Modelling in Propositional Logic: A Case Study

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Abstract. Car sequencing has been a traditional benchmark in the Operation Research and Constraint Programming community. In this paper we will demonstrate that state of the art propositional satisfiability solvers can compete with these established paradigms. We will show how to express the traditional car sequencing problem in different ways in propositional logic and give an empirical evaluation of these translations. The results underline the practical challenge how NP-complete problems are reduced to SAT.

1 Introduction

Contributions of the paper:
1) to the (best of our konwledge) first SAT model for car sequencing and 2) demonstration of its usefulness on experiments with the CSP lib 3) a comprehensive future work secion with future work and promising research directives.

2 SAT Solving

Formally state the SAT problems. Give reference to NP compleness problems and reductions. Give reference to Handbook. Short overview of techniques of current state of the art SAT solvers.

2.1 Modelling in SAT

Discribe the challenges in boolean modelling. Declarativity of the problem. Propagators of CP are rather procedural descriptions of the reasoning task. Low level view and give advantages when tweaking the model, which can make the difference for hard instances.

Give list of techniques on what to focus on with encodings. Modelling in SAT is not just translating to CNF and a solver will find the solution. 1) Design of variables 2) identifying higher constraints 3) espressing these constraints by introducing auxiliary variables and 4) introduce redundant constraints and break symmetries.

2.2 Car Sequencing

Describe the problem in short words and give references and their approaches to solve the probelems. Then reference the benchmark set in [Gent and Walsh, 1999].

2.3 Literature Review

Numerous publications on approaches to CS.

Tradintional Models for CP. Give short formula.

Give CP and MIP formulations. reference latest good results on the benchmark by a more global view on the problems.

2.4 Counter Encoding

First we will show how to do a counter encoding.

3 Car Sequencing in CNF

4 Evaluation

5 Conclusion and Future Work

References

[Gent and Walsh, 1999] Gent, I. P. and Walsh, T. (1999). CSP_{LIB}: A Benchmark Library for Constraints. In *CP*, pages 480–481.