

A Canonical Locally Named Representation of Binding

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Received: 2 May 2011 / Accepted: 4 May 2011 / Published online: 24 May 2011
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Abstract This paper is about completely formal representation of languages with binding. We have previously written about a representation following an approach going back to Frege, based on first-order syntax using distinct syntactic classes for locally bound variables vs. global or free variables (Sato and Pollack, J Symb Comput 45:598–616, 2010). The present paper differs from our previous work by being more abstract. Whereas we previously gave a particular concrete function for canonically choosing the names of binders, here we characterize abstractly the properties required of such a choice function to guarantee canonical representation, and focus on the metatheory of the representation, proving that it is in substitution preserving isomorphism with the nominal Isabelle representation of pure lambda terms. This metatheory is formalized in Isabelle/HOL. The final section outlines a formalization in Matita of a challenging language with multiple binding and simultaneous substitution. The Isabelle and Matita proof files are available online.

Keywords Binding · Lambda calculus · Formal proof

Pollack is partially supported by the project CerCo which acknowledges the financial support of the Future and Emerging Technologies (FET) programme within the Seventh Framework Programme for Research of the European Commission, under FET-Open grant number: 243881.

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