Neele, Thomas; Valmari, Antti; Willemse, Tim A. C.
A detailed account of the inconsistent labelling problem of stutter-preserving partial-order reduction. (English) [Zbl 07407780]

Summary: One of the most popular state-space reduction techniques for model checking is partial-order reduction (POR). Of the many different POR implementations, stubborn sets are a very versatile variant and have thus seen many different applications over the past 32 years. One of the early stubborn sets works shows how the basic conditions for reduction can be augmented to preserve stutter-trace equivalence, making stubborn sets suitable for model checking of linear-time properties. In this paper, we identify a flaw in the reasoning and show with a counter-example that stutter-trace equivalence is not necessarily preserved. We propose a stronger reduction condition and provide extensive new correctness proofs to ensure the issue is resolved. Furthermore, we analyse in which formalisms the problem may occur. The impact on practical implementations is limited, since they all compute a correct approximation of the theory.

MSC:
03B70 Logic in computer science
68-XX Computer science

Keywords:
partial-order reduction; stutter equivalence; LTL; stubborn sets

Full Text: [Link arXiv]

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