Bindings, Mobility of Bindings, and the ∇-Quantifier: An Abstract

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We present a meta-logic that contains a new quantifier ∇ (for encoding "generic judgments") and inference rules for reasoning within fixed points of a given specification. We then specify the operational semantics and bisimulation relations for the finite π-calculus within this meta-logic. Since we restrict to the finite case, the ability of the meta-logic to reason within fixed points becomes a powerful and complete tool since simple proof search can compute the unique fixed point. The ∇ quantifier helps with the delicate issues surrounding the scope of variables within π-calculus expressions and their executions (proofs). We shall illustrate several merits of the logical specifications we write: they are natural and declarative; they contain no-side conditions concerning names of bindings while maintaining a completely formal treatment of such bindings; differences between late and open bisimulation relations are easy to see declaratively; and proof search involving the application of inference rules, unification, and backtracking can provide complete proof systems for both one-step transitions and for bisimulation. This work is joint with Alwen Tiu and is described in more detail in the following papers.

References

1. Miller, D., Tiu, A.: A proof theory for generic judgments: An extended abstract. In: Proceedings of LICS 2003, IEEE (2003) 118–127
2. Miller, D., Tiu, A.: A proof theory for generic judgments. ACM Transactions on Computational Logic (To appear.)
3. Tiu, A., Miller, D.: A proof search specification of the π-calculus. Submitted. (2004)

J. Marcinkowski and A. Tarlecki (Eds.): CSL 2004, LNCS 3210, p. 24, 2004.