Integrating Tree Decompositions into Decision Heuristics of Propositional Model Counters – Technical Appendix

Technical Appendix of CP-21 Submission 73

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1 Overview

This technical appendix includes source code, instances used, and detailed data about experiments. We also document the performance of SharpSAT-TW on the private instance set of Model Counting Competition 2020 Track 1.

2 Source Code

Our modification of SharpSAT is available in `code/sharpsat`, our modification of GANAK is available in `code/ganak`, and our implementation for computing dtrees and vtrees for c2d and minic2d based on a tree decomposition is available in `code/vtree`.

2.1 FlowCutter

We downloaded FlowCutter from `https://github.com/kit-algo/flow-cutter-pace17`. Our solvers assume that there is a FlowCutter binary `flow_cutter_pace17` in `code/flow-cutter-pace17`.

2.2 SharpSAT

We downloaded SharpSAT from `https://github.com/marcthurley/sharpSAT`. Our modification of SharpSAT is available in `code/sharpsat`. The file

code/sharpsat/diff.txt summarizes the differences of our modification and original SharpSAT. The file code/sharpsat/mod-README.txt contains instructions to compile our modification of SharpSAT and run it.

2.3 GANAK

We downloaded GANAK from https://github.com/meelgroup/ganak. Our modification of GANAK is available in code/ganak. The file code/ganak/diff.txt summarizes the differences of our modification and original GANAK. The file code/ganak/mod-README.txt contains instructions to compile our modification of GANAK and run it. We note that for the original GANAK this is not sufficient as it also requires the MIS software, which we downloaded from https://github.com/meelgroup/mis.

2.4 c2d and minic2d

We downloaded c2d from http://reasoning.cs.ucla.edu/c2d/ and minic2d from http://reasoning.cs.ucla.edu/minic2d/. Our implementation for using tree decompositions computed with FlowCutter on c2d and minic2d is in code/vtree. The file code/vtree/README.txt contains instructions to compile and use it.

3 Instances

Our main instance set is a merge of instance sets of

- http://www.cril.univ-artois.fr/KC/benchmarks.html
- https://github.com/dfremont/counting-benchmarks

After removing duplicates this set contains 2495 instances (list in data/all_ins.txt) available at

https://drive.google.com/file/d/19tkX1sZu4dNgFfrQkPMuhNfh127OtlqY/view?usp=sharing

and after removing instances found unsatisfiable by a SAT solver this set contains 2424 instances (list in data/sat_ins.txt).

For the comparison with NestHDB and gpusat we downloaded the 1494 instances and the running times of NestHDB and gpusat from https://tinyurl.com/nesthdb.

4 Experiment Data

Per-instance data of all experiments is available in `data/results`. The file `data/results/main.csv` contains data about the main experiments, including the treewidth (as reported by SharpSAT-TW), and the file `data/results/nesthdb_gpusat.csv` data about the comparison to NestHDB and gpusat.

The directory `data/scripts` contains scripts to generate all tables, plots, and facts mentioned in text from the per-instance data.

5 Model Counting Competition 2020

We ran SharpSAT-TW on the competition instance set of 100 private instances of Model Counting Competition 2020 Track 1[1][2], on a setting emulating the competition (i.e. time limit of 1800 seconds and memory limit of 8GB), although with different hardware. We used a timeout of 60 seconds for computing the tree decomposition, otherwise the settings of SharpSAT-TW were the same as in our main experiment. SharpSAT-TW solved 75 instances, using on average 140 seconds in solved instances (per-instance data in `data/results/competition.csv`). The winning solver of Model Counting Competition 2020 Track 1 (nus-bareganak) was reported to solve 75 instances, using on average 604 seconds in solved instances.

[1] `https://mccompetition.org/2020/mc_description`
[2] `https://arxiv.org/pdf/2012.01323.pdf`