DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
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COMPUTER SCIENCE COLLOQUIUM

Linear Logic on Petri Nets

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The Seminar Room

Abstract: The talk will be based on the results reported in [RS-94-3] below. However, the emphasis will be on explaining our semantic interpretation of intuitionistic linear logic in Petri nets and how interesting properties of Petri nets can be specified. The interpretation is explained in more detail in DAIMI-PB-301. For shorter conference papers on the semantics and the completeness results, please consult our FTP archive.

[RS-94-3] Uffe H. Engberg and Glynn Winskel. "Linear Logic on Petri Nets". February 1994. Appears in: Proceedings of REX'93 (eds. J. W. de Bakker et al.), LNCS 803, 1994.

Abstract: This article shows how individual Petri nets form models of Girard's intuitionistic linear logic. It explores questions of expressiveness and completeness of linear logic with respect to this interpretation. An aim is to use Petri nets to give an understanding of linear logic and give some appraisal of the value of linear logic as a specification logic for Petri nets. This article might serve as a tutorial, providing one in-road into Girard's linear logic via Petri nets. With this in mind we have added several exercises and their solutions. We have made no attempt to be exhaustive in our treatment, dedicating our treatment to one semantics of intuitionistic linear logic.

Completeness is shown for several versions of Girard's linear logic with respect to Petri nets as the class of models. The strongest logic considered is intuitionistic linear logic, with $\otimes$, $\multimap$, $\&$, $\oplus$ and the exponential ! ("of course"), and forms of quantification. This logic is shown sound and complete with respect to atomic nets (these include nets in which every transition leads to a nonempty multiset of places). The logic is remarkably expressive, enabling descriptions of the kinds of properties one might wish to show of nets; in particular, negative properties, asserting the impossibility of an assertion, can also be expressed. A start is made on decidability issues.

Kim Skak Larsen