

I write three programs that can transform an instance of QCP to a CNF formula. The first program in acd folder uses properties (a) (c) and (d), which is the minimal subset of the properties (a) through (f). The second program in abcd folder uses properties (a) (b) (c) and (d), which consists the first set, plus some additional properties among (a) through (f). The third program in bef folder uses properties (b) (e) and (f), which is other correct subset of clauses corresponding to (a) through (f).

I use SLIME (<https://github.com/maxtuno/slimesat-solver>) as the SAT solver, and record the solver running time for each qcp files. Here are the results:

properties (a) (c) (d)					
order	#1	#2	#3	#4	mean
10	UNSAT	UNSAT	UNSAT	UNSAT	
16	0.318	0.327	0.337	0.347	0.332
20	UNSAT	UNSAT	0.683	0.83	0.757
24	1.325	UNSAT	1.443	1.319	1.362
30	6.454	7.02	8.718	7.764	7.489
32	15.767	14.807	14.201	10.719	13.874

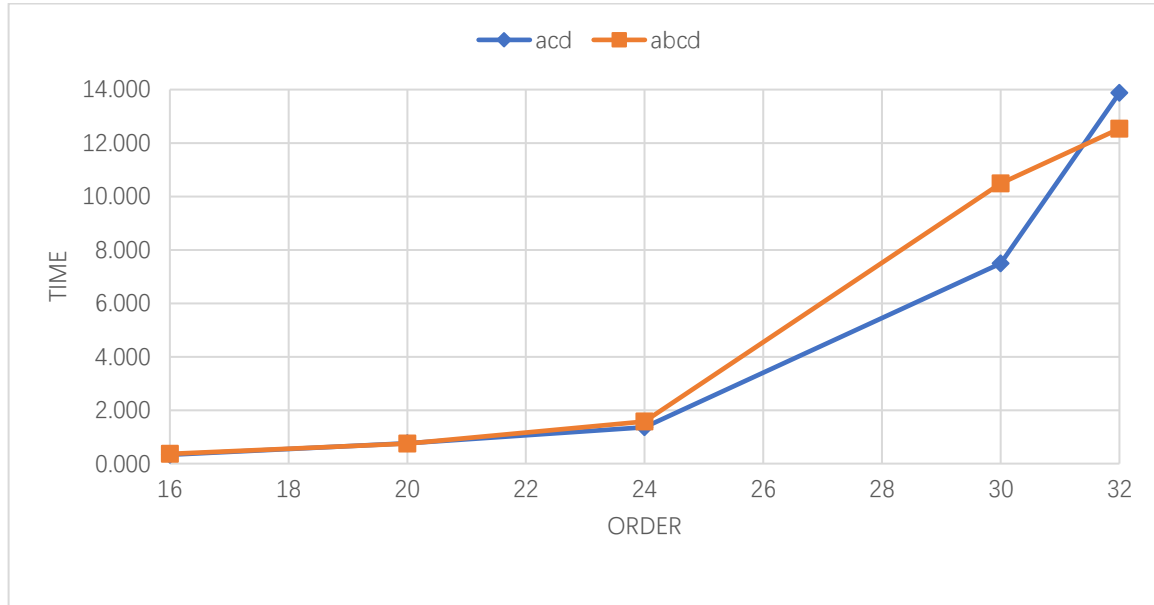
properties (a) (b) (c) (d)					
order	#1	#2	#3	#4	mean
10	UNSAT	UNSAT	UNSAT	UNSAT	
16	0.352	0.352	0.4	0.356	0.365
20	UNSAT	UNSAT	0.727	0.784	0.756
24	1.618	UNSAT	1.626	1.475	1.573
30	8.575	11.809	10.673	10.877	10.484
32	15.501	8.698	12.637	13.308	12.536

properties (b) (e) (f)					
order	#1	#2	#3	#4	mean
10	UNSAT	UNSAT	UNSAT	UNSAT	
16	650.86	34.638	36.342	106.012	206.963

For the SAT result that uses properties (b) (e) and (f), I only record SAT solver running time for order 10 and order 16, because order 16 already takes way longer time than the other two SAT results' order 16's time. I tried to run order 20, but the solver did not give result more than 10 minutes, the order 24, 30, and 32 would even take longer time, so I did not record them.

Here is the plot illustrating the effect of the choice of transformation on the solver running time:

(SAT result used properties (b) (e) (f) takes way longer than the other two SAT results, so it is not on the plot)



For order 16 and 20, SAT result used properties (a) (c) (d) and SAT result used properties (a) (b) (c) (d) use the similar time. For order 24 and 30, SAT result used properties (a) (c) (d) takes less time than SAT result used properties (a) (b) (c) (d). For order 24 and 30, SAT result used properties (a) (c) (d) takes more time than SAT result used properties (a) (b) (c) (d). SAT result used properties (b) (e) (f) takes way longer than the other two SAT results.

There are three folders: abcd, acd, and bef, the names of the folders are corresponding to the properties that the program used.

Go to one of the folders, "A2-qcp-instances" folder stores the qcp files, "output" folder stores cnf files generated by "qcp2cnf.py".

To run the program, use "python3 qcp2cnf.py example.qcp example.cnf", for example "python3 qcp2cnf.py q_10_01.qcp q_10_01.cnf".

If you want to generate all cnf files, use "python3 qcp2cnf.py all".