A reflexive object in a category built on sets and relations is proposed as a denotational model for the concurrent lambda-calculus.

Concurrent lambda-calculus is obtained by extending the lambda-calculus with parallel composition (of terms) and non-deterministic choice (between terms). A suitable notion of head-reduction is given to define the operational semantics, by associating with each term a ‘generalized’ head normal form which is a set of multisets of terms whose head subterms are variables. Roughly speaking, the operational value of a term is the collection of all possible outcomes of its head reductions. When the head subterm is $M + N$ (may non-deterministic choice) then the head reduction goes on by choosing either $M$ or $N$. When the head subterm is $M \parallel N$ (must parallelism) then the head reduction forks. Clearly, the calculus is nonconfluent and nondeterministic.

Let $\mathbf{MRel}$ be the category of sets and relations built using the finite-multiset comonad. Albeit $\mathbf{MRel}$ has not enough points, it is known that its reflexive objects are lambda-models. A particular extensional reflexive object $D$ of $\mathbf{MRel}$ is considered and endowed with two additional operators which turn it into a semiring. This domain is used as the target of the denotational interpretation. The model is proved to be sensible in a suitable way and the adequacy is proved with respect to the contextual preorder induced by the operational semantics. Last, it is shown that the model is not fully abstract.

Luca Paolini

References

12. T. Ehrhard, The Scott model of linear logic is the extensional collapse of its relational model, PPS Internal Report, draft available at http://hal.archives-ouvertes.fr/hal-00369831/submitted. MR2891556

Note: This list reflects references listed in the original paper as accurately as possible with no attempt to correct errors.