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Solving SAT in a distributed cloud: a portfolio approach. (English) Zbl 1430.68293

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Summary: We introduce a new parallel and distributed algorithm for the solution of the satisfiability problem. It is based on an algorithm portfolio and is intended to be used for servicing requests in a distributed cloud. The core of our contribution is the modeling of the optimal resource sharing schedule in parallel executions and the proposition of heuristics for its approximation. For this purpose, we reformulate a computational problem introduced in a prior work. The main assumption is that it is possible to learn optimal resource sharing from traces collected on past executions on a representative set of instances. We show that the learning can be formalized as a set coverage problem. Then we propose to solve it by approximation and dynamic programming algorithms based on classical greedy algorithms for the maximum coverage problem. Finally, we conduct an experimental evaluation for comparing the performance of the various algorithms proposed. The results show that some algorithms become more competitive if we intend to determine the trade-off between their quality and the runtime required for their computation.

MSC:

- 68T20 Problem solving in the context of artificial intelligence (heuristics, search strategies, etc.)
- 68W15 Distributed algorithms
- 68W25 Approximation algorithms

Keywords:

resource provisioning; scheduling; parallel distributed SAT; algorithm portfolio; maximum coverage problem

Software:

GridSAT; Lingeling; Plingeling; ppfolio; PrecoSAT; PSATO; SATO; SATzilla

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