Towards an efficient contextual unfolder

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Petri nets are a useful formalism for modelling concurrent systems; they explicitly express notions such as concurrency, causality, independence etc. *Places* in Petri nets model resources, while *actions* consume and produce them. Unfoldings are generally accepted as a useful tool for the analysis of Petri nets; their construction and their properties are a well-studied topic, and efficient tools such as Mole [4] exist.

Recently, unfoldings for contextual nets have been proposed [2]. Contextual nets add so-called read arcs to Petri nets. This allows an appropriate modelling of actions that require the existence of some resource without actually consuming it. E.g., a microwave oven might have to be switched off before its door can be opened; however, the opening of the door will not change the setting of the on/off switch. Read arcs also arise naturally in the encoding of circuits.

Contextual net unfoldings allow to make better use of concurrency relations, however the underlying theory becomes notably more complicated. Said theory was presented in last year's ACTS II workshop.

The proposed talk would focus on the advances that have been made since then, which focused on the creation of an efficient implementation. Apart from the actual implementation, this required work on the theoretical background and suitable data structures.

The most critical computational problem in constructing unfoldings is to identify the events that it must contain. To render this procedure efficient, we identify a new concurrency relation [1], as well as how to exploit the causal relationships between different histories of the same event. These ideas have been implemented in a new unfolder [3], and we present experimental results.

References

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[4] S. Schwoon. Mole – an unfolder for Petri nets. Available at `http://www.lsv.ens-cachan.fr/~schwoon/tools/mole/`.