Submissions to QBFEVAL'16

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Variants of DepQBF (1/2)

QCDCL with Generalized QRES Axioms: [LES16]

- Clause (cube) learning based on Q-resolution calculus (QRES).
- Traditional QCDCL: current assignment A either falsifies a clause or satisfies all clauses of PCNF ψ.
- Learning: QRES guided by assignment A.
- Idea: incomplete satisfiability testing of $\psi[A]$ to learn stronger clauses.
- Implementation in DepQBF, submitted three variants to QBFEVAL CNF track (heuristics, amount of preprocessing,...).
- Paper at SAT 2016.

$\Rightarrow$ *talk on Tuesday, session 11:00-12:30.*

Variants of DepQBF (2/2)

Incremental Solving Track: [MMLB12, LE14, MMB15]

- Solve a sequence of PCNFs $\langle \psi_1, \ldots, \psi_n \rangle$.
- PCNF ψ_i is syntactically related to ψ_{i+1}.
- Reuse subset of clauses and cubes learned from ψ_i when solving ψ_{i+1}.
- Submitted DepQBF 5.0 (latest public version).

Certification Track:

- Tool suite QBFCert: extracting Herbrand (Skolem) functions from clause (cube) resolution proofs [NPL+12].
- For SAT/UNSAT: DepQBF 5.0 (without dynamic QBCE [LBB+15]).
- For UNSAT only: DepQBF 5.0 with dynamic QBCE (redundant clauses ignored for proof generation).

Parallel Solving of Primal/Dual Encodings

Solver "pd-par-depqbf":

- Idea: solve primal and dual encoding of non-CNF instance [VG13].
- Input: prenex non-CNF formula ψ.
- Encode ψ as prenex CNF ψ^+ via Tseitin translation, apply Bloqqer.
- Encode $\neg\psi$ as prenex CNF ψ^- via Tseitin translation, apply Bloqqer.
- Run two identical instances of DepQBF on ψ^+ and ψ^- in parallel.
- No communication between solver instances.
- Simple shell script controls solver instances, returns appropriate exit code after termination.

MPIDepQBF

Parallel QBF Solving Without Knowledge Sharing:

- MPI-based master-worker framework.
- Master splits search space into subproblems by assignments.
- Workers solve subproblems by solving input QBF under assumptions.
- Master combines results of subproblems.
- Workload balancing to avoid long idle times of workers.
- Integration of DepQBF in worker processes.
- Tool paper at SAT 2014 [JKLS14].

HordeQBF

Modular and Massively Parallel QBF Solving:

- Based on HordeSAT [BSS15].
- MPI-based parallel portfolio of arbitrary (Q)CDCL solvers.
- Parallel execution of identical (Q)CDCL solvers.
- Integration of DepQBF.
- No search-space partitioning.
- Solver instances are diversified by their parameters (heuristics,. . .).
- Frequent clause/cube sharing.
- Tool paper at SAT 2016: promising experiments, up to 1024 cores.

$\Rightarrow$ *talk by Tomáš Balyo on Friday, session 11:00–12:40.*

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