

Analysis of Rewriting-Based Systems as First-Order Theories*

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Abstract

Computational systems based on a first-order language that can be given a *canonical model* which captures provability in the corresponding calculus can often be seen as first-order theories \mathcal{S} , and computational properties of such systems can be formulated as first-order sentences φ that hold in such a canonical model of \mathcal{S} . In this setting, standard results regarding the *preservation* of satisfiability of different classes of first-order sentences yield a number of interesting applications in program analysis. In particular, properties expressed as existentially quantified boolean combinations of atoms (for instance, a set of *unification problems*) can then be *disproved* by just finding an *arbitrary* model of the considered theory plus the *negation* of such a sentence. We show that rewriting-based systems fit into this approach. Many computational properties (e.g., infeasibility and non-joinability of critical pairs in (conditional) rewriting, non-loopingness, or the secure access to protected pages of a web site) can be investigated in this way. Interestingly, this semantic approach succeeds when specific techniques developed to deal with the aforementioned problems fail.

Keywords: Logical models, Program analysis, Rewriting-based systems.

References

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