Sized Higher-Order Datatypes

Andreas Abel

Department of Computer Science,
Chalmers University of Technology

Polytypic programs in Generic Haskell [HJ03b] are obtained by analysis of the structure of the type on which they are supposed to operate. Due to the nature of the generation process, it should often be the case that these programs are terminating on all inputs. If nested or higher-order types are involved, like in merging generalized search tries [Hin00,HJ03a], proof of termination is challenging. Due to nested recursive calls, termination is hard to infer from the generated program code, i.e., the operational behavior of the program alone. However, termination can simply be ensured by type-checking the generated program using types with size annotations. This requires an adaption of the sized types approach [HPS96,Par00,BFG+04,Abe03] to higher-order datatypes.

References

[Abe03] Andreas Abel. Termination and guardedness checking with continuous types. In Martin Hofmann, editor, *Typed Lambda Calculi and Applications (TLCA 2003)*, volume 2701 of *Lecture Notes in Computer Science*, pages 1–15, Valencia, Spain, June 2003. Springer.

[BFG+04] G. Barthe, M. J. Frade, E. Giménez, L. Pinto, and T. Uustalu. Type-based termination of recursive definitions. *Mathematical Structures in Computer Science*, 14(1):1–45, 2004.

[Hin00] Ralf Hinze. Generalizing generalized tries. *Journal of Functional Programming*, 10(4):327–351, July 2000.

[HJ03a] Ralf Hinze and Johan Jeuring. Generic haskell: Applications. To appear in the lecture notes of the Summer School on Generic Programming, LNCS, Springer-Verlag, 2003.

[HJ03b] Ralf Hinze and Johan Jeuring. Generic haskell: Practice and theory. To appear in the lecture notes of the Summer School on Generic Programming, LNCS, Springer-Verlag, 2003.

[HPS96] John Hughes, Lars Pareto, and Amr Sabry. Proving the correctness of reactive systems using sized types. In *Symposium on Principles of Programming Languages*, pages 410–423, 1996.

[Par00] Lars Pareto. *Types for Crash Prevention*. PhD thesis, Chalmers University of Technology, 2000.