The hardest sudokus (new thread)

Re: The hardest sudokus (new thread)

by **hendrik_monard** » Thu Jan 06, 2022 3:08 pm

QUOTE

hendrik_monard
Posts: 50
Joined: 19 April 2021
Location: Leuven (Louvain) Belgium

> **mith wrote:**
> I had some of these in the database (mostly the 11.6s) but almost all not rated yet. One example of different SER for the morphs we are using in this batch:
>
> CODE: SELECT ALL
> ```
> ..........1..2..3.2..4..5......6..5..6..3.7289..........6...7..723.5..1....732.  ED=11.5/1.2/1.2
> 98.7..6..7...9..8.....68...65..7.9.....5.6.4......9...5....73....2.3......1....9.  ED=11.6/1.2/1.2
> ```
> .

interesting indeed. I was not aware that also for SER there was this morph dependency for high ratings. I wonder what you would do if a dedicated morph would be posted with an SER rating higher than the one of its canonical morph or its minlex morph.
I am still working on the list of derivatives, so I expect to have a new list in a few of days. Do you have an idea when the database that you are working on will be ready for uploading, and consequently until when new puzzles can be posted for inclusion?

Re: The hardest sudokus (new thread)

by **mith** » Thu Jan 06, 2022 3:15 pm

QUOTE

mith
Posts: 862
Joined: 14 July 2020

After adding those, here's an update on count by SER and clues:

CODE: SELECT ALL
```
       11.6 11.7 11.8 11.9
20c       1    0    1    0
21c      51   36   17    1
22c      91   76   36    5
23c     101   18   16    3
24c     154   20    1    0
25c      91   15    0    0
26c     152   22    1    0
27c     266   94    1    0
28c     394   54    0    0
29c     179   14    2    0
30c      52    0    2    0
31c       4    0    0    0

total  1536  349   77    9
ph2010  393  138   61    9
```

Re: The hardest sudokus (new thread)

by **mith** » Thu Jan 06, 2022 3:24 pm

QUOTE

mith
Posts: 862
Joined: 14 July 2020

> **hendrik_monard wrote:**
>
> > **mith wrote:**
> > I had some of these in the database (mostly the 11.6s) but almost all not rated yet. One example of different SER for the morphs we are using in this batch:
> >
> > CODE: SELECT ALL
> > ```
> > ..........1..2..3.2..4..5......6..5..6..3.7289..........6...7..723.5..1....732.  ED=11.5/1.2/1.2
> > 98.7..6..7...9..8.....68...65..7.9.....5.6.4......9...5....73....2.3......1....9.  ED=11.6/1.2/1.2
> > ```
> > .
>
> interesting indeed. I was not aware that also for SER there was this morph dependency for high ratings. I wonder what you would do if a dedicated morph would be posted with an SER rating higher than the one of its canonical morph or its minlex morph.
> I am still working on the list of derivatives, so I expect to have a new list in a few of days. Do you have an idea when the database that you are working on will be ready for uploading, and consequently until when new puzzles can be posted for inclusion?

As we discussed above, there is the potential for uniqueness techniques to affect the rating based on morph (say the two puzzles above have multiple 11.5 options at some step, and pick different ones because of the morph; one of these allows for a uniqueness technique, while the other permanently destroys that same uniqueness technique and must move to an 11.6 step eventually), or some shortcuts leading to not finding the absolute "shortest" (lowest node count) chain (this is more likely to be the case here, I would think - and this behavior shouldn't affect the rating more than 0.1 on its own).

It probably would make sense at some point to standardize rating to a single canonical form; in the case of a morph having a higher rating, it might be worth adding a column or two to account for that, not sure. Really, the lower rating would be the more "accurate" one (assuming no bug), since the higher rated morph can certainly be solved with the lower rating steps.

I could also generate a number of random morphs of each high rated puzzle and rate them to see which puzzles have this behavior, though that could take some time even on this computer.

As for the database, I still need to go through the pattern game so it will be a while longer. I'll keep adding new ones you find as you post them.

Re: The hardest sudokus (new thread)

by **denis_berthier** » Thu Jan 06, 2022 4:56 pm

QUOTE

denis_berthier
2010 Supporter
Posts: 3334
Joined: 19 June 2007
Location: Paris

> **mith wrote:**
> One example of different SER for the morphs we are using in this batch:
>
> CODE: SELECT ALL
> ```
> ..........1..2..3.2..4..5......6..5..6..3.7289..........6...7..723.5..1....732.  ED=11.5/1.2/1.2
> 98.7..6..7...9..8.....68...65..7.9.....5.6.4......9...5....73....2.3......1....9.  ED=11.6/1.2/1.2
> ```

This is a very interesting example.
First, I checked the ratings and I get the same ones as Mith.

But I also checked that this difference is not related to rules for uniqueness. Indeed the resolution paths found by SE don't use uniqueness.

Conclusion: there are values r of the SER such that the set of rules rated no more than r doesn't have the confluence property, even if rules for uniqueness are disabled.

As I explained before, this is due to the way ratings are defined, in terms of the number of inferences and arbitrary thresholds.

Re: The hardest sudokus (new thread)

by **mith** » Thu Jan 06, 2022 6:12 pm

QUOTE

mith
Posts: 862
Joined: 14 July 2020

Just restarted the SER script (after running the generating scripts for a bit), new 11.8 pearl:

CODE: SELECT ALL
```
........1.....2.3...4.5.6....748.....3...1..84.85......4....7...9.....237...6.8..  ED=11.8/11.8/2.6
```

Some more 11.7/11.6 as well:

CODE: SELECT ALL
```
........1....2345...45.16.2....3.....7......6689..........5.1.....6.23.43...14.25  ED=11.7/1.2/1.2
........1....23.....4..5.....6....7..187...9479.1..6.8.4....81..6....7.98.9.7..46  ED=11.7/1.2/1.2
.......12.....13.4.13........5.678.3.6.5......7813.....5678....73...5.8.8.1..6...  ED=11.6/1.2/1.2
........1.....2.3...3.14....15.6...7.3.1...858.7....6..71.865.3.8....6..5.63.1..8  ED=11.6/1.2/1.2
```

The SER script rates one at each clue count (if available), and this is just from the first pass, so I'm sure there will be more 11.6+ coming shortly.

Re: The hardest sudokus (new thread)

by **mith** » Thu Jan 06, 2022 6:25 pm

QUOTE

mith
Posts: 862
Joined: 14 July 2020

Just to give an idea of the speed, these were all rated in the last 10 minutes (along with other 11.0-11.5 at other clue counts):

CODE: SELECT ALL
```
........1.....2.3...4.5.6....7.6.8...4....7...9.....23.3...1..84.85.....7..48....       23      11.6    11.6    2.6     DCFC+DFC
........1....23.....4..5.....6....7..187...94.9.1..6.8.47...81..6......98.9.7..46       27      11.7    1.2     1.2     DRFC+DFC
.............1.23.....2145..617.....879.62..19..28....296.....67.....8.8.1..7...       28      11.7    1.2     1.2     DRFC+DFC
........1....23.....21.4.....5....62..7.6.18.68....7.5.7....5..12....8.65.86.1.27       29      11.6    1.2     1.2     DCFC+DFC
........1.....2.3...3.14....15.6...7.3.1...858.7....6..71.865.3.8....61.5.63....8       30      11.6    1.2     1.2     DCFC+DFC
........1....2345...45.16......3.....7......6689.....3....5.1.....6.23.43...14.25       27      11.7    1.2     1.2     DRFC+DFC
.............1.23.....2145..1..6....2789....86.....9...816.....967.82..17..29...       28      11.7    1.2     1.2     DRFC+DFC
........1.....2.3......3245..216......73.8...68..27.1..3678....1.8..63..27...1...       29      11.6    1.2     1.2     DCFC+DFC
........1.....2.3...3.14....15.6...7.3.....858.7...16..71.865.3.8....6..5.63.1..8       30      11.6    1.2     1.2     DCFC+DFC
```

Re: The hardest sudokus (new thread)

by **mith** » Thu Jan 06, 2022 11:34 pm

QUOTE

mith
Posts: 862
Joined: 14 July 2020

Here's the whole batch from this afternoon - it finally settled down below 11.6s:

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Re: The hardest sudokus (new thread)

by **denis_berthier** » Fri Jan 07, 2022 2:57 am

QUOTE

denis_berthier
2010 Supporter
Posts: 3334
Joined: 19 June 2007
Location: Paris

.
As usual, I checked the new 11.8. It is in B6B or less.

Re: The hardest sudokus (new thread)

by **hendrik_monard** » Fri Jan 07, 2022 7:58 am

QUOTE

hendrik_monard
Posts: 50
Joined: 19 April 2021
Location: Leuven (Louvain) Belgium

> **mith wrote:**
> Here's the whole batch from this afternoon - it finally settled down below 11.6s:

Really impressing, and with another 11.8. Congratulations mith

Re: The hardest sudokus (new thread)

by **ghfick** » Fri Jan 07, 2022 2:17 pm

QUOTE

ghfick
Posts: 160
Joined: 06 April 2016

I tried the new 11.8 with YZF_Sudoku_621.
A 4x4 MSLS yields a solution path with nothing harder than AICs

CODE: SELECT ALL
```


Locked Candidates 1 (Pointing): 6 in b9 => r7c1<>6,r7c3<>6
Locked Candidates 1 (Pointing): 8 in b7 => r1c1<>8,r2c1<>8,r3c1<>8
MSLS:16 Cells r3469c2689, 16 Links 78r3,56r4,67r6,45r9,12c2,39c6,19c8,29c9
19 Eliminations:r2c2,r7c8<>1,r1c2<>2,r17c6<>3,r4c17,r9c3<>5,r4c1<>6,r3c4,r6c5<>7,r3c4<>8,r7c689,r1c68,r2c9,r5c8<>9
Locked Candidates 2 (Claiming): 9 in r7 => r9c4<>9,r9c6<>9
Locked Pair: in r7c8,r7c9 => r8c7<>5,r9c8<>5,r9c9<>5,r7c1<>5,r7c3<>5,r7c6<>5,
Naked Single: r7c6=8
Hidden Single: 8 in b7 => r8c1=8
Hidden Single: 6 in b7 => r8c3=6
Hidden Single: 5 in b7 => r9c2=5
Hidden Single: 5 in b8 => r8c6=5
Locked Candidates 2 (Claiming): 5 in r4 => r5c7<>5,r5c8<>5
Locked Candidates 2 (Claiming): 5 in c7 => r1c8<>5,r2c9<>5
Skyscraper : 4 in r1c6,r2c9 connected by r9c69 => r1c78,r2c5 <> 4
WXYZ-Wing: 4789 in r13c8,r29c9,Pivot Cell Is r2c9 => r3c9,r9c8<>9
Hidden Single: 9 in b9 => r9c9=9
Hidden Single: 4 in c9 => r2c9=4
Uniqueness Test 4: 56 in r47c89 => r4c89 <> 6
Sue de Coq(Cannibalized): r1c46 - {346789} (r12c5,r3c46 - {13479}, r1c28 -{678}) =>  r2c4<>1 r1c1<>6 r1c4<>7 r1c5<>7 r1c6<>7 r2c4<>7 r2c4<>9
X-Wing:7c69\r36  => r3c28,r6c8<>7
AIC Type 1: (8=7)r1c8 - r1c2 = (7-8)r2c2 = 8r2c4 => r1c4<>8
Hidden Single: 8 in b2 => r2c4=8
Locked Candidates 1 (Pointing): 6 in b2 => r1c2<>6
AIC Type 2: 6r2c1 = (6-7)r2c2 = (7-8)r1c2 = r1c8 - (8=9)r3c8 - (9=5)r2c7 => r2c1<>5
AIC Type 2: 8r3c2 = (8-7)r1c2 = r1c8 - (7=2)r3c9 => r3c2<>2
Locked Candidates 2 (Claiming): 2 in c2 => r4c1<>2,r5c1<>2,r5c3<>2
Sue de Coq: r2c13 - {1569} (r123c2 - {1678}, r2c7 -{59}) =>  r3c1<>1 r2c5<>9
AIC Type 2: (1=7)r2c5 - (7=6)r2c2 - r4c2 = r4c6 - (6=4)r1c6 - r1c5 = 4r8c5 => r8c5<>1
Empty Rectangle : 1 in b7 connected by c5 => r2c3 <> 1
Locked Candidates 2 (Claiming): 1 in c3 => r7c1<>1
Naked Pair: in r2c3,r5c3 => r1c3<>59,
Naked Pair: in r2c3,r2c7 => r2c1<>9,
Dual Empty Rectangle : 1 in b2 connected by r8,c1 => r4c7 <> 1
AIC Type 2: 6r1c4 = (6-7)r5c4 = r8c4 - (7=4)r8c5 - r1c5 = 4r1c6 => r1c6<>6
stte
```

Re: The hardest sudokus (new thread)

by **mith** » Fri Jan 07, 2022 10:15 pm

QUOTE

mith
Posts: 862
Joined: 14 July 2020

One more 11.7 today (and 188 11.6s):

CODE: SELECT ALL
```
........1...234.....2..5.....6.....2..7.8.69.89....1.7.791..8.61.8...72.62......9  ED=11.7/1.2/1.2
```

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Re: The hardest sudokus (new thread)

by **eleven** » Sat Jan 08, 2022 12:07 am

QUOTE

eleven
Posts: 2820
Joined: 10 February 2008

Impressing an interesting results. So the q2 filter i used, was much more biased for this purpose, than i thought at that time.

Re: The hardest sudokus (new thread)

by **mith** » Sat Jan 08, 2022 12:38 am

QUOTE

mith
Posts: 862
Joined: 14 July 2020

Yeah, you said you used 98000 q2 as your filter, right? My current filter for most counts is 95000 (or backdoor >2, though I don't have any stats on how many high rated puzzles that has picked up) for the generating scripts (-1+1, -1+2, -2+1). Obviously, that is still letting some slip by.

Most of my puzzles that are below 95000 q2 are from the separate expander script, which doesn't check q2 at all (take a puzzle with singles available, add all singles, minimize - these are guaranteed to be at least as hard as the seed puzzle barring uniqueness shenanigans).

The tweak I'm thinking about making is to ignore the q2 filter (or at least greatly reduce it) for seed puzzles that are sufficiently highly rated (11.6+, or maybe +DFC) - this will at least catch immediate neighbors. (Or I might base the filter value on the seed puzzle's q2, since I have a good collection from the expander script now with low q2. Or I may drop it entirely and benchmark the impact.)

Re: The hardest sudokus (new thread)

by **mith** » Sat Jan 08, 2022 6:56 pm

QUOTE

mith
Posts: 862
Joined: 14 July 2020

Today's batch:

CODE: SELECT ALL
```
........1.......23....45.....6.......4786..9.89..57....5947....46...8...7.8.965..  ED=11.7/1.2/1.2
........1..2..3.....1245.....6....7..2..7.68.8.....1.9.17...92..6......89.81..7.6  ED=11.7/1.2/1.2
........1.......23....45.....6.57....8.9.....47.68..9..67.985..59.47....8.4..6...  ED=11.7/1.2/1.2
..............1.23.....2145..6..7....78.1..6.92.8......91.26...76.9.82..8...7....  ED=11.7/1.2/1.2
```

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Re: The hardest sudokus (new thread)

by **mith** » Sat Jan 08, 2022 7:10 pm

QUOTE

mith
Posts: 862
Joined: 14 July 2020

Just out of curiosity, I grabbed the largest ER - skfr_ER by clue count:

CODE: SELECT ALL
```
19 - .........5...1.2....3..9..6.........7..2..1....9..6..41...5.7....4....8......3..9, 9.9, 9.6, Pat
20 - ..............1.23..4.5.6.....5.7.....746.8...8.........58..7...2......1.3.....9., 10.6, 10.2, mith
21 - ........1.....2.3...4.5.6.7...2.8....7..6...59.........16...4...5..1.7..8..3....., 11.7, 11.1, mith
22 - ........1....23.4.....452....1.3.....3...2.6.7..6....8..7.....9.5....4..8.9....1., 11.6, 10.9, mith
23 - ........1.....2.3...4.5.67......1.2....3....8.4..6.5...678......95..7...4...9.7.., 10.5, 9.7, mith
24 - ........1.....2..3..4.5..6...573..4..7.8..3..48..6..9...6...9...5.4.6...3...9...., 10.4, 9.7, mith
25 - ........1....23.....2..4.....5....6..27.6.18..8....5.7.1....8.6.768...255.....7.., 11.7, 11.1, mith
26 - 98.76.5..7.5.......64..9...6.84.7....7..56.4..5.98.....9..........8....5......3.2, 11.7, 11.0, hendrik_monard
27 - 98.76.5..7.5..98...4.8.....6..95....4...87....974.6.5..6......5.....4..........32, 11.7, 11.1, hendrik_monard
28 - 98.76.5..7.5.498...64......6..95.....976.4....5..87....4.....5....8...32........8, 11.7, 11.1, hendrik_monard
29 - 9876.....6..8.......5.......6..4.53..5.3.2.46......8.2...4.5.2....28.3.4....36.85, 11.7, 11.1, hendrik_monard
30 - .............12.34..1.5.6.2.1.6.....5.2.78...7..1.5..8.7658.2..1.52.7...8...61..., 11.5, 11.1, mith
31 - ..............1..2....3..45..6.17....413.6.7.37.84.1...84.7....6.3..4.8771.68...3, 11.1, 10.7, mith
32 - ..............1.23..4.5...1.16.7....5.81.4..77..56...8.65..7.8.47.8.5..68.164.7.., 11.1, 10.6, mith
33 - ........1.....2....34...256....271.....8.6..7.6715..28.5.6..7.2.7.2.1.858...7561., 10.9, 10.6, mith
34 - ........1.....2....13.....4...5....671.7.5683.36.8.715..51.68..363.7..5..7.8..5.16, 10.9, 10.6, mith
35 - ........1..2.13.4..154...6....76..38..38.471.7....14.6.3...867..8.37...42.7.46.8., 10.2, 9.8, mith
36 - .............12.34..153..26.178.3....5.12..7.2.8.57..3.7238....13.2.5.878.5.71..., 10.4, 10.2, mith
```

And the reverse:

CODE: SELECT ALL
```
19 - ...........1..2..3.4..5.67.....4..5....8.....7..3....1....8.....5.....4.3..1....8, 10.2, 10.3, mith
20 - ...........1..2..3.4..5..6.........7...58..4.3....72....7...1...6.9...5..8.4....., 10.2, 10.4, mith
21 - ........1.....2.3....45.6....1.....2.7..6.8..48.5.......9..3.....6.8.....5...4.7.., 11.5, 11.8, mith
22 - ..............1..2.13.4..5...6..3....7.1...3.8...54....47....1..5.7....96.......5, 10.9, 11.3, mith
23 - .......12..1..3....4..5.6.....7.8.....6..9.2..8.3.....7..69..5...9.....4.5...6..2., 10.9, 11.3, mith
24 - ........1.....2.3...4.5.6.......3..6.4..6.5..6.57...2..581......96.....74...9.8.., 10.9, 11.3, mith
25 - ..............1.23..4..215......3.16..3.4.5...2.6.54...1.....4..3..5....7.82....5, 10.9, 11.3, mith
26 - ...........1..2..3..4.5..26....2.......4...1..7281.5.4....8.....275.1.4.8...7.2.5, 10.9, 11.3, mith
27 - ........1..2..3.....1..4.5......561..1..76...8.62..5.7...5..8...2..671..5.7....62, 10.9, 11.3, mith
28 - ..............1.23.24...1.5..1.62.74.7.1.4...6.....2...1..278...8.4.6...2.681...., 10.9, 11.3, mith
29 - ..............1.23.24...1.5.1..267...7.4.8...2.871.....621.4...7...82.648.......1, 10.9, 11.3, mith
30 - ........1....23.....2..4..5.16.7..525.7..681.82........71.6....28.5...766.5...12., 11.0, 11.3, mith
31 - ........1....23....24..5....67.4..1214...687.8.2.....6.78.6.1..21....7..4.67...28, 11.0, 11.3, mith
32 - ........1.......2...3.14..5.36..17...4..3..687.8.46.1..6418....31.4.7.8.8.7.63..., 10.3, 10.6, mith
33 - ..............1.23..2..45...23.67.8568...3.7.7.5.....6.6..3.75.25..7..383.78..6.2, 10.4, 10.6, mith
34 - ........1.....2.3..4516.72........8...38.7.62.8.23.1.7..762.81..68...2.31..3.8.76, 10.2, 10.6, mith
35 - ...........1..2.34.35.6472.....48.17.8.6..24.1..2.78......86.72..67.148...842...1, 10.2, 10.3, mith
36 - ..............1.23.24.5361.....178...7856.13.5..3.8.67....7538...713...6.5.8.6.71, 10.2, 10.3, mith
```

These are just getting the first one in the database, so there could be a ton tied for the same difference. I'm going to have a closer look at that 11.8 skfr_ER, see if morphing it makes any difference on the ER.