On Model-Based Reasoning: Recent Trends and Current Developments

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Abstract. Proofs and models are the mainstay of automated reasoning. Traditionally, proofs have taken center stage, because in first-order logic theorem proving is semi-decidable, and model building is not. The growth of algorithmic reasoning and of its applications to software has changed the balance, because if satisfiability is decidable, symmetry is restored, and models are useful for applications and intuitive for users. While first-order provers search for a proof and may use an interpretation to guide the search, algorithmic reasoners search for a model, use deduction to drive the search, and the candidate model to guide the deduction. Thus, the symmetry is also in the reasoner's operations. However, decidability comes at the expense of expressivity. After some historical perspective on the evolution from proof to model oriented reasoning, we present a method, named DPLL(Gamma+T), which integrates algorithmic reasoner and first-order prover, in such a way that each does what it is best at, and the prover also makes use of the candidate model.