Sudoku Players' Forums

Rating rules / Puzzles. Ordering the rules

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Author	Message
m_b_metcalf Joined: 15 May 2006 Posts: 2152 Location: Berlin	Posted: Sat Jul 04, 2009 2:12 am Post subject: quote **Red Ed wrote:** I really just need to know how to generate and rate minimal puzzles. I'm sitting watching my new generator build puzzles from 'below' rather than from 'above'. Even now, I can see that the average number of clues is going to be lower. Why? I think because the elimination phase starts with a much lower number of clues and therefore is more likely to reach a local minimum that is also an absolute minimum. More results later. But which is 'better'? Regards, Mike Metcalf Back to top profile pm
Red Ed Joined: 06 Jun 2005 Posts: 532	Posted: Sat Jul 04, 2009 2:26 am Post subject: quote Ah, when I asked how to generate puzzles I meant using any of the existing (almost certainly biased) generators. I didn't care whether that generator is "better" than any others. Anyway, I don't need that now, because I'm going to try the sudogen0_1M subset filtering idea instead. It's a quite separate question to understand why your above/below generators perform differently. Separate, but also interesting! Back to top profile pm
tarek Joined: 05 Jan 2006 Posts: 2179	Posted: Sat Jul 04, 2009 2:36 am Post subject: quote I've just Been reading through this thread again, I must confess that my earlier postings seem to have followed a heavy meal before dozing off

Location: The Midlands, UK

this optimal generator discussion is interesting.

Q. do we have mean/mode/median of clues generated by several solvers working from top to bottom & from bottom to top.

I'm asking this because we can then average these figures to create a third generator which starts from that average then works either up or down depending if the puzzle is unique then if it is minimal.

your optimal generator then, is a random mixture of the 3. Placements or Removals always should be random.

tarek

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Red Ed

Posted: Sat Jul 04, 2009 2:55 am Post subject: quote

Joined: 06 Jun 2005
Posts: 532

What's "optimal"? Do you mean "unbiased"? You cannot, in general, get an unbiased process by taking a "random mixture" of 3 biased ones. For all we know, both of Mike's might tend to produce puzzles with too many clues, so a "random mixture" involving those will probably show the same tendency.

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m_b_metcalf

Posted: Sat Jul 04, 2009 2:58 am Post subject: quote

Joined: 15 May 2006
Posts: 2152
Location: Berlin

> **Red Ed wrote:**
>
> For all we know, both of Mike's might tend to produce puzzles with too many clues, so a "random mixture" involving those will probably show the same tendency.

They certainly do, because they search for local minima. I'll make a test with absolute minima next week, but it'll be a smaller sample as that gets to be slower.

Regards,

Mike Metcalf

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tarek

Posted: Sat Jul 04, 2009 3:05 am Post subject: quote

Joined: 05 Jan 2006
Posts: 2179
Location: The Midlands, UK

I guess this discussion requires more accuracy in terms.

What I meant is a not "Optimal" & not "UnBiased" but "A less biased generator" ....

I might be wrong but if one method is biased in 1 direction & the other is bised in the opposite direction wouldn't a mixture be less biased than either ?

[ADDED LATER]
My BIASED  view of this is that the 2 methods are our confidence interval bounderies, therefore a mixture is always better then either.

tarek

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Red Ed

Posted: Sat Jul 04, 2009 3:27 am Post subject: quote

Joined: 06 Jun 2005
Posts: 532

What makes you think that (a) there are only two "directions" in which bias can be observed; or (b) Mike's generators are biased in "opposite" directions?

This has nothing to do with confidence intervals.

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tarek

Posted: Sat Jul 04, 2009 4:04 am Post subject: quote

Joined: 05 Jan 2006
Posts: 2179
Location: The Midlands, UK

Red Ed wrote:

> What makes you think that (a) there are only two "directions" in which bias can be observed; or (b) Mike's generators are biased in "opposite" directions?

You are right. I'm no mathmatician & no statistician. I'm hoping to understand the concepts you're after & hopefully bring something to the table.

If your genrating from a solution grid by removing clues aiming to reach a locally minimal minimal puzzle then this is working in an opposite direction to starting from a 16 clue multiple solution puzzle adding clues to reach a unique puzzle then reduce if not minimal. From numbers presented earlier in this thread ... The distribution of clues for each method was skewed in opposite directions.

Red Ed wrote:

> This has nothing to do with confidence intervals.

TRUE, it was my way of looking at this matter & bringing it closer to something that I understand.

tarek

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Red Ed

Posted: Sat Jul 04, 2009 4:36 am Post subject: quote

Joined: 06 Jun 2005
Posts: 532

tarek wrote:

> The distribution of clues for each method was skewed in opposite directions.

I must nit-pick. The distributions were different, but you can't tell if either is skewed, let alone in "opposite directions".

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Red Ed

Posted: Sat Jul 04, 2009 4:58 am Post subject: quote

Joined: 06 Jun 2005
Posts: 532

Now my turn to be shot down!

I filtered sudogen0_1M down to the 297838 puzzles with 25 clues. For each of those 297838 puzzles, I computed a score equal to n(9)*10^9 + n(8)*10^8 + ... + n(0)*10^0 where n(t) is the number of clue values appearing t times in the puzzle. So, high scores correspond to puzzles with one or two clues appearing very often; low scores correspond to puzzles with all clues appearing about the same number of times.

I then selected the top 10000 and bottom 10000 scores and, for each tabulated the SE ratings. In the table below, the columns are: SE rating x10, occurrences in the top 10000 (unbalanced puzzles), occurrences in the bottom 10000 (balanced puzzles):

Code:

```
Got ratings: 1.200000 to 9.300000, tens=10
nv = 297838
12      212     132
15      2536    1734
17      172     99
20      1431    2154
23      148     454
25      89      109
26      601     552
28      192     155
30      103     150
32      27      15
34      63      80
36      15      21
38      6       1
40      3       9
42      427     486
44      61      67
45      244     210
46      25      14
47      1       0
50      3       4
52      1       0
56      88      95
57      12      12
62      4       2
65      13      4
66      1073    576
67      154     60
68      42      32
69      21      15
70      19      5
71      886     921
72      688     1079
73      163     284
74      11      25
75      5       10
76      39      20
77      31      7
78      44      9
79      10      1
80      7       0
82      22      9
83      140     184
84      94      107
```

```
85      20      40
86      2       2
88      9       5
89      19      31
90      24      19
top: mean rating = 3.957140
bot: mean rating = 4.014390
Log nr combinations: 13265.208230
Natural occurrences: 0/10000
```

There's not a great difference in the mean ratings; but the rating distributions are markedly (statistically very significantly) different.

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.

EDIT: corrected floating-point rounding errors

Last edited by Red Ed on Sat Jul 04, 2009 5:05 am; edited 1 time in total

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Red Ed

Posted: Sat Jul 04, 2009 4:59 am Post subject: quote

Joined: 06 Jun 2005
Posts: 532

Same experiment for NRCZT ratings ... interesting behaviour at rating 8.0 ...

Code:

```
Got ratings: 0.900000 to 13.000000, tens=10
nv = 297838
9       3817    3999
10      1246    1059
20      1742    1178
30      1832    1744
40      1052    1549
50      236     360
60      54      75
70      20      24
80      0       10
100     1       1
110     0       1
top: mean rating = 1.952330
bot: mean rating = 2.096110
Log nr combinations: 13696.731140
Natural occurrences: 0/10000
```

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m_b_metcalf

Posted: Sat Jul 04, 2009 5:30 am Post subject: quote

Joined: 15 May 2006
Posts: 2152
Location: Berlin

OK, I ran my new generator for 5 hours real time and got over 64000 puzzles. The method is:

1) To a blank grid add 18 random values at 18 random and distinct locations consistent with the basic constraints.

2) Find the number of solutions.

3) If zero solutions GOTO 1.

4) If one solution GOTO 9 (never happens, but you never know!).

5) If multiple solutions add a new clue and find number of solutions.

6) If zero solutions remove last clue added and GOTO 5.

7) If one solution GO TO 9.

8) If multiple solutions GOTO 5.

9) Visit each clue in turn randomly. If it is redundant remove it.

The summary is:

Code:

```
Number:        64410
Average:    23.88505

      19        0
      20       19
      21      510
      22     5165
      23    17590
      24    23678
      25    13340
      26     3565
      27      521
      28       21
      29        1
      30        0
```

That's really different!

I will send the file to Denis.

Note: When generating puzzles from a solution grid, any candidate puzzle has at least one solution. This is not the case with this method, which demands a two-pronged test on whether there is *no* solution: first a fast test, followed if necessary by a slooooooow count. The timing is even slower if I start with 17 clues rather than 18.

Regards,

Mike Metcalf

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Red Ed

Joined: 06 Jun 2005
Posts: 532

Posted: Sat Jul 04, 2009 5:39 am Post subject: quote

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

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tarek

Posted: Sat Jul 04, 2009 5:43 am Post subject: quote

Joined: 05 Jan 2006
Posts: 2179
Location: The Midlands, UK

Red Ed wrote:

> **tarek wrote:**
>
> > The distribution of clues for each method was skewed in opposite directions.
>
> I must nit-pick. The distributions were different, but you can't tell if either is skewed, let alone in "opposite directions".

So that means that no one confirmed that the previous results in the thread were skewed despite the difference in the results

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Red Ed

Posted: Sat Jul 04, 2009 5:48 am Post subject: quote

Joined: 06 Jun 2005
Posts: 532

"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.

Last edited by Red Ed on Sat Jul 04, 2009 5:52 am; edited 2 times in total

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