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Author

Message

m_b_metcalf

Posted: Sat Jul 04, 2009 1:48 pm Post subject:



Joined: 15 May 2006
Posts: 2158
Location: Berlin

Red Ed wrote:

Why is the count so slow? You only have to go up to 2, max.

Right, if there are multiple solutions. I'm talking about the case where there is *no* solution and this can be determined only by counting (fast tests are applied first, see also [here](#)). It takes a long time to count to zero when there are only 18 clues!

Regards,

Mike Metcalf

Last edited by m_b_metcalf on Sat Jul 04, 2009 1:50 pm; edited 1 time in total

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Red Ed

Posted: Sat Jul 04, 2009 1:49 pm Post subject:



Got it, ta.

Joined: 06 Jun 2005
Posts: 536

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tarek

Posted: Sat Jul 04, 2009 3:01 pm Post subject:



Red Ed wrote:

"Skewed" is the wrong term. "Biased" is better. And yes, no-one's proven that any one of the standard minimal puzzle generators is biased -- though it's likely that they all are.

Despite swimming in the sea of inaccurate terms, I have now a clearer picture about where we're heading with this.

Thanks,

tarek

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

Posted: Sat Jul 04, 2009 3:49 pm Post subject:



Joined: 05 Sep 2006

Posts: 467

Location: Winterpeg

im still not really sure how the randomly generated sample of minimal puzzles

would be biased generated in the first place.

the difference in skewing of graphics would be incurred by the random nature of generating different samples from all the possible grids that exist. you would see different aspects of the grids every time a new sample is created.

i can see how they can be biased, from the way my generator code functions:

i use the implemented techniques to verify the puzzle has 1 solution and to delete unneeded clues, over time. thus any puzzle outside the application of my solver would be skipped as valid minimal.

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Posted: Sat Jul 04, 2009 3:59 pm Post subject:



Joined: 06 May 2005

Posts: 998

Location: Oxford

mbmall your work repeats what **dukuso** did !**Code:**

clues , 1)	2)	3)	4)
17, 0	0	0	0
18, 0	0	0	0
19, 0	4.3	0	5
20, 59	182	0	254
21, 2428	6051	85	8268
22, 33966	61826	1775	80869
23,170727	227480	21648	273518
24,342620	352289	116766	364111
25,298349	248568	286836	209158
26,122691	86061	329853	56006
27, 25237	15908	185028	7284
28, 2733	1547	50469	505
29, 205	74	7040	22
30, 7.6	8.6	486	0
31, 0	0	12	0
32, 0	0	2.4	0
aver.24.38	24.10	25.72	23.88

```
1] 1M puzzles from 1M different H-class grids [1
puzzle from each grid]
2] puzzles from SF grid [29 17-puzzles]
3] puzzles from MC grid [canonical]
4] puzzles made using ..."a program building upwards"
```

he was puzzled by the result for 4] at the time but probably explainable by the methodology

we now know that the mean puzzle size is probably 24.3 plus 1.0

again demonstrated by **mbm**

I repeated another 40 clue subgrid and confirm this again. I somehow feel that

this may still be an underestimate.

from gsfs site
 sudoku -g -m1 -qFN generates [not sure of bias]
 sudoku -q2 rates....[or -q1]

C

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tarek

Posted: Sat Jul 04, 2009 4:40 pm Post subject:



Fine

So All these show different results.

Q1: Can we say that dukuso's 1 & 4 methods are either/both biased or not ?
 (Different H classes is a bias ?)

Q2: If we average 1 & 4 means then 24.13 springs out. Will a generator based on
 mbm's algorithm but starting from 24.13 clues - will it be less biased ?

Q3: This question has no true foundation but could the BEST average clue
 number be the one that gives 50% unique solution puzzles & 50% multiple
 solutions puzzles if that number is fed to mbm's generator as the starting clue
 number?

tarek

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Red Ed

Posted: Sat Jul 04, 2009 6:17 pm Post subject:



Joined: 06 Jun 2005
 Posts: 536

The big problem is that we don't know Prob(random minimal puzzle has N clues),
 for any N in the range 17 to 35ish, to any useful accuracy. So we cannot ever tell
 if any single generator is "biased".

So the answer to Q1 is "no" (owing to lack of ground truth data).

I have no way of telling what the answer to Q2 or Q3 might be, nor do I have
 any reason to expect Mike's generator (seeded with whatever number of clues)
 to be any more/less "biased" than the rest.

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m_b_metcalf

Posted: Sat Jul 04, 2009 6:40 pm Post subject:



Joined: 15 May 2006
 Posts: 2158
 Location: Berlin

coloin wrote:

mbm
 all your work repeats what **dukuso** did !

Well, that's fine. Any experiment should be repeatable to be credible.

Let me go out on a limb. Given a puzzle with m non-redundant clues and n
 individually redundant clues, surely the optimal puzzle is that from which the
 largest possible number of the n clues can be deleted. This is because one has
 then achieved a **measurable** goal, that of covering all the unavoidable sets with

the minimum number of clues. This is what I'll try to do next week (incidentally using unavoidable sets to improve the efficiency of the code by making an early identification of a multiple solution). This must yield the asymptotically best average.

Regards,

Mike Metcalf

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Red Ed

Posted: Sat Jul 04, 2009 6:46 pm Post subject:



Joined: 06 Jun 2005
Posts: 536

That procedure will generate a minimal sub-puzzle (of the original puzzle) that has the fewest-possible number of clues. Is that the sense in which you mean "best"? Fine, but I don't see what this has to do with the topic of bias.

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m_b_metcalf

Posted: Sat Jul 04, 2009 7:12 pm Post subject:



Joined: 15 May 2006
Posts: 2158
Location: Berlin

Red Ed wrote:

That procedure will generate a minimal sub-puzzle (of the original puzzle) that has the fewest-possible number of clues. Is that the sense in which you mean "best"? Fine, but I don't see what this has to do with the topic of bias.

Yes, I mean *best*. And working from 'below' rather than from 'above' gets us there faster. I don't feel competent to discuss bias.

Regards,

Mike Metcalf

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eleven

Posted: Sat Jul 04, 2009 8:02 pm Post subject:



Joined: 10 Feb 2008
Posts: 311

Red Ed wrote:

I'd love to hear from anyone that can explain why, for example, unbalanced puzzles are nearly twice as likely to have SE=6.6 than balanced ones.

SE 6.6 are the puzzles solved with turbot fish, the most common coloring technique (where you only use the occurrences of a single digit to make eliminations). I guess that the probability, that you can apply it, is higher, when you have more givens of a number.

@Mike: Can you tell me, whats the difference between your new generation algorithm and [suexg](#) (beside of that suexg starts with 0 clues, which i think does not matter) ?

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Red Ed

Posted: Sat Jul 04, 2009 9:32 pm Post subject:



Re SE 6.6 - nice. Thanks eleven

Joined: 06 Jun 2005
Posts: 536

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Red Ed

Posted: Sat Jul 04, 2009 9:34 pm Post subject:



Joined: 06 Jun 2005
Posts: 536

@Mike: well now I'm confused because I thought this was a thread about rating puzzles and (for example) the influence of bias on those ratings; **not** about finding ways to introduce bias towards low numbers of clues.

Maybe the thread needs to be split. We need Denis to come back and remind us what he wants to see addressed here.

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denis_berthier

Posted: Sun Jul 05, 2009 5:23 am Post subject:



Joined: 19 Jun 2007
Posts: 638
Location: Paris, France

Red Ed wrote:

@Mike: well now I'm confused because I thought this was a thread about rating puzzles and (for example) the influence of bias on those ratings; **not** about finding ways to introduce bias towards low numbers of clues.
Maybe the thread needs to be split. We need Denis to come back and remind us what he wants to see addressed here.

I haven't been much at home yesterday. Neither shall I be today.

I think the best way to answer you is indirect: what kind of bias are we considering?

Remember the Tower of Pisa metaphor. A sample can be biased wrt to some criterion but unbiased wrt to another. I could say that, for so complex an object as a puzzle, given any sample one will always find a statistical variable (i.e. a function from puzzles to numbers) for which it appears to be biased.

**A bias is *a priori* interesting for this thread if it can have an impact on the rating/classification of resolution rules or puzzles.
Unfortunately, we have no means of knowing this *a priori*.**

It seems *a posteriori* that the number of clues doesn't satisfy the above condition because (for any of the various collections examined in this thread) I've shown it is almost uncorrelated with the (SER or NRCZT) ratings. But you noticed some trend in sudogen_0 (and in my next post you'll see that it is there also in Mike's last collection) for higher SER with increasing number of clues. It is interesting to investigate this. Having a knowingly biased collection may be one way of getting some information. Of course, if it appeared that we need a specific thread for biased generation, it is always possible to open one; but do we really have much to say on this topic?

Now, I'm also preparing another post to recall what I had in mind when I opened this thread.

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denis_berthier

Posted: Sun Jul 05, 2009 5:30 am Post subject:



Joined: 19 Jun 2007
 Posts: 638
 Location: Paris, France

Mike,

Here are the results for your last series of 64,410 puzzles (limited to the first 64,000):

1) Clues

mean number of clues = 23.89

standard deviation = 1.08

smaller than sudogen0_1M (E = 24.38, SD = 1.11)

Code:

#Clues	#Puzzles	E(SER)	s(SER)
20	19	2.72	1.76 (E not meaningful)
21	505	3.19	2.11
22	5133	3.21	2.15
23	17480	3.34	2.24
24	23536	3.56	2.35
25	13245	3.85	2.45
26	3544	4.10	2.52
27	516	4.51	2.48
28	21	4.95	2.60
29	1	6.60	0.0 (E not meaningful)
30	0	0.00	0.00 (E not meaningful)
all	64000	3.57	2.14

The distribution is significantly different from sudogen0.

An apparent trend for larger SER (and standard deviation) with increasing #clues, as in sudogen0_1M. With the same restrictions on how to understand it: as the standard deviation is very high, it is impossible to use this result for predictions (such as linear regression).

2) SER

mean SER = 3.58 (standard deviation = 2.34)

Still a little below Sudogen0 : 3.77 (standard deviation = 2.42)

Max SER 9.2 (one puzzle), a few 9.1, ~50 9.0

This is the same max as sudogen_0 and above the max of any of the other collections reviewed until now.

The puzzles in this collection are globally harder than those in your previous series, but still easier than those in sudogen0_1M.

It'd be interesting to understand why suexg gives samples harder than the other generators.

3) Correlation coefficient #clues vs SER = 0.11 : uncorrelated. Also a very stable result, valid for all the generators studied here.

4) NRCZT

Considering that these results are sufficiently interesting, I've also launched the NRCZT computation. It will take some time to complete.

The first results, computed for the first 5000 puzzles, give a correlation

coefficient for NRCZT-rating vs SER = 0.89, same as for sudogen_0. This seems to be a real value, independent of the way the puzzles have been generated.

Regards

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