

Stateful runners for effectful computations

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This talk is about Moggi’s [1] monad-based approach to effectful computation, as improved by Plotkin and Power [2], who started to look at the Lawvere theories giving rise to the relevant monads.

We consider the question of what structure is required of a set so that computations in a given notion of computation can be run statefully with this set as the state set. For running nondeterministic computations statefully, a resolver structure is needed; for interactive input/output computations, a “responder-listener” structure is necessary; to be able to serve stateful computations, the set must carry the structure of a lens.

We show that, in general, to be a stateful runner of computations for a monad corresponding to a Lawvere theory (defined as a set equipped with a monad morphism between the given monad and the state monad for this set) is the same as to be a comodel of the theory, i.e., a coalgebra of the corresponding comonad.

We work out a number of instances of this observation and also compare runners to Plotkin and Pretnar’s [3] effect handlers.

References

- [1] E. Moggi. Notions of computation and monads. *Inf. and Comput.*, v. 93, n. 1, pp. 55–92, 1991.
- [2] G. Plotkin, J. Power. Notions of computation determine monads. In M. Nielsen, U. Engberg, eds., *Proc. of 5th Int. Conf. on Foundations of Software Science and Computation Structures, FoSSaCS 2002 (Grenoble, Apr. 2002)*, *Lect. Notes in Comput. Sci.*, v. 2303, pp. 342–356. Springer, 2002.
- [3] G. Plotkin, M. Pretnar. Handling algebraic effects. *Log. Methods in Comput. Sci.*, v. 9, n. 4, article 23, 2013.