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Connector algebras for C/E and P/T nets’ interactions. (English)  

Summary: A quite flourishing research thread in the recent literature on component-based systems is concerned with the algebraic properties of different classes of connectors. In a recent paper, an algebra of stateless connectors was presented that consists of five kinds of basic connectors, namely symmetry, synchronization, mutual exclusion, hiding and inaction, plus their duals, and it was shown how they can be freely composed in series and in parallel to model sophisticated “glues”. In this paper we explore the expressiveness of stateful connectors obtained by adding one-place buffers or unbounded buffers to the stateless connectors. The main results are: i) we show how different classes of connectors exactly correspond to suitable classes of Petri nets equipped with compositional interfaces, called nets with boundaries; ii) we show that the difference between strong and weak semantics in stateful connectors is reflected in the semantics of nets with boundaries by moving from the classic step semantics (strong case) to a novel banking semantics (weak case), where a step can be executed by taking some “debit” tokens to be given back during the same step; iii) we show that the corresponding bisimilarities are congruences (w.r.t. composition of connectors in series and in parallel); iv) we show that suitable monoidality laws, like those arising when representing stateful connectors in the tile model, can nicely capture concurrency (in the sense of step semantics) aspects; and v) as a side result, we provide a basic algebra, with a finite set of symbols, out of which we can compose all P/T nets with boundaries, fulfilling a long-standing quest.

MSC: 68Q85 Models and methods for concurrent and distributed computing (process algebras, bisimulation, transition nets, etc.) Cited in 11 Documents

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