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POMSETS FOR LOCAL TRACE LANGUAGES [1, 2]

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ABSTRACT

Mazurkiewicz traces can be seen as equivalence classes of words or as pomsets. Their generalization by local traces was formalized by HOOGERS, KLEIJN and THIAGARAJAN as equivalence classes of step firing sequences. First we introduce a pomset representation for local traces. Extending Büchi's Theorem and a previous generalization to Mazurkiewicz traces, we show then that a local trace language is recognized by a finite step transition system if and only if its class of pomsets is bounded and definable in Monadic Second Order logic.

Keywords: Model of concurrency, monadic second order logic, recognizable sets of pomsets

Introduction

Labeled partially ordered sets (pomsets) are widely used to model the behavior of a concurrent system [36, 18]; in this approach, the order describes the causal dependence of the events while the labeling denotes which action is performed by an event. In particular, the incomparability of two events denotes that they can be executed simultaneously. Typical examples of this line of research are series-parallel pomsets [18, 28], pomsets (also known as semi-words or partial words [41, 7]) and dependence graphs of Mazurkiewicz traces [29, 9]. A dependence graph is a pomset where the order relation is dictated by a static independence relation.

To any static independence relation over the alphabet of actions, one can naturally associate an equivalence relation on words that identifies words if they differ only in

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