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Peer Review

Review of: "A “Propositions as Types” Interpretation of Classical Logic"

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Summary

This paper proposes an alternative "propositions as types" interpretation for classical logic: spanning first-order propositional logic, first-order predicate logic, and second- and higher-order predicate logic. Such an interpretation avoids the control-operator approach pioneered by Griffin. Instead of relying on call/cc, exceptions, and backtracking, the author leverages a polymorphic identity function and a small set of type-level operations (identity, instantiation, destruction) to witness classical logical truths within a functional programming paradigm. The paper uses a classical meta-logic in which every type is either inhabited or uninhabited, and defines all logical connectives in terms of implication and universal quantification.

Contributions

The central contribution is an alternative route from classical logic to the Curry-Howard correspondence that does not require the machinery of continuations or exception handling. This is a legitimate goal: Griffin's approach, while foundational, does impose significant complexity on the programming language runtime and is known to create difficulties with type safety. The paper offers three type-level combinators: polymorphic identity, instantiation, and destruction. The author shows that they suffice to interpret classical principles such as double negation elimination, excluded middle, and the standard introduction/elimination rules for connectives and quantifiers.

A second contribution is the explicit construction of lambda-term witnesses for a broad catalogue of logical truths in Appendix A, covering propositional logic (implication introduction, Curry's principle, falsum, contraposition, double negation elimination, disjunction, conjunction, excluded middle) and predicate logic at first, second, and higher orders (universal and existential introduction and elimination). The sheer breadth of cases treated is appreciated.

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The paper also makes the philosophical point that classical logic's "hypothetical reasoning" can be built into the meta-logic rather than requiring runtime control flow, which is a perspective worth articulating.

Declarations

Potential competing interests: No potential competing interests to declare.