CS 360 Project Report

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General

The implementation of both `sud2sat` and `sat2sud` used C++. `sud2sat` records the puzzle input into a 2D array, and uses a helper function that takes three numbers (row number, column number, and assigned value) to determine the index of the propositional variables. Then it uses loops that represent each requirement in the minimal encoding method, to print each clause individually to `STDOUT`.

Then, `sat2sud` processes each truth assignment produced by `minisat`, filters out the positive values and prints their corresponding assignment values to `STDOUT`, giving the solution.

Performance Evaluation

Based on the output file `STDOUT`, after running all of the example grids and the one shown in the project description, a total of 51 grids, we can obtain a data set of number of clauses and CPU times, the first pair of number of clauses and CPU time is the data obtained upon testing the first grid, and so on.

```
Numbers of clauses:
2949
2949
3743
3859
3527
2656
4379
3902
3026
4184
3897
3934
3378
3861
4064
3565
2660
2706
```

```
3608
3247
3264
3748
3857
3773
3924
3936
4358
3982
3746
4195
4066
4156
4084
3463
3347
3638
3113
3565
3502
3406
3070
4184
4061
3899
4308
4106
4360
4524
4207
4572
4055

CPU times:
0.002298
0.002395
0.002436
0.002361
0.002425
0.001921
0.002645
0.00248
0.00217
0.002491
0.002355
0.002419
0.001964
```

```
0.002158
0.002559
0.002071
0.001801
0.001864
0.002261
0.001893
0.001929
0.002291
0.002174
0.002132
0.002315
0.002417
0.00252
0.002297
0.002159
0.002405
0.002458
0.002992
0.002401
0.002361
0.002007
0.002275
0.001922
0.00231
0.001987
0.002076
0.001935
0.002479
0.002457
0.002349
0.002541
0.002443
0.002587
0.002863
0.002608
0.002875
0.002371
```

With the above testing data set, the average number of clauses is 3736.52; the average CPU time is 0.002312 seconds; the worst-case number of clauses is 4572; and the worst-case CPU time is 0.002992 seconds.