Interaction Nets and Concurrency

Damiano Mazza
Institut de Mathématiques de Luminy
Dipartimento di Filosofia Università “Roma Tre”
mazza@iml.univ-mrs.fr
http://iml.univ-mrs.fr/~mazza

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Abstract

Interaction Nets (IN) are a model of distributed computation introduced by Lafont [Laf90], which can be seen as a generalization of Girard’s multiplicative proof-nets [Gir87]. They admit an extremely simple system of universal combinators [Laf97], which has a very natural algebraic semantics in the style of the so-called Geometry of Interaction (GoI, [Gir88]).

Even though IN are Turing-complete, their strong determinism prevents them from expressing concurrent behavior. In his Ph.D. thesis [Ale99], Vladimir Alexandriev has defined several non-deterministic extensions of IN. We consider here what he called Interaction Nets with Multiple Principal Ports (INMPP), and we show that they are a very expressive model of concurrent computation by encoding within them the $\pi$-calculus (without sums or match). We also show that INMPP too admit a surprisingly simple system of universal combinators, which is an extension of Lafont’s system. These combinators may be the key to the definition of a “cuncurrent GoI”, possibly throwing a bridge between the worlds of logic and concurrency.

References


