

A Goal-Directed Decision Procedure for Hybrid PDL

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Abstract We present the first goal-directed decision procedure for hybrid PDL. The procedure is based on a modular approach that scales from basic modal logic with eventualities to hybrid PDL. The approach is designed so that nominals and eventualities are treated orthogonally. To deal with the complex programs of PDL, the approach employs a novel disjunctive program decomposition. In arguing the correctness of our approach, we employ the novel notion of support generalizing the standard notion of Hintikka sets.

Keywords Modal logic · Propositional dynamic logic · Hybrid logic · Decision procedures

1 Introduction

Propositional dynamic logic (PDL) [19, 23] is an expressive but decidable modal logic initially introduced for reasoning about program correctness. It extends basic modal logic with expressions called programs. Programs describe binary relations on states, and are used to define modalities. Complex programs are constructed from atomic programs with union, composition, and iteration (i.e., complex programs include regular expressions over atomic programs). Additionally, there are special programs called tests that allow to restrict the domain or range of a relation to states satisfying a certain formula. A particularly important class of formulas in PDL are diamond formulas of the form $\langle \alpha^* \rangle \varphi$, which hold for a given state if they can reach a state

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