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AN ALGEBRAIC BOX CALCULUS

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ABSTRACT

A-nets, a high level class of labeled Petri nets introduced in order to cope with structured data and typing, are provided with an algebraic structure allowing to compositionally construct complex systems from simple building blocks. Standard Petri Box Calculus control flow operations are complemented here by a generalized synchronization mechanism based on parameter identification, of which various forms are examined. Its usefulness is illustrated in the semantics of a parallel program.

Keywords: Petri nets, algebraic specifications, synchronization, compositional models.

Introduction

The Petri Box Calculus (PBC) is a formalism developed in [3, 2] in order to apply Petri net theory to the specification and the verification of concurrent algorithms, and also to address the compositional semantics of languages introduced to express them.

The PBC syntax yields *box expressions*, which can be seen as an extension of process terms of CCS [29]; their compositional semantics is given by (classes of) labeled place/transition nets, called *Boxes*. Boxes are nets with two kinds of interfaces: an entry/exit interface (places) and a communication interface (transitions). Boxes can be composed with each other across these interfaces and are provided with a full algebraic structure which mimics the one present in expressions.

The natural domain of application of the Petri Box Calculus is the semantics of parallel languages, and in particular of $B(PN)^2$ (Basic Petri Net Programming Notation) introduced in [8] for the specification of concurrent algorithms. A formal low level semantics in terms of Petri Boxes has been proposed in [8] by associating a box expression to every meaningful sub-construct of a concurrent $B(PN)^2$ program, and in turn providing a compositional Petri net semantics [3]. However, the size of the