

QuBE7-c Solver Description

Enrico Giunchiglia, Paolo Marin and Massimo Narizzano

DIST, University of Genova
Viale Causa 13, 16145 Genova
emails: name.lastname@unige.it

Abstract. In this paper we describe the features included in the Quantified Boolean Formulas (QBF) Solver *QuBE7* as it was submitted to the QBF Evaluation 2009.

QUantified Boolean formula Evaluator 7

In the QBF Evaluation 2008, *QuBE6.1* [1] resulted the most powerful mono-engine QBF Solver: it ran hors concours, and was able to solve more than twice the amount of instances solved by the second solver in the rank [2].

QuBE7 is its natural evolution. It is the composition of two different reasoning tools: the effective QBF preprocessor *sQueuezeBF* [3] and the efficient search-based core solver *qube7.0*.

sQueuezeBF is an effective preprocessor for QBFs in Conjunctive Normal Form (CNF) that combines various techniques for eliminating variables and/or clauses. In particular *sQueuezeBF* combines (i) variable elimination by *Q-resolution* and equality reduction, and (ii) clause simplification via subsumption and self-subsuming resolution. It was introduced in [3], where the authors showed that *sQueuezeBF* can produce significant reductions in the number of clauses and/or variables — up to the point that some instances are solved directly by *sQueuezeBF* — and can improve the efficiency of a generic state-of-the-art QBF solver.

qube7.0 is a completely new search-based QBF Solver that uses lazy data structures both for unit clauses propagation and pure/don't care literals detection [4]. Its data structure is designed to maximize data locality, for instance binary constraints (from now on we will speak indifferently about clauses and terms with the word constraints) are stored into separate specialized structure. It also features non-chronological backtracking and learning both for conflict and solution analysis.

This version (*QuBE7-c*) features a conflict clause/solution term shortening mechanism, generalizing to QBF the one described in [5]. Moreover, its branching strategy leverages the information gathered during the backtracking phase in a VSIDS' fashion.

References

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