The hardest sudokus (new thread)

POSTREPLY Search this topic... Search

1330 posts • Page 36 of 89 • 1 ... 33 34 35 36 37 38 39 ... 89

Re: The hardest sudokus (new thread)

QUOTE

by **champagne** » Thu May 15, 2014 3:34 pm

> **petyo staykov wrote:**
> here's a new very difficult puzzle. It has ER/EP/IED 11,9,11,9,11,8
>
> Good luck to all members of the forum.
> Regards,
> Petyo Staykov

Hi,

Welcome in the forum.

This is a brilliant first post, unhappily, the puzzle is a morph of that one

CODE: SELECT ALL

```
90.7....2.....8....6.5.....4...5.3..79..5.....2...1..85..9.....1..4.....3.2.
11.9  11.8  11.8
champagne dry
```

Just for information, How did you find it

champagne
2017 Supporter

Posts: 7269
Joined: 02 August 2007
Location: France Brittany

Re: The hardest sudokus (new thread)

QUOTE

by **petyo staykov** » Thu May 15, 2014 4:30 pm

Hi [url]champagne[/url],
I am very disappointed by the new! But can I see where was your puzzle published for the first time?
Regards,
Petyo staykov

petyo staykov
Posts: 4
Joined: 11 May 2014

Re: The hardest sudokus (new thread)

QUOTE

by **champagne** » Thu May 15, 2014 7:11 pm

> **petyo staykov wrote:**
> I am very disappointed by the new! But can I see where was your puzzle published for the first time?

No reason to be disappointed.
That puzzle has been first published in that thread, but this is not the key point. I'll give the reference in a separate post.

The search for "hardest puzzles" started years ago (?? 8?)
Many many puzzles have been produced (more than one million) and it appeared very difficult to really tell what are the property of the "hardest".

I collected all known "potential hardest" and I publish several times per year an update of my data base.

The agreed rating for the data base is the rating of Sudoku Explainer, mainly for historical reasons. In that rating, your puzzle is ranked first, but believe me, it is not by far the hardest.

IMO, anybody willing to search such puzzles should first download the file of known puzzles and compare it's finding to the already discovered puzzles.

Apparently, you did not do that, and this is one reason why I asked you how you produced that puzzle.

I'll now read back that thread to find the post where that puzzle was given

Last edited by champagne on Thu May 15, 2014 7:20 pm, edited 1 time in total.

champagne
2017 Supporter

Posts: 7269
Joined: 02 August 2007
Location: France Brittany

Re: The hardest sudokus (new thread)

QUOTE

by **champagne** » Thu May 15, 2014 7:18 pm

It has not been to hard to find the corresponding post

here p18

so that puzzle has been first published in July 2011

EDIT I red the post following the link given above.

That puzzle had earlier been seen by eleven, but not rated and not published.

champagne
2017 Supporter

Posts: 7269
Joined: 02 August 2007
Location: France Brittany

Re: The hardest sudokus (new thread)

QUOTE

by **petyo staykov** » Fri May 16, 2014 12:32 pm

Hi champagne,
Thank you! I am fully satisfied. Was little late with that sudoku - only three years... I am new in hard sudoku creating - I started only seven weeks ago. It seems that you boys work hard. I currently have 114 sudokus over 11.0 but checking my five 11.7's I in your update file I found that all they are isomorphs... About my strategies - nothing new under the sun. Taking a good sudoku, removing m and adding n clues I make different number of sudokus with permutation of 8 chosen by me clues. If it is promising I go ahead and start iterating filling the new form with different numbers until I exhaust the form. My computer works day and night 24X7. I have 3 more computers but they are outdated, the laptop is good - I **5 3 GGhz** but started restarting rather often and it is a hardware error. I also carefully plan the clues in a sudoku (trying to achieve max solutions) and then add 4 to 8 numbers randomly - creating millions sudokus but only a small number have 1 solution, it depends. BTW, do you know a program which will batch process a number of 16 clues sudokus and is fast enough in the same time /giving the number of solutions in a text file/. I read a post of colin mentioning such a program. If you know a link please give it to me. Thanks in advance.
All the best to you,
Petyo Staykov

petyo staykov
Posts: 4
Joined: 11 May 2014

Re: The hardest sudokus (new thread)

QUOTE

by **champagne** » Sat May 17, 2014 8:48 am

> **petyo staykov wrote:**
> BTW, do you know a program which will batch process a number of 16 clues sudokus and is fast enough in the same time /giving the number of solutions in a text file/. I read a post of colin mentioning such a program. If you know a link please give it to me. Thanks in advance.
> All the best to you,
> Petyo Staykov

Preliminary remark :

Starting in the search of hardest puzzles, especially in the area 20-22 clues could be very disappointing without fresh idea to find seeds.

That area has been deeply searched for years.

Regarding your request, I am somehow surprised.

Any program checking the validity of a puzzle is based on the count of solutions, so you surely have in hands such a program.

The only point is that, checking validity you can stop at the second puzzle found.

Counting the number of solutions can be very long if the puzzle has millions of solutions, what can be. I remember posts of tarek telling "I stopped the count at ..."

champagne
2017 Supporter

Posts: 7269
Joined: 02 August 2007
Location: France Brittany

Re: The hardest sudokus (new thread)

QUOTE

by **petyo staykov** » Sun May 25, 2014 5:08 pm

Thank you champagne.
What I meant was a program like Dobrichev's gridchecker - it's an excellent one! Thank you Dobrichev!
Your compatriot,
petyo staykov

petyo staykov
Posts: 4
Joined: 11 May 2014

Re: The hardest sudokus (new thread)

QUOTE

by **tsaeff** » Wed May 28, 2014 10:11 pm

Is it just me, or are the patterns on a lot of these puzzles very similar?

I have rewritten each of the SE Top 5 as isomorphs which share these characteristics:

1. All but #3 share the same pattern in box 1.
2. Boxes 2 and 4 contain exactly 1 given. (Exception at #3 box 4 which contains 0)
3. Boxes 3 and 7 have exactly 2 givens, which do not share a row or column. (Exception at #4 box 7)
4. Boxes 5, 6, and 8, contain 3 givens which share no rows or columns which each other. (Exceptions at #3 boxes 5 and 8)
5. Box 9 contains either 2 or 3 givens which share neither a row nor a column.
6. Either the given in box 2 is parallel with the row with no givens in box 3, and the given in box 4 is in column 3, or the given in box 2 is in row three, and the given in box 4 is in the column with no givens in box 7. (only exception is puzzle 3 which does not have a given in box 4)
   Note: These two options can be interchanged with a diagonal swap, which does not have an effect on any other condition listed, all puzzles therefore have isomorphs which follow either option.
7. Box 3 contains 3 given in row three, and box 7 contains 3 given in column 3.
8. Boxes 6 and 8 have the same three givens. (Exception at #3)
9. Two of the givens in box 5 will appear in box 9. (Exception at #3)

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This also works for a few of the q1 and q2 puzzles, although I haven't included them. Have people been specifically targeting these kinds of patterns or has it just turned out this was how they turned out?

EDIT: Added additional items to list.

Last edited by tsaeff on Wed Sep 24, 2014 12:47 am, edited 3 times in total.

tsaeff
Posts: 80
Joined: 11 May 2014

Re: The hardest sudokus (new thread)

QUOTE

by **champagne** » Thu May 29, 2014 9:50 am

> **tsaeff wrote:**
> Is it just me, or are the patterns on a lot of these puzzles very similar?
>
> This also works for a few of the q1 and q2 puzzles, although I haven't included them. Have people been specifically targeting these kinds of patterns or has it just turned out this was how they turned out?

Hi,

You have several properties of a pattern that can generate very hard puzzles.
Some of these patterns have been clearly identified and described in several threads.

I tried to summarize the findings here exotic patterns a resume

The most common sub pattern in the file of hardest puzzles is the JExocet pattern. I am working on it to generate new seeds. I got poor results in the 20_22 clues area, but I find many new seeds in the ongoing search in the 23 clues area;

The highest SE rating I got so far with these new seeds is 11.7, but I have plenty of new puzzles to load in the data base of potential hardest.

The next update of the file should come beginning of June.

As far as I remember, the top part of the file is made of puzzles having the JExocet property

champagne
2017 Supporter

Posts: 7269
Joined: 02 August 2007
Location: France Brittany

Re: The hardest sudokus (new thread)

QUOTE

by **tsaeff** » Sat May 31, 2014 5:45 pm

> **champagne wrote:**
>
> > **tsaeff wrote:**
> > Is it just me, or are the patterns on a lot of these puzzles very similar?
> >
> > This also works for a few of the q1 and q2 puzzles, although I haven't included them. Have people been specifically targeting these kinds of patterns or has it just turned out this was how they turned out?
>
> Hi,
>
> You have several properties of a pattern that can generate very hard puzzles.
> Some of these patterns have been clearly identified and described in several threads.
>
> I tried to summarize the findings here exotic patterns a resume
>
> The most common sub pattern in the file of hardest puzzles is the JExocet pattern. I am working on it to generate new seeds. I got poor results in the 20_22 clues area, but I find many new seeds in the ongoing search in the 23 clues area;
>
> The highest SE rating I got so far with these new seeds is 11.7, but I have plenty of new puzzles to load in the data base of potential hardest.
>
> The next update of the file should come beginning of June.
>
> As far as I remember, the top part of the file is made of puzzles having the JExocet property

I am still unclear whether Tarek and Eleven were looking for these patterns when they posted these puzzles, or these patterns emerged as a result of the difficulty of the puzzles they produced. Also, given that many of the current hardest puzzles exhibit most of properties, I was wondering if the patterns which exhibit all of these properties been given a full search?

For example I expect the pattern below to contain a large number of difficult puzzles

CODE: SELECT ALL

```
XX.....
X.......X
...X.X.X..
...X.X.X..
X...X..X.
.....X..X
.X.X.X...
..X.X.X..
...X..X..X
```

tsaeff
Posts: 80
Joined: 11 May 2014

Re: The hardest sudokus (new thread)

QUOTE

by **champagne** » Mon Jun 02, 2014 12:22 pm

Hi,

I found no puzzle in the data base of potential hardest with your pattern.

A full scan for a 22 clues puzzles is a very long task.

I started a mixed search using the same bundle of techniques as those used in the pattern game. I could have by to morrow an idea of the potential of that pattern.

To be clear, the search for hardest puzzles started with no specific idea of the patterns to test except that from the very beginning players noticed that a diagonal pattern is in average harder.

The first hard pattern identified has been the SK loop. Others where discovered later.

champagne
2017 Supporter

Posts: 7269
Joined: 02 August 2007
Location: France Brittany

Re: The hardest sudokus (new thread)

QUOTE

by **eleven** » Mon Jun 02, 2014 1:26 pm

> **tsaeff wrote:**
> I am still unclear whether Tarek and Eleven were looking for these patterns when they posted these puzzles, or these patterns emerged as a result of the difficulty of the puzzles they produced.

While Tarek and Colin worked with patterns, I just made neighbourhood searches starting with random puzzles, but found there patterns this way too. See summary 2011.

eleven
Posts: 2820
Joined: 03 February 2006

Re: The hardest sudokus (new thread)

QUOTE

by **champagne** » Tue Jun 03, 2014 6:29 am

> **tsaeff wrote:**
> For example I expect the pattern below to contain a large number of difficult puzzles
>
> CODE: SELECT ALL
>
> ```
> XX.....
> X.......X
> ...X.X.X..
> ...X.X.X..
> X...X..X.
> .....X..X
> .X.X.X...
> ..X.X.X..
> ...X..X..X
> ```

So far, the highest ratings stay just below the cut off for the data base of hardest puzzles,

but one interesting (biased) ratio is the following.

Out of 23.5 millions puzzles generated, only 3.4 have a rating below SE ER=6.2

The final ratio should be higher, but still relatively low.
At the end of the day, I should have enough results in the high ratings to write more.

champagne
2017 Supporter

Posts: 7269
Joined: 02 August 2007
Location: France Brittany

Re: The hardest sudokus (new thread)

QUOTE

by **champagne** » Tue Jun 03, 2014 1:52 pm

12.....
3....4.
.5.6.7
..8.6.
6..1.2.
..7.5
1.7.9..
..4.3.
..9.5.8 ED=11.3/11.3/7.6

That one is qualified for the data base of potential hardest.
Several other puzzles are around the limit

champagne
2017 Supporter

Posts: 7269
Joined: 02 August 2007
Location: France Brittany

Re: The hardest sudokus (new thread)

QUOTE

by **champagne** » Wed Jun 04, 2014 8:08 am

I had a problem with the data base of puzzles for that pattern, so I nearly stop investigations

Here the list of puzzles inside or near the cut off for the data base of potential hardest

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I'll restore as much as possible the base of puzzles for that pattern to give statistics

champagne
2017 Supporter

Posts: 7269
Joined: 02 August 2007
Location: France Brittany

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