

The hardest sudokus (new thread)

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Re: The hardest sudokus (new thread)

by denis_berthier » Mon Mar 07, 2022 11:24 am

““ hendrik_monard wrote:

““ denis_berthier wrote:

.

Conclusion: as of now, in addition to Loki (and its equivalent 11.8 form), there are two 11.8 puzzles not in T&E(2):

.....1.....2.34.35.....62.....7.3.25..885...67...7853....32..68...5.62.7.8. ED=11.9/11.9/3.4

.....1.....2.34.35.....62.....7.3.25..885...67...7853....32..68...5.62.7.8. 30c not in T&E(2)

These two are not minimal. As I understood it, they are an expansion of the group of puzzles on the following lines.

The first relates to Loki and friend(s), and the second to two other puzzles from mith with respectively 26c and 27c.

It is interesting to observe that in the last case the puzzles are in T&E(2) but the expansion is not. I interpret this as an indication that a higher number of clues can cause a higher ranking, even if the 'puzzle' is not minimal. Of course one has to be careful with results obtained for non minimals.

Hi Hendrik,

I know these two are not minimal.

In my treatment of series 3, as I explained, I checked only the 74 expansions (not the 146 puzzles).

Who said the puzzles with any of these two expansions are in T&E(2)? Obviously, they can't be. I don't need to make any computations for stating this:

- adding clues can't in any way increase any of my ratings/classifications;

- T&E(n) and all of these classification results are totally unrelated to minimality.

denis_berthier

2010 Supporter

Posts: 3334

Joined: 19 June 2007

Location: Paris

Re: The hardest sudokus (new thread)

by hendrik_monard » Tue Mar 08, 2022 9:21 am

““ denis_berthier wrote:

. I don't need to make any computations for stating this:

- adding clues can't in any way increase any of my ratings/classifications;

- T&E(n) and all of these classification results are totally unrelated to minimality.

OK, I've got it.

The same cannot be said about SER. I got the following rating for the second expanded puzzle (30c) in your message:

.....1.....2.34.35.....62.....7.3.25..885...67...7853....32..68...5.62.7.8. ED=11.9/11.9/3.4

while the two related minimal puzzles (resp. 26c and 27c) have ED=11.8/1.2/1.2

Re: The hardest sudokus (new thread)

by denis_berthier » Tue Mar 08, 2022 1:53 pm

““ hendrik_monard wrote:

““ denis_berthier wrote:

. I don't need to make any computations for stating this:

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Interesting. That'll make one more example of the inconsistencies of the SER.

However, that doesn't change the status of the SER as the only *de facto* reference as a vague measure of difficulty.

Re: The hardest sudokus (new thread)

by champagne » Tue Mar 08, 2022 6:32 pm

““ hendrik_monard wrote:

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while the two related minimal puzzles (resp. 26c and 27c) have ED=11.8/1.2/1.2

Once more, in the very high ratings, in 2005, Nicolas Juillerat limited the search to have an acceptable run time.

The result is a small deviation of the results in the different morphs of a puzzle.

Adding a clue, you can in some way have another morph of the puzzle analyzed.

Nobody proposed so far a "difficulty rating" receiving an agreement of the community.

And it's not a rating telling that a puzzle solved manually by one of our friends in less than one our is "the hardest ever seen" that can push us to take such a rating as reference

Re: The hardest sudokus (new thread)

by mith » Tue Mar 08, 2022 8:49 pm

Bigger update today, but no 11.8+.

11.7 (27c-31c):

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11.6 (26c-31c):

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I haven't started work on this yet, but am finalizing a database scheme for tracking singles-expanded puzzles. Once that's done, I will likely only post expanded forms + info about number of minimals, clue count range for minimals, and SER range (if different from the SER of the expanded form). I am also going to work on setting up a website this week, where I will host the "official" database updates (both expanded and minimal).

Re: The hardest sudokus (new thread)

by denis_berthier » Wed Mar 09, 2022 10:00 am

““ mith wrote:

I haven't started work on this yet, but am finalizing a database scheme for tracking singles-expanded puzzles. Once that's done, I will likely only post expanded forms + info about number of minimals, clue count range for minimals, and SER range (if different from the SER of the expanded form).

Before you start creating the databases, could you post your full schemes so that we can make comments on what's possibly missing?

As shown by my stats (<http://forum.enjoysudoku.com/relation-between-difficulty-and-number-of-candidates-139836.html>), candidates count after Singles (though not very predictive) is at least as interesting than clue count (for different reasons).

As I said before, I'm mostly interested in minlexed "expanded" forms, but I also need to be able to easily relate them to previously existing puzzles for which I've already computed the BpB classification.

Re: The hardest sudokus (new thread)

by coloin » Wed Mar 09, 2022 7:12 pm

Maybe it would be easy to morph the entire collection [to the minlex solution grid] and then group all the puzzles from the same grid, its quite possible and likely that many of the original entries are related if they have the same solution grid and maybe more are to be found... maybe mith has done this to an extent ...

Re: The hardest sudokus (new thread)

by mith » Wed Mar 09, 2022 9:49 pm

If it has a sufficiently high rating, I have already singles-expanded and found all the minimals. The highest rating (max(ER,skfr_ER)) that hasn't been expanded at the moment is 11.2 (all 23c), and I just tweaked my script to go ahead and run through all of these before moving on. Still a very large number to process from the 11.0-11.1 range though (about 1.5 million).

I've thought about using the minlex solution form for comparison, but haven't tried to implement that yet. At this point probably the fastest thing to do would be to generate the singles-expanded form for all the remaining puzzles "without" minimizing, and then come back and run the minimizing on the expanded database. (If a minimal is marked as expanded, then I don't need to rerun the minimize step on the expanded form; I can just carry over the expanded flag.)

Anyway, when I do the separate expansion database (which I expect to take about a week), I'll be adding the minlex expanded form as a new column in the minimal databases, so it will be easy to cross-reference. And yes, Denis, I can post the schemas before I run anything.

Re: The hardest sudokus (new thread)

by hendrik_monard » Thu Mar 10, 2022 9:24 am

There seems to be a tendency towards minlex for the future database.

I've not been able to integrate existing minlex algorithms available on the internet in my script (VBA under MS Office). For skfr and SER i use exe-files found on the internet. However I found no exe version for minlex calculation.

Has someone an idea how I could proceed?

by 1to9only » Thu Mar 10, 2022 10:15 am

Snippets from previous posts:

““ mith wrote:

Denis/Hendrik, I use the minlex from gsf: <http://gsf.cococlyde.org/download/sudoku>

““ mith wrote:

I use sudoku-linux.i386-64. Complete documentation is in sudoku.html (download tab, sudoku will take you to google drive).

Command for minlex is ./sudoku-linux.i386-64 -f%#mc' [puzzle or input file]

It uses 0 for blanks, I use sed to convert to . format.

““ JPF wrote:

hi Mith,

““ IIRC it may have some bugs and not always find the actual minlex grid but at least is consistent?

Yes that point was discussed [here](#)

Both gsfprogram and dobrichev's gridchecker have the same bug: for some puzzles (not full grids) they don't give the minlex value.

But ... there are good reasons to believe that they give for any puzzles a canonicalized form c ; i.e: c(P1)=c(P2) if and only if P1 and P2 are equivalent.

Note that gridchecker is much faster than gsf's.

In Windows I use sudoku.exe with this command:

CODE: SELECT ALL

sudoku.exe -qFN -f%#mc puzzles.txt > minlex.txt

Re: The hardest sudokus (new thread)

by coloin » Thu Mar 10, 2022 12:18 pm

The bug is in the minlexpuzzle determination.

AFAIK there is no bug in the puzzle-in-minlexgrid determination

Command is

CODE: SELECT ALL

sudoku -64 -qFN -f%#0c

[puzzle in minlexgrid], [labelling 0 to .. with sed]

of course the puzzle in minlex solution grid morph is not satisfactory for human solvers !

Re: The hardest sudokus (new thread)

by JPF » Thu Mar 10, 2022 1:02 pm

Right.

Take this 17 clue puzzle:

CODE: SELECT ALL

.....1.....2.....34.....3.....3.45.2.....6.....4...1.67.....28...7....

Then:

gsf-MinLex

CODE: SELECT ALL

.....1.....2.....34.....3.....3.45.2.....6.....4...1.67.....28...7....

Real MinLex

CODE: SELECT ALL

.....1.....1.23..4.5.....6.....4...12.....2...6...7...8...8.5...4..

Re: The hardest sudokus (new thread)

by mith » Thu Mar 10, 2022 8:11 pm

Big batch today, both 11.6 and 11.7 from the 26c-30c minimal range:

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Re: The hardest sudokus (new thread)

by mith » Thu Mar 10, 2022 8:22 pm

rangsk (from CTC discord) has a minlex tool which does not have this bug: <https://github.com/dclamage/SudokuClassicMinLex> Unfortunately, it's currently far too slow to consider converting all the puzzles in the database. (His work on this developed initially as an anti-knight and sudoku x minlex tool for the purpose of finding minimal clue counts for those constraints.) I might run this on the 11.6+ puzzles (either minimal or expanded form, or both), but I would still need to keep the gsf version in the database as a consistent check for uniqueness.

We did a quick test with one of Denis' controlled-bias sets and came up with an error rate of around 10% for gsf's minlex. We think the error has something to do with finding the lexically minimal "pattern" and then only finding the minlex from the subset of puzzles with that pattern - this fails to take into account cases like JPF's example, where the true minlex has repeated 1s in band 1 (and is therefore not the minimal pattern).

I also think maxlex would be far less prone to this sort of error, and probably faster to compute, but since neither gsf nor rangsk's tool currently supports this I haven't pursued testing accuracy or speed.

Re: The hardest sudokus (new thread)

by coloin » Thu Mar 10, 2022 9:25 pm

swb01 also ? has developed a minlexer

Minlex Routine

maybe it is faster

I agree that the max lex format might well be a way to eradicate any error - although 18/27 clue puzzles with 2/3 clues in each row will challenge it as before

at any rate the pseudominlexer from gsf seems to convert the real minlex to its pseudo minlex rather consistently !!

