

camlogic: a CDCL SAT solver for OCaml

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Implementation Details

- Managed the project using oasis
- Parsed the specification files using ocamllex and ocaml yacc.
- Specify a problem as follows:
- List number of variables and clauses at top of file.
- Each clause is a sequence of integers terminated by a zero.

Interesting Part of the CDCL Algorithm

- The most interesting part of CDCL is when we learn new information from a conflict in the form of a conflict clause.
- There are multiple correct ways to generate a conflict clause (some lead to more efficient solvers than others)
- Allow me to walk you through the procedure I used to find a conflict clause on the board.

Results

	Average Runtime	Fastest Runtime	Slowest Runtime
Satisfiable problems with 20 variables and 91 clauses	0.003876 seconds	Negligible (close to zero seconds)	0.024 seconds
Satisfiable problems with 50 variables and 218 clauses	0.48944 seconds	0.012 seconds	3.344 seconds
Unsatisfiable problems with 50 variables and 218 clauses	1.19576 seconds	0.24 seconds	10.132 seconds
Satisfiable problems with 75 variables and 325 clauses	14.11968 seconds	0.028 seconds	2.19 minutes
Unsatisfiable problems with 75 variables and 325 clauses	38.46464 seconds	2.668 seconds	4.5962 minutes

Future Work

- Implement random restarts, and compare the results to the solver as it is now.
- Look into different methods for generating conflict clauses.
- I already have a tool that solves SAT using DPLL without conflict clauses. I could compare that tool to this one.

Now, for a quick demo!

1. There are five houses.
2. The Englishman lives in the red house.
3. The Spaniard owns the dog.
4. Coffee is drunk in the green house.
5. The Ukrainian drinks tea.
6. The green house is immediately to the right of the ivory house.
7. The Old Gold smoker owns snails.
8. Kools are smoked in the yellow house.
9. Milk is drunk in the middle house.
10. The Norwegian lives in the first house.
11. The man who smokes Chesterfields lives in the house next to the man with the fox.
12. Kools are smoked in the house next to the house where the horse is kept.
13. The Lucky Strike smoker drinks orange juice.
14. The Japanese smokes Parliaments.
15. The Norwegian lives next to the blue house.

Now, who drinks water? Who owns the zebra?

In the interest of clarity, it must be added that each of the five houses is painted a different color, and their inhabitants are of different national extractions, own different pets, drink different beverages and smoke different brands of American cigarets *[sic]*. One other thing: in statement 6, *right* means *your* right.

—*Life International*, December 17, 1962