

Discrete Parameters in Petri Nets*

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Abstract

With the aim of significantly increasing the modeling capability of Petri nets, we suggest models that involve parameters to represent the weights of arcs, or the number of tokens in places. We call these Petri nets *parameterised nets* or *PPNs*. Indeed, the introduction of parameters in models aims to improve genericity. It therefore allows the designer to leave unspecified aspects, such as those related to the modeling of the environment. This increase in modeling power usually results in greater complexity in the analysis and verification of the model. Here, we consider the property of coverability of markings. Two general questions arise: "Is there a parameter value for which the property is satisfied?" and "Does the property hold for all possible values of the parameters?". We first study the decidability of these issues, which we show to be undecidable in the general case. Therefore, we also define subclasses of parameterised networks, based on restriction of the use of parameters, depending on whether the parameters are used on places, input or output arcs of transitions or combinations of them. Those subclasses have therefore a dual interest. From a modeling point of view, restrict the use of parameters to tokens, outputs or inputs can be seen as respectively processes or synchronisation of a given number of processes. From a theoretical point of view, it is interesting to introduce those subclasses of PPN in a concern of completeness of the study. We study the relations between those subclasses and prove that, for some subclasses, certain problems become decidable, making these subclasses more usable in practice.

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