

A Machine-Checked Correctness Proof of Normalization by Evaluation for Simply Typed Lambda Calculus

Author: András Kovács Advisor: Ambrus Kaposi

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Abstract

We present an executable implementation and correctness proof of normalization by evaluation for the simply typed lambda calculus, using the proof assistant Agda. First, we use a presheaf model over the category of order-preserving context embeddings to define the normalization function. Then we prove completeness by a Kripke logical relation between the term and presheaf models, and soundness by another Kripke logical relation on the presheaf model. Stability is proven by induction on normal forms. We follow Altenkirch, Hoffman and Streicher [1] in the usage of presheaf models, but unlike *loc. cit.* we keep the definition of normalization and its correctness proofs separate, and rely on direct type-theoretic rather than categorical constructions. Our formalization is lightweight in comparison to prior correctness proofs of normalization based on big-step evaluation [TODO] and hereditary substitution [TODO].

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1	References	1
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1 References

1. Altenkirch T, Hofmann M, Streicher T (1995) Categorical reconstruction of a reduction free normalization proof. In: Pitt D, Rydeheard DE, Johnstone P (eds) *Category theory and computer science*. pp 182–199