Forgetting is an inherently difficult problem, much harder than standard reasoning (satisfiability and validity testing), and very few logics are known to be complete for forgetting (or have the uniform interpolation property). These not so encouraging premises should however not prevent us from developing practical methods for computing forgetting solutions and uniform interpolants.

My presentation gives an overview of the methods and success stories of three forgetting tools:

- SCAN, which performs second-order quantifier elimination [1, 2],
- LETHE, which solves the uniform interpolation problem for many expressive description problems extending \mathcal{ALC} [3, 4], and
- FAME, which computes semantic forgetting solutions for description logics of different expressivity [5, 6].

References

1. D. M. Gabbay and H. J. Ohlbach. Quantifier elimination in second-order predicate logic. *South African Computer Journal*, 7:35–43, 1992. Also published in B. Nebel, C. Rich, W. R. Swartout, editors, *Proceedings of the Third International Conference on Principles of Knowledge Representation and Reasoning (KR'92)*, pages 425–436. Morgan Kaufmann, 1992.
2. D. M. Gabbay, R. A. Schmidt, and A. Szalas. *Second-Order Quantifier Elimination: Foundations, Computational Aspects and Applications*, volume 12 of *Studies in Logic: Mathematical Logic and Foundations*. College Publications, 2008.

Copyright © 2017 by the paper's authors

In: P. Koopmann, S. Rudolph, R. Schmidt, C. Wernhard (eds.): *SOQE 2017 – Proceedings of the Workshop on Second-Order Quantifier Elimination and Related Topics, Dresden, Germany, December 6–8, 2017*, published at <http://ceur-ws.org>.

3. P. Koopmann and R. A. Schmidt. Uniform interpolation of \mathcal{ALC} -ontologies using fixpoints. In P. Fontaine, C. Ringeissen, and R. A. Schmidt, editors, *Proceedings of the 9th International Symposium on Frontiers of Combining Systems (FroCoS 2013)*, volume 8152 of *Lecture Notes in Artificial Intelligence*, pages 87–102. Springer, 2013.
4. P. Koopmann and R. A. Schmidt. Count and forget: Uniform interpolation of \mathcal{SHQ} -ontologies. In S. Demri, D. Kapur, and C. Weidenbach, editors, *Automated Reasoning (IJCAR 2014)*, volume 8562 of *Lecture Notes in Artificial Intelligence*, pages 434–448. Springer, 2014.
5. Y. Zhao and R. A. Schmidt. Forgetting concept and role symbols in $\mathcal{ALCOIH}\mu^+(\nabla, \sqcap)$ -ontologies. In S. Kambhampati, editor, *Proceedings of the Twenty-Fifth International Joint Conference on Artificial Intelligence (IJCAI'16)*, pages 1345–1352. AAAI Press/IJCAI, 2016.
6. Y. Zhao and R. A. Schmidt. Role forgetting for $\mathcal{ALCOQH}(\nabla)$ -ontologies using an Ackermann approach. In C. Sierra, editor, *Proceedings of the Twenty-Sixth International Joint Conference on Artificial Intelligence (IJCAI'17)*, pages 1354–1361. AAAI Press/IJCAI, 2017.