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THE REAL DISTRIBUTION OF MINIMAL PUZZLES

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Author

Message

denis_berthier

Posted: Sat Oct 03, 2009 10:08 am Post subject:



Joined: 19 Jun 2007
Posts: 887
Location: Paris, France

Allan,

One more thing: this generator of complete grids is the same as the one you used to generate the rabrnd_1M collection of minimal puzzles, whose statistics were very close to those of suexg?

Red Ed,

I thought you had tested the collection of solution grids with your 3322 tests for bias, but I've been unable to find the results.

If not, could you test it?

The solution grids are on my web pages:

http://www.carva.org/denis.berthier/HLS/Classification/rabrnd_1M-solns.txt.gz

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denis_berthier

Posted: Sat Oct 03, 2009 10:48 am Post subject:



Joined: 19 Jun 2007
Posts: 887
Location: Paris, France

Pisaacson wrote:

I downloaded the sage source distribution and found the sudoku and back-tracking source in the compressed file sage-4.1.1/spkg/standard/sage-4.1.1.spkg. Upon expanding with 7Zip, the actual source code is in sage/games/sudoku.py and sudoku_backtrack.pyx. These are coded using python and cython, so I'm pretty skeptical of the "fastest" claim.

Aren't python and cython used only as an interface to more basic DLX functions in C?

[Edit: I found the core of the algorithm: dancing_links_c.h, in file sage/combinat/matrices. In spite of the .h, it contains C++ code.]

Pisaacson wrote:

I should have the entire first 100 bands finished in a few hours, so I've got lots of grids to test. Is there anything in particular you would like to

see compared/testged using the new suexg-cb with the bb_solver vs. the prior version

The suexg-cb version I'm currently using is the one outputting a stream of (puzzle, #grids-used) pairs. It has only one optimisation: deleting the first 46 clues without doing any test. Eleven's U4 test is not yet included, because, as his last version changes several things at the same time -RNG, prefilling diagonal, apparently no optim46- the advantage is not yet clear to me. The RNG I use is the standard MRW because I can see no serious reason for changing it. It can be downloaded here:

<http://www.carva.org/denis.berthier/HLS/Classification/suexg-cb-opt.c>

The comparisons I'd like is between this version and the same one with just bb_solver() replacing solve(). Knowing that suexg has calls to the inside of solve(), I suppose that, when you replaced solve() by bb_solver(), you had to do other modifications in suexg.

Of course, as this modification bears on the deletion part, comparisons will be more focused if the generation part takes no time, e.g. using gsf's file as input and piping.

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Allan Barker

Posted: Sat Oct 03, 2009 11:12 am Post subject:



Joined: 21 Feb 2008
Posts: 348
Location: Bangkok

denis_berthier wrote:

Allan,
One more thing: this generator of complete grids is the same as the one you used to generate the rabrnd_1M collection of minimal puzzles, whose statistics were very close to those of

Yes, it was used to make the complete grids that were then used by a top down generator to make rabrnd_1M.

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eleven

Posted: Sat Oct 03, 2009 11:15 am Post subject:



Joined: 10 Feb 2008
Posts: 513

PIsaacson wrote:

The time to produce a controlled bias puzzle seemed excessive, so I recompiled with profiling to see what was taking so long. The low hanging fruit appears to be the function solve, so I replaced it with the brute-force solver from Brian Turner as posted on the Sudoku Programmers' Forum. His bb_solver is wicked fast, so I modified the suexg and suexg-cb code to use his bb Solve function.

Very interesting, i did not know, that this solver code is available. Your results look promising, so hopefully Brian Turner allows to use it for this purpose.

I would also be interested, if a U4 test still would be an improvement with the faster solver. [added:](Dont forget to comment out calc4unavoid()); when you use the bb_solver.)

Last edited by eleven on Sat Oct 03, 2009 11:48 am; edited 1 time in total



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Posted: Sat Oct 03, 2009 11:31 am Post subject:

Joined: 10 Feb 2008
Posts: 513**denis_berthier wrote:**

The suexg-cb version I'm currently using is the one outputting a stream of (puzzle, #grids-used) pairs. It has only one optimisation: deleting the first 46 clues without doing any test. Eleven's U4 test is not yet included, because, as his last version changes several things at the same time -RNG, prefilling diagonal, apparently no optim46- the advantage is not yet clear to me.

The optim46 (no solving before its down to 34 clues) of course still is in this version. Prefilling the diagonal only is used, when the grids are generated by suexg (and leads to less bias).

The Marsenne Twister RNG is more reliable than MRW and hardly slower.

The U4 test makes this solver faster with a factor of at least 1.5 as far i as could see.

Quote:

Knowing that suexg has calls to the inside of solve(), I suppose that, when you replaced solve() by bb_solver(), you had to do other modifications in suexg.

Not, when you get the grids from a file or stream outside.

[Back to top](#)**denis_berthier**

Posted: Sat Oct 03, 2009 12:02 pm Post subject:

Joined: 19 Jun 2007
Posts: 887
Location: Paris, France**eleven wrote:**

The optim46 (no solving before its down to 34 clues) of course still is in this version.

Yes, sorry, I had missed it.

eleven wrote:

The U4 test makes this solver faster with a factor of at least 1.5 as far i as could see.

Interesting. Do your estimations rely on a large sample?

At some point, you weren't completely sure of your code for U4. Is it safe?

eleven wrote:**Quote:**

Knowing that suexg has calls to the inside of solve(), I suppose that, when you replaced solve() by bb_solver(), you had to do other modifications in suexg.

Not, when you get the grids from a file or stream outside.

But for consistency reasons in the other cases.

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Red Ed

Posted: Sat Oct 03, 2009 12:04 pm Post subject:



Joined: 06 Jun 2005
Posts: 757

denis_berthier wrote:

Red Ed,
I thought you had tested the collection of solution grids with your 3322 tests for bias, but I've been unable to find the results.
If not, could you test it?

OK:

Code:

```

+-----+-----+-----+
-+-----+
|          Pattern          |   Bias   |   Z-score
|   Z_1M   |
+-----+-----+-----+
-+-----+
|   . . . . . 2 . . 8 . . . . . . . . . . . . . . 8 . . 2 |   -5.52% |   -74.04
|   -74.04 |
|   . 8 7 . . . 1 . 2 2 . . . . . . . . . . . . . . 6 1 2 4 8 7 5 . |   -5.34% |   -72.79
|   -72.79 |
|   . 3 4 . 9 . 8 7 . . 5 . . . . . . . . . . 2 8 9 . . 3 5 . 6 . |   -5.33% |   -72.68
|   -72.68 |
|   6 . 2 . . 4 . . . . 7 9 . . 8 . 6 5 . 5 8 . . 1 . . 7 |   -5.66% |   -71.45
|   -71.45 |
|   . . 2 . 9 . 1 . . . . . 4 . . . . . 2 . . 9 . 2 1 . . . |   -5.04% |   -71.22
|   -71.22 |
|   3 . 1 . . 9 7 5 . . 4 . . 6 . . . . 3 . 9 7 . 2 . 1 . . |   -5.65% |   -71.04
|   -71.04 |
|   . 1 . 5 . . . 6 . . 6 . . . . . 1 . . . . . 6 . 2 . 5 |   -5.86% |   -70.69
|   -70.69 |
|   2 1 8 . 3 7 . . . . 3 9 . . 2 4 . . 7 . . . . . . . . 8 . |   -5.69% |   -70.17
|   -70.17 |
|   3 1 8 . . 7 9 . . . 4 . . . . . . . . . . 7 7 . 5 9 . 3 . 2 . |   -5.99% |   -70.05
|   -70.05 |
|   . 7 . 9 3 . 2 . . . . 8 2 . 6 . . . . . 9 . 7 . 1 . . 3 |   -4.99% |   -69.91
|   -69.91 |
|   . 9 . . 3 . 5 8 6 . 3 4 . 1 7 2 . . 7 . 2 . . . 4 . . |   -5.89% |   -68.18
|   -68.18 |
|   . 8 . . 7 4 5 . 1 5 . . . . 1 . 2 . 7 9 7 . 6 . . . 3 4 |   -6.49% |   -67.88
|   -67.88 |
|   6 . . . 8 . . 7 . . . 8 7 . 2 . 1 . 7 . . 3 . . . 6 . |   -5.75% |   -67.84
|   -67.84 |
|   5 7 8 . 6 1 3 . . . 3 . . . . . 7 6 4 . 2 . . 9 . . 1 . |   -5.88% |   -67.82
|   -67.82 |
|   8 . . 1 . . . 4 . 1 9 . 8 . . 6 . 2 3 . 2 . 9 . . . 7 |   -5.81% |   -67.71
|   -67.71 |
|   . 1 4 . . 7 . . . 5 . . . . . 2 6 8 . 2 9 . 6 . 5 . 7 . |   -6.25% |   -67.65
|   -67.65 |
|   1 . 3 . . . . 8 6 9 . . 4 . . 2 1 . 2 . . 7 . . 9 4 . |   -5.42% |   -66.64
|   -66.64 |
|   7 1 3 2 . . 6 5 . . . . . . . . 8 . 4 1 . . 6 5 . 9 . 2 . |   -6.35% |   -66.45
|   -66.45 |
|   . 9 . . 6 . . 7 1 . 7 4 . . 3 . 9 8 3 5 . 7 . . . . 4 |   -6.27% |   -66.14
|   -66.14 |
|   . . 7 3 . . . 4 5 4 . . . 7 . . 6 . . 3 5 1 . . 9 . 7 |   -6.28% |   -66.11
|   -66.11 |
+-----+-----+-----+
-+-----+
processed 1000000 grids
    
```

That's one of the best results so far.

I probably ought to maintain a log of these somewhere ...

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Red Ed

Posted: Sat Oct 03, 2009 12:15 pm Post subject:

 [quote](#)

Joined: 06 Jun 2005
Posts: 757

Ah! I see there is an old log: <http://www.sudoku.com/boards/viewtopic.php?p=39771#39771>

The link to anttiahola's B159 algorithm still works. I have a copy of the .exe (not the source) which absolutely flies. I'm not aware of any faster implementation that has such low bias.

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denis_berthier

Posted: Sat Oct 03, 2009 12:15 pm Post subject:

 [quote](#)  [edit](#)

Joined: 19 Jun 2007
Posts: 887
Location: Paris, France

Red Ed wrote:

denis_berthier wrote:

Red Ed,
I thought you had tested the collection of solution grids with your 3322 tests for bias, but I've been unable to find the results.If not, could you test it?

That's one of the best results so far.

As it is also fast, it is a very interesting generator of grids.

BTW, did you ever compute the results of your tests on the gsf collection?

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Red Ed

Posted: Sat Oct 03, 2009 12:19 pm Post subject:

 [quote](#)

Joined: 06 Jun 2005
Posts: 757

I didn't run my test on gsf's collection: there's no point, as the bias will be so low as to be imperceptible to my program.

If you are prepared to do tests in multiples of 5.4bn source grids, then gsf's collection is in practice as good as my unbiased generator. If you want to do independent tests on smaller samples then extracting samples from gsf's collection will be too slow to be useful, I think.

And if you want to compute whole-grid statistics (e.g. distribution of the number of U4s, which DPB asked about; or max/min number of something-or-others) over the entire population of solution grids, then gsf's collection is the best way of doing that.

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denis_berthier

Posted: Sat Oct 03, 2009 12:56 pm Post subject:

 [quote](#)  [edit](#)

Joined: 19 Jun 2007
 Posts: 887
 Location: Paris, France

Red Ed wrote:

I didn't run my test on gsf's collection: there's no point, as the bias will be so low as to be imperceptible to my program.

The point: a test of your program.

Red Ed wrote:

If you are prepared to do tests in multiples of 5.4bn source grids

I've already used several billion grids to generate my first unbiased 500,000 minimals

Red Ed wrote:

gsf's collection is in practice as good as my unbiased generator.

You mean: "my unbiased generator is in practice as good as gsf's collection"?
 How can you be sure your generator is unbiased?
 (And anyway it isn't available.)

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Red Ed

☐ Posted: Sat Oct 03, 2009 1:02 pm Post subject:

 [quote](#)

Denis, "as good as" is a symmetric relation in my lexicon.

Joined: 06 Jun 2005
 Posts: 757

Point taken about testing the tester. Maybe I *will* do that after all.

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denis_berthier

☐ Posted: Sat Oct 03, 2009 1:23 pm Post subject:

 [quote](#)  [edit](#)

Red Ed wrote:

Denis, "as good as" is a symmetric relation in my lexicon.

Joined: 19 Jun 2007
 Posts: 887
 Location: Paris, France

The meaning is not symmetric in natural language 😊

What are the scores for your generator?

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Red Ed

☐ Posted: Sat Oct 03, 2009 2:35 pm Post subject:

 [quote](#)

The scores for my generator are:

Joined: 06 Jun 2005
 Posts: 757

- **Ed's Generator 1** - 0 Liverpool FC
- Man Utd 0 - **20 Ed's Generator**
- **Ed's Generator 4** - 0 Real Madrid



As for testing: it would take 2 weeks to run through the whole list. I might do a randomised 1-in-N sampling run instead, as I don't fancy wasting that much electricity.

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eleven

Posted: Sat Oct 03, 2009 3:14 pm Post subject:



Joined: 10 Feb 2008
Posts: 513

denis_berthier wrote:

eleven wrote:

The U4 test makes this solver faster with a factor of at least 1.5 as far i as could see.

Interesting. Do your estimations rely on a large sample?
At some point, you weren't completely sure of your code for U4. Is it safe?

I neither had time nor cpu resources for a large test. But e.g. from my 1 hour sample posted yesterday you can see, that the code was 2 times faster for the grids, that had 9.2 vs 3.7 U4's on avg.

Because the bb_solver is that fast, it is not clear, if the overhead to calculate the U4's also is compensated by the about 50% quick solves then.

I have tested with 10 mio puzzles, that the U4 test did not see a U4, when it was unique, but it is more effort to ensure, that it does not miss a U4. Thus i asked for a double check, because i was surprised by the low U4 counts in band 299.

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