The hardest sudokus (new thread)

Re: The hardest sudokus (new thread)

by heetbeet » Fri Aug 20, 2021 9:28 am

heetbeet — Posts: 2 — Joined: 16 August 2021

Thanks for the reply

> **denis_berthier wrote:**
> Could you say a word about the two techniques, the main results and why you compare them only for the hardest instances?

Our technique is aimed at constraint satisfaction problems in general (but slightly more aimed at graph coloring problems). It is based on the belief propagation techniques found in https://arxiv.org/ftp/arxiv/papers/1212/1212.2463.pdf with some extra insights from sources such as https://ieeexplore.ieee.org/document/4454429, https://uol.de/f/5/inst/physik/ag/compphys/download/talks/heiko_bauke.pdf, http://www.ece.ualberta.ca/~madjid/Files/Publications/TR081231.pdf, https://research.ee.sun.ac.za/pgms/Resources/graphcoloring.pdf, combined with a form of sequential variable elimination https://en.wikipedia.org/wiki/Variable_elimination to ensure that the system will either always converge or blow up the memory for problems too hard (it wouldn't get "stuck" in a loop or converge to an incorrect result, it is proven to retain the solution space).

We compare this combined-family of techniques to previous Sudoku Attempts (we use their 2010 Gordon Royle 17-entry dataset for exact comparison), and also to the ACE system http://reasoning.cs.ucla.edu/ace/moreInformation.html as recommended by a previous review cycle. For our system and the ACE system, the much-referenced 17-entry set is too easy (from reading the Sudoku literature it seems like the general consensus stops at thinking that 17-entries is what is required of a Sudoku to be most-difficult, e.g. https://www.dcc.fc.up.pt/~acm/sudoku.pdf; which seems to be proven wrong by this Champagne set). With this said, we were looking for some nice, fairly-difficult but well-understood graph coloring problems to use as a comparison metric. We also used a ton of Killer Sudokus, Calcudokus, Kakuros and Fill-a-Pix for further *colouring* in our puzzle database.

Thanks for the reply, since there seems to be no other papers where Champagne is references, I'll go with your explanation (with maybe a reference to https://pdfs.semanticscholar.org/87cc/6591845d4023aeeec8121aa20f72dc4d32c7.pdf to show the Sudoku Explainer metric). I'll post the paper here after all is done, but it might not be that interesting to this thread, since there are better Sudoku-specific techniques out there.

Re: The hardest sudokus (new thread)

by mith » Sat Aug 21, 2021 2:32 am

mith — Posts: 862 — Joined: 14 July 2020

CODE: SELECT ALL
```
29c
........1....23.....21.4.....5....6..27.6.18.68....5.7.7......521....8.65.86.172.  ED=11.7/1.2/1.2
```

Re: The hardest sudokus (new thread)

by denis_berthier » Sat Aug 21, 2021 4:17 am

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

> **heetbeet wrote:**
> For our system and the ACE system, the much-referenced 17-entry set is too easy (from reading the Sudoku literature it seems like the general consensus stops at thinking that 17-entries is what is required of a Sudoku to be most-difficult,

Probably, you are not reading the right Sudoku literature. Most of what's published about Sudoku in scientific journals is pure BS, lagging 10 or 20 years behind current knowledge.
It has long been known in the Sudoku community that 17-clue puzzles are in the mean easier than other puzzles.
To be more precise, I wrote in [PBCS, section 6.4]:

> **PBCS wrote:**
> Graphically, the W rating distribution of n-clue puzzles looks like a wave. When n increases, the wave moves to the right, with a longer tail on its left and a steeper front on its right. The same remarks apply if the W rating is replaced by the SER.

This is developed in much more precise form on my webpages (https://denis-berthier.pagesperso-orange.fr/HLS/Classification/index.html, see sections 1.3.2 and 1.3.3), where it is shown that the mean W or SER ratings increase with n, for all the types of generators studied.
As for the real dependencies of the W or SE ratings wrt the number of clues (i.e. in unbiased stats), they are given in sections 3.1.3 and 3.1.4. which show that the real mean difficulty of minimal puzzles increases with their number of clues. This may be counter-intuitive, but that's how it is.
I just remember now, I've also published it on GitHub: https://github.com/denis-berthier/Controlled-bias_Sudoku_generator_and_collection/blob/master/Docs/W-classification-results.pdf

> **heetbeet wrote:**
> e.g. https://www.dcc.fc.up.pt/~acm/sudoku.pdf;

> **the above paper wrote:**
> Definition 1 A Sudoku puzzle is minimum if it has exactly 17 clues.

doesn't even known the definition of minimal puzzle.

> **heetbeet wrote:**
> which seems to be proven wrong by this Champagne set).

The set is not champagne's; champagne assembled a collection of puzzles created by many different people, as is clear from the names in the collection. He never claimed the puzzles to be his; but he also contributed to the collection.
As for the previous assumption being proven wrong, that was known to be wrong much before champagne started to assemble this collection.

> **heetbeet wrote:**
> Thanks for the reply, since there seems to be no other papers where Champagne is references, I'll go with your explanation (with maybe a reference to https://pdfs.semanticscholar.org/87cc/6591845d4023aeeec8121aa20f72dc4d32c7.pdf to show the Sudoku Explainer metric).

It's a pity you have to refer to a third-class paper with a second-hand definition of the SER and zero added value. Unfortunately, the only references to SER I know are on this website. The following original list is too long to be published in your paper, but here it is for your own information:

CODE: SELECT ALL
```
 1.0 Single
 1.2 Hidden Single in box
 1.5 Hidden Single in line
 1.7 Direct Pointing
 1.9 Direct Claiming
 2.0 Direct Hidden Pair
 2.3 Naked Single
 2.5 Direct Hidden Triplet
 2.6 Pointing
 2.8 Claiming
 3.0 Naked Pair
 3.2 X-Wing
 3.4 Hidden Pair
 3.6 Naked Triplet
 3.8 Swordfish
 4.0 Hidden Triplet
 4.2 XY-Wing
 4.3 [Direct Hidden Quad]
 4.4 XYZ-Wing
 4.5 UR Types 1 or 2 or 4 or 3 w/ hidden pair
 4.6 UR Type 3 w/ naked pair or hidden triplet
     UL Types 1 or 2 or 4 or 3 w/ hidden pair (6 cells)
 4.69 UL Type 3 w/ a naked pair or hidden triplet (6 cells)
 4.7 UR Type 3 w/ naked triplet or hidden quad
     UL Types 1 or 2 or 4 or 3 w/ hidden pair (8 cells)
 4.8 UR Type 3 w/ naked quad
     UL Type 3 w/ naked triplet [or hidden quad] (6 cells)
     UL Type 3 w/ naked pair or hidden triplet (8 cells)
 4.89 UL Type 3 w/ naked quad (6 cells)
 4.9 [UL Type 3 w/ naked triplet or hidden quad (8 cells)]
 5.0 Naked Quad or UL 1 or 2 or 4 (>=10 cells)
 5.1 UL Type 3 w/ naked pair (>=10 cells)
 5.2 Jellyfish
 5.3 Unknown
 5.4 Hidden Quad
 5.5 Unknown
 5.6 BUG Type 1
 5.7 BUG Type 2 or 4
 5.8 BUG Type 3 w/ naked pair
 5.9 BUG Type 3 w/ naked triplet
 6.0 BUG Type 3 w/ naked quad
 6.1 BUG Type 3 w/ naked quint
 6.2 Aligned Pair Exclusion
 6.3 Unknown
 6.4 Unknown
 6.5 Bidirectional X-Cycle or Bidirectional Y-Cycle (1-4 nodes)
 6.6 Turbot Fish
     Forcing X-chain or Bidirectional Y-Cycle (5-6 nodes)
 6.69 Forcing X-Chain (7-8 nodes)
 6.7 Bidirectional Y-cycle (7-8 nodes)
 6.8 Forcing X-Chain or Bidirectional Y-cycle (9-12 nodes)
 6.9 Forcing X-Chain or Bidirectional Y-cycle (13-16 nodes)
 7.0 Bidirectional Y-cycle (17-24 nodes)
     Forcing Chain or Bidirectional Cycle (1-4 nodes)
 7.1 Forcing Chain or Bidirectional Cycle (5-6 nodes)
 7.2 Forcing Chain or Bidirectional Cycle (7-8 nodes)
 7.3 Forcing Chain or Bidirectional Cycle (9-12 nodes)
 7.4 Forcing Chain (13-16 nodes)
 7.5 Forcing Chain (17-24 nodes)
     Aligned Triplet Exclusion
 7.6 Forcing Chain (25-36 nodes)
     Nishio Forcing Chain (5-6 nodes)
 7.7 Nishio Forcing Chain (7-8 nodes)
 7.8 Nishio Forcing Chain (9-12 nodes)
 7.9 Nishio Forcing Chain (13-16 nodes)
 8.0 Nishio Forcing Chain (17-24 nodes)
 8.1 Nishio Forcing Chain (25-36 nodes)
 8.2 Multiple (7-8 nodes) Region Forcing Chains
 8.3 Multiple (9-12 nodes) Cell/Region Forcing Chains
 8.4 Multiple (13-16 nodes) Cell/Region Forcing Chains
 8.5 Multiple (17-24 nodes) Cell/Region Forcing Chains
 8.6 Multiple (25-36 nodes)
     Dynamic (5-6 nodes) Cell/Region Forcing Chains
 8.7 Dynamic (7-8 nodes) Cell/Region Forcing Chains
 8.8 Dynamic (9-12 nodes) CRCD Forcing Chains
 8.9 Dynamic (13-16 nodes) CRCD Forcing Chains
 9.0 Dynamic (17-24 nodes) CRCD Forcing Chains
 9.1 Dynamic (25-36 nodes) CRCD Forcing Chains
 9.2 Dynamic (37-48 nodes) CRCD Forcing Chains
 9.3 Dynamic (49-72 nodes)
     Dynamic + (9-12 nodes) CRCD Forcing Chains
 9.4 Dynamic (73-96 nodes)
     Dynamic + (13-16 nodes) CRCD Forcing Chains
 9.5 Dynamic + (17-24 nodes) CRCD Forcing Chains
 9.6 Dynamic + (25-36 nodes) CRCD Forcing Chains
 9.7 Dynamic + (37-48 nodes) CRCD Forcing Chains
 9.8 Dynamic + (49-72 nodes) CRCD Forcing Chains
 9.9 Dynamic + (73-96 nodes) CRCD Forcing Chains
10.0 Dynamic + (97-144 nodes)
     Dynamic + Forcing Chains (17-24 nodes) CRCD Forcing Chains
10.1 Dynamic + (145-192 nodes)
     Dynamic + Forcing Chains (25-36 nodes) CRCD Forcing Chains
10.2 Dynamic + Forcing Chains (37-48 nodes) CRCD Forcing Chains
10.3 Dynamic + Forcing Chains (49-72 nodes) CRCD Forcing Chains
10.4 Dynamic + Forcing Chains (73-96 nodes) CRCD Forcing Chains
10.5 Dynamic + Forcing Chains (97-144 nodes) CRCD Forcing Chains
10.6 Dynamic + Forcing Chains (145-192 nodes) CRCD Forcing Chains
10.7 Dynamic + Forcing Chains (193-288 nodes) CRCD Forcing Chains
10.8 Dynamic + Forcing Chains (289-384 nodes) CRCD Forcing Chains
10.9 Dynamic + Multiple Forcing Chains (73-96 nodes) CRCD Forcing Chains
11.0 Dynamic + Multiple Forcing Chains (97-144 nodes) CRCD Forcing Chains
11.1 Dynamic + Multiple Forcing Chains (145-192 nodes) CRCD Forcing Chains
11.2 Dynamic + Multiple Forcing Chains (193-288 nodes) CRCD Forcing Chains
11.3 Dynamic + Multiple Forcing Chains (289-384 nodes) CRCD Forcing Chains
11.4 Dynamic + Multiple Forcing Chains (385-576 nodes) CRCD Forcing Chains
11.4 [Dynamic + Dynamic Forcing Chains (73-96 nodes) Region/Contradiction Forcing Chains]
11.5 [Dynamic + Dynamic Forcing Chains (97-144 nodes) Region Forcing Chains]
11.6 [Dynamic + Dynamic Forcing Chains (145-192 nodes) Cell Forcing Chains]
11.7 [Dynamic + Dynamic Forcing Chains (193-288 nodes) Double Forcing Chains]

CRCD=Cell/Region/Contradiction/Double
UL=Unique Loop
UR=Unique Rectangle
BUG=Bivalue Universal Grave
```

> **heetbeet wrote:**
> I'll post the paper here after all is done, but it might not be that interesting to this thread, since there are better Sudoku-specific techniques out there.

I think this is not the proper thread to post this; probably, you should make a new thread in the "software" section. I'm sure several of us will be interested in your results. Most of what's discussed on this forum is about resolution rules and pattern-based solutions, but this is not exclusive of other techniques.

Re: The hardest sudokus (new thread)

by mith » Sat Aug 21, 2021 9:32 pm

mith — Posts: 862 — Joined: 14 July 2020

New 11.8:

CODE: SELECT ALL
```
........1....12.....34...5.....6...2.7....53..8.5..4...378.....1....9...94....7..  ED=11.8/1.2/1.2
```

Re: The hardest sudokus (new thread)

by eleven » Sat Aug 21, 2021 11:58 pm

eleven — Posts: 2820 — Joined: 10 February 2008

> **heetbeet wrote:**
> https://www.dcc.fc.up.pt/~acm/sudoku.pdf

It's really impressing, that about 10 years after people in this forum posted free programs, which solve each known puzzle (100 times harder than the author's ones) in a split second, a paper is written where it says
"No puzzle requiring more than 3 minutes (in a relatively old computer) was found."

Re: The hardest sudokus (new thread)

by eleven » Sun Aug 22, 2021 12:04 am

eleven — Posts: 2820 — Joined: 10 February 2008

> **mith wrote:**
> New 11.8

Congrats, i am really surprised by your findings, both by the hard ratings of > 24 clue puzzles and by this one, cause i thought, the 22 clue space is already well searched.

Re: The hardest sudokus (new thread)

by denis_berthier » Sun Aug 22, 2021 6:58 am

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

> **mith wrote:**
> New 11.8:
>
> CODE: SELECT ALL
> ```
> ........1....12.....34...5.....6...2.7....53..8.5..4...378.....1....9...94....7..  ED=11.8/1.2/1.2
> ```

Congrats for the new 11.8; a new puzzle with such a high rating is becoming very rare.
As usual, I computed its BpB classification: B5B (exactly).

Re: The hardest sudokus (new thread)

by ghfick » Sun Aug 22, 2021 9:39 pm

ghfick — Posts: 160 — Joined: 06 April 2016

YZF_Sudoku finds an MSLS but the path is still long and tough

Hidden Single: 1 in b1 => r3c2=1
Locked Candidates 1 (Pointing): 5 in b2 => r1c1<>5,r1c2<>5,r1c3<>5
Locked Candidates 2 (Claiming): 8 in c1 => r1c3<>8,r2c3<>8
2-String Kite: 2 in r3c7,r8c2 connected by r1c2,r3c1 => r8c7 <> 2
MSLS:16 Cells r3567c1569, 16 Links 78r3,48r5,37r6,45r7,26c1,29c5,16c6,69c9
18 Eliminations:r49c6<>1,r89c5,r1c1<>2,r5c3,r7c8<>4,r289c9,r1c16,r2c1,r9c6<>6,r6c8<>7,r3c7<>8,r1c5,r2c9<>9
Locked Pair: in r9c5,r9c6 => r7c5<>5,r7c6<>5,r8c4<>3,r8c5<>35,r9c4<>3,r9c3<>5,r9c4<>3,r9c9<>35,
Naked Single: r9c9=8
Hidden Single: 8 in b7 => r8c3=8
Locked Candidates 1 (Pointing): 8 in b6 => r4c6<>8
Naked Triple: in r3c9,r5c9,r6c9 => r2c9<>7,r7c9<>69,
2-String Kite: 1 in r4c7,r9c4 connected by r7c7,r9c8 => r4c4 <> 1
Uniqueness Test 4: 35 in r19c56 => r1c56 <> 3
Locked Candidates 1 (Pointing): 3 in b2 => r4c4<>3
AIC Type 2: 3r1c4 = r1c7 - r2c9 = (3-5)r8c9 = r8c2 - (5=9)r4c2 - (9=7)r4c4 => r1c4<>7
AIC Type 1: 2r3c7 = r3c1 - r1c2 = (2-5)r8c2 = r8c9 - (5=4)r7c9 - (4=2)r7c5 => r7c7<>2
Locked Candidates 2 (Claiming): 2 in c7 => r1c8<>2
AIC Type 2: 8r4c8 = (8-1)r4c7 = (1-9)r7c7 = 9r7c8 => r4c8<>9
Grouped AIC Type 1: 5r2c3 = r4c3 - (5=9)r4c2 - (9=7)r4c4 - r8c4 = (7-4)r8c5 = r8c89 - (4=5)r7c9 - r7c1 = 5r8c2 => r2c2<>5
AIC Type 2: (6=9)r2c2 - (9=5)r4c2 - r4c3 = 5r2c3 => r2c3<>6
Grouped AIC Type 2: 9r3c5 = r56c5 - (9=7)r4c4 - r8c4 = 7r8c5 => r3c5<>7
Grouped AIC Type 2: 9r3c5 = r56c5 - (9=7)r4c4 - r8c4 = (7-4)r8c5 = r8c89 - (4=5)r7c9 - r7c1 = (5-2)r8c2 = r1c2 - r1c7 = 2r3c7 => r3c7<>9
Grouped AIC Type 1: (9=5)r4c2 - r8c2 = r8c9 - (5=4)r7c9 - r7c56 = (4-7)r8c5 = r8c4 - (7=9)r4c4 => r4c3<>9 r4c7<>9
Empty Rectangle : 9 in b6 connected by r3 => r6c5 <> 9
Grouped AIC Type 1: (7=9)r4c4 - (9=5)r4c2 - r8c2 = r8c9 - (5=4)r7c9 - r7c56 = (4-7)r8c5 = 7r8c4 => r2c4<>7
Almost Locked Set XZ-Rule: A=r2c249 {3469},B=r8c79,r7c9 {3456}, X=4, Z=6 => r2c7<>6
Almost Locked Set XY-Wing: A=r16789c5{234578}, B=r134569c6{1345678}, C=r12c4,r3c5{3689}, X,Y=8, 6, Z=4 => r5c5,r7c6<>4
Cell Forcing Chain: Each candidate in r2c4 true in turn will all lead r1c2<>9
3r2c4 - r2c9 = (3-5)r8c9 = r8c2 - (5=9)r4c2 - 9r1c2
6r2c4 - (6=9)r2c2 - 9r1c2
9r2c4 - r4c4 = r4c2 - 9r1c2
Region Forcing Chain: Each 6 in c7 true in turn will all lead r1c3<>2
6r1c7 - (6=2)r1c2 - 2r1c3
(6-2)r3c7 = r1c7 - 2r1c3
6r7c7 - (6=1)r7c6 - r9c4 = (1-2)r5c4 = r56c5 - (2=4)r7c5 - (4=5)r7c9 - r8c9 = (5-2)r8c2 = r1c2 - 2r1c3
(6-3)r8c7 = (3-5)r8c9 = (5-2)r8c2 = r1c2 - 2r1c3
Region Forcing Chain: Each 6 in c7 true in turn will all lead r1c3<>6
6r1c7 - 6r1c3
(6-2)r3c7 = r1c7 - (2=6)r1c2 - 6r1c3
6r7c7 - (6=1)r7c6 - r9c4 = (1-2)r5c4 = r56c5 - (2=4)r7c5 - (4=5)r7c9 - r8c9 = (5-6)r8c2 = r12c2 - 6r1c3
6r8c7 - r8c2 = r12c2 - 6r1c3
Almost Locked Set XY-Wing ,Triple Links: A=r128c2{2569}, B=r124c3{1459}, C=r4c2478{15789}, X,Y=5, 1, Z=(9) => r4c6<>7
Grouped AIC Type 2: 7r3c9 = r6c9 - r4c8 = (7-9)r4c4 = r5c45 - (9=6)r5c9 => r3c9<>6
Locked Candidates 2 (Claiming): 6 in c9 => r6c8<>6
Almost Locked Pair: 19 in r79c8 r7c7 r6c8 => r1c8<>9 r2c8<>9 r4c8<>1 r7c7<>6
WXYZ-Wing: 5789 in r1c56,r3c59,Pivot Cell Is r3c5 => r1c8,r3c6<>7
Locked Candidates 1 (Pointing): 7 in b2 => r1c1<>7
Hidden Pair: 57 in r1c5,r1c6 => r1c5<>8,r1c6<>8
Locked Candidates 1 (Pointing): 8 in b2 => r3c1<>8
Hidden Pair: 89 in r3c5,r5c5 => r5c5<>2
WXYZ-Wing: 2679 in r12c2,r3c19,Pivot Cell Is r3c1 => r2c7<>9
AIC Type 1: 8r1c1 = (8-7)r2c1 = r2c8 - (7=8)r4c8 => r1c8<>8
Hidden Pair: 78 in r2c8,r4c8 => r2c8<>46
Almost Locked Pair: 26 in r1c78 r3c7 r1c2 => r1c4<>6
XY-Wing: 469 in r1c3 r1c8 r2c2 => r1c2 <> 6
Naked Single: r1c2=2
Hidden Single: 2 in b3 => r3c7=2
Empty Rectangle : 2 in b7 connected by c5 => r6c3 <> 2
XY-Wing: 679 in r3c9 r3c1 r5c9 => r5c1 <> 6
XY-Chain: (6=9)r2c2 - (9=5)r4c2 - (5=6)r8c2 - (6=3)r8c7 - (3=8)r2c7 - (8=7)r2c8 - (7=9)r3c9 - (9=8)r3c5 - (8=6)r3c6 => r2c4<>6 r3c1<>6
stte

Re: The hardest sudokus (new thread)

by JPF » Mon Aug 23, 2021 8:57 pm

JPF — 2017 Supporter — Posts: 5947 — Joined: 06 December 2005 — Location: Paris, France

Hi Mith,

Nice puzzle indeed! Interesting pattern too.
When generating puzzles with that pattern, these puzzles (including yours) poped up quickly:

CODE: SELECT ALL
```
........1....12.....34...5.....6...2.7....53..8.5..4...378.....1....9...94....7..;11.8;1.2;1.2
........1....21.....34...5.....6...2.7....53..8.5..4...378.....6....9...94....7..;11.7;11.7;2.6
........1....21.....34...5.....6...2.7....53..8.5..4...378.....1....9...94....7..;11.3;1.2;1.2
........1....23.....45...6.....7...3.5....84..9.8..6...469.....2....1...18....4..;11.3;1.2;1.2
........1....21.....34...5.....6...2.7....53..8.3..4...378.....6....9...94....7..;11.3;1.2;1.2
........1....12.....34...5.....6...7.8....43..9.3..5...598.....2....7...73....9..;11.2;1.2;1.2
........1....23.....45...6.....7...2.5....48..8.4..6...659.....3....1...14....8..;11.1;1.2;1.2
........1....21.....34...5.....6...2.7....53..8.5..4...378.....9....6...64....7..;11.0;11.0;2.6
........1....12.....34...5.....6...2.4....37..7.3..5...548.....1....9...93....7..;11.0;1.2;1.2
```

but it took years to rate them with Sudoku Explainer.

Btw, what is the link of the up-to-date data base?

JPF

Re: The hardest sudokus (new thread)

by mith » Mon Aug 23, 2021 10:03 pm

mith — Posts: 862 — Joined: 14 July 2020

Yeah, I got the 11.7 at least in this morph:

CODE: SELECT ALL
```
........1....12.....34...5......6..2.7....53..8.5..4...378.....6...9....94....7..
```

Along with another related one with the same rating:

CODE: SELECT ALL
```
........1.....1.2...3.4.5.......2.6..7.43.....8.5..4...37...8..6.......995.7.....  ED=11.7/11.7/2.6
```

Probably have some of the others.

Most recent update is here: https://drive.google.com/file/d/12pGYj7 ... sp=sharing

(I'm planning to get some version of a database up eventually since I'm actively searching, so that I can update it more frequently. But I'll at least get all of my 11.6+ up in one place sometime soon.)

Re: The hardest sudokus (new thread)

by mith » Fri Aug 27, 2021 2:42 pm

mith — Posts: 862 — Joined: 14 July 2020

Well, this was unexpected:

CODE: SELECT ALL
```
23c
........1.....2.34....3.56...2.64....7.8.....8..9....6..5....4..8....1.771......9  ED=11.8/11.8/2.6
........1.....2.34....3.56...2.46....7.8......8.9....6..5....4.71......98.....1.7  ED=11.8/11.8/2.6
........1.....2.34....3.56...2.46....7.8.....8..9....6..5....4..8....1.771......9  ED=11.8/11.8/2.6
........1.....2.34....3.56...2.46....7.8.....8..9....6..4....5.18......77.....1.9  ED=11.8/11.8/2.6
........1.....2.34....3.56...2.46....7.8......8.9....6..4....5.71......98.....1.7  ED=11.8/11.8/2.6
```

Re: The hardest sudokus (new thread)

by mith » Fri Aug 27, 2021 4:51 pm

mith — Posts: 862 — Joined: 14 July 2020

Also a new pb for q1 (tied with Cheese) - well, newish, I hadn't checked in a while. (Previous best was 99431 - that one is still the highest q2 I've found at 99489.)

CODE: SELECT ALL
```
........1.....2.3....45.6......23.....467.8...7.5......85...7..1.7....299........  q1=99432, q2=99442
```

I only have q1 99000+ puzzles in the 21c-26c range, but I have a 30c breaking the q2 99100 mark (and 28c-29c breaking 99400):

CODE: SELECT ALL
```
.............1.23..1.4...5.46.....78...74...9.761.8...6849..7.19..87...7.4..6.9.  q1=97157, q2=99233
```

(That one has the same sort of trivalue oddagon pattern we were discussing a couple pages ago.)

The highs by clue count follow the same sort of curve as the SE highs; not surprising. Also not surprising is that the q1 highs fall off faster (since I'm using q2 as a primary filter).

Re: The hardest sudokus (new thread)

by urhegyi » Fri Aug 27, 2021 6:23 pm

urhegyi — Posts: 616 — Joined: 13 April 2020

Found thisone on sudokuwiki.org:

CODE: SELECT ALL
```
Please check out this puzzle. It was found by eleven who posts on The New Players' Forums.
1 . . | . . . | 7 . .
. . 7 | 1 . 9 | . . .
6 8 . | . 7 . | . . .
-------+-------+-------
. . 1 | . 9 . | 6 . .
. . . | 3 . . | . 2 .
. 4 . | . . . | . . 3
-------+-------+-------
. . 8 | . 6 . | 1 . .
5 . . | . . . | . 4 .
. . . | . . 2 | . . 5
```

Re: The hardest sudokus (new thread)

by ghfick » Sat Aug 28, 2021 12:26 am

ghfick — Posts: 160 — Joined: 06 April 2016

Each of these new 11.8/11.8/2.6 admits an MSLS so that dynamic chains are not needed

Re: The hardest sudokus (new thread)

by dxSudoku » Mon Aug 30, 2021 12:27 am

dxSudoku — Posts: 43 — Joined: 06 April 2020

I love this thread and you guys are masters at hunting for really hard puzzles. But I have a question with regards to puzzles requiring Brute-Force in order to solve a puzzle. Say for example the cell requiring Brute-Force as the next step in the solving the puzzle had 1, 3, 5 as possible candidates. And say the Brute-Force choice were the value of 1. When you run your programs for finding solutions do you stop at this point or do you continue to see if the puzzle will result in a solution grid for choosing 3 or 5 as the value of the cell? It would be really interesting and amazing if a puzzle requiring Brute-Force as part of it's solution had two possible solutions grids from the constellation of givens and values where Brute-Force was the next step required. The way I envision this as possible is if the puzzle required 2 or more Brute-Force steps which led to two different solution grids.