Ben Greenman December 8, 2015

An Equivalence-Preserving CPS Translation via Multi-Language Semantics

Defines a CPS translation from a simply-typed language to a language with polymorphism that preserves simply-typed contextual equivalence [1]. If two source terms are contextually equal, then no target context will be able to distinguish translated versions of the terms.

Strengths

- Introduces / showcases many interesting techniques: using target-language types to encode source-language guarantees, using polymorphism for information hiding, back translation via partial evaluation.
- Relates two languages of varying power.

Weaknesses

- Is this going to scale beyond λ-calculi? The conclusion notes potential trouble with non-termination and recursive types; effects are another issue. Also, the fact that partial evaluation in the target yields a basically-source term seems more of a quirk than a useful observation.
- The introduction gave a motivating background story about the pitfalls of language-based security, but then the paper only talked about purely functional languages. I wasn't convinced that security is a major issue for pure languages.
- I don't understand the criticisms towards game semantics and domain theory in the introduction and conclusion. The first priority ought to be finding *any* technique that scales all the way to a real language—say GHC or SML/NJ. In celebration we can worry about finding beautiful proofs and intuitive explanations, but until then there's no sense in discouraging other ideas.

The original definition of *ciu* equivalence required contexts to use their hole term at least once [2, 3].

References

[1] Amal Ahmed and Matthias Blume. An equivalence-preserving cps translation via multi-language semantics. In *ICFP*, 2011.

[2] Ian Mason and Carolyn Talcott. Equivalence in functional languages with effects. In *Journal of Functional Programming*, 1990.

[3] Andrew Pitts. Howe's method for higher-order languages. 2011.