



Sudoku Players' Forums

- [FAQ](#)
- [Search](#)
- [Memberlist](#)
- [Usergroups](#)
- [Register](#)
- [Profile](#)
- [Log in to check your private messages](#)
- [Log in](#)

Strong inferences induced by the UR

Goto page [Previous](#) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#) [Next](#)



[Sudoku Players' Forums Forum Index](#) -> [Advanced solving techniques](#)

[View previous topic](#) :: [View next topic](#)

Author

Message

aran

Posted: Sat Jul 18, 2009 12:20 am Post subject:



Joined: 02 Mar 2007
Posts: 356

storm_norm wrote:

IV. Ucommon UR inferences.

Code:

```

-----
| 17      17      45      | 8      6      2      | *39      *49
| *35     |          |          |          |          |          |          |
| 68      [68]5   9      | 1      4      3      | *58      7
| 2        |          |          |          |          |          |          |
| 48      3      2      | 9      7      5      | 1        48
| 6        |          |          |          |          |          |          |
:-----+-----+-----:
| 3      [68]     68      | 2      1      7      | 4        5
| 9        |          |          |          |          |          |          |
| 5        9      1      | 4      3      6      | 7        2
| 8        |          |          |          |          |          |          |
| 2        4      7      | 5      9      8      | 6        3
| 1        |          |          |          |          |          |          |
:-----+-----+-----:
| 45678  U5678   4568   | 3      58     1      | 2        U689
| 57      |          |          |          |          |          |          |
| 79      2      58     | 6      58     4      | 39      1
| 37      |          |          |          |          |          |          |
| 168    U1568   3      | 7      2      9      | 58      U68
| 4        |          |          |          |          |          |          |
-----

```

this chain can be formed...

$$(9)r1c7 = (9)r1c8 - UR68r79c28[(9)r7c8 = hp(68)r24c2] - (5)r2c2 = (5)r2c7 - (5=3)r1c9; r1c7 <> 3$$

StormNorm

That doesn't look too solid...

true that the very existence of 68 in r4c2 "rules out" the possibility of a UR68 further down that column (r79c2); that said such logic even if "illogical" is not barred. Let's see starting with 9r7c8 false :

this quickly implies for the "UR" r79c28 :

r7 68 68

r9 168 68.

At that stage we can either (better) use the existing 68 in r4c2 to place (in the context of the chain) 1 in r9c2 or use ("logical/illogical") UR considerations to place 1 in r9c2.

Thus established $9r7c8=1r9c2$.

From which : $9r7c8=1r9c2-1r9c1=68r29c1-(8=4)r3c1-(4=8)r2c8-(8=6)r9c8-(68=9)r7c8$

=>**r7c8=9**

[Back to top](#)



storm_norm

Posted: Sat Jul 18, 2009 8:31 am Post subject:



Joined: 27 Feb 2008
Posts: 122

could there be an instance where a hidden pair is weakly linked to a UR? or strongly inferred to another interior/exterior candidate with respect to the UR?
if so, I would love to have that example presented in this forum.

[Back to top](#)



David P Bird

Posted: Sat Jul 18, 2009 8:50 am Post subject:



Joined: 16 Sep 2008
Posts: 138
Location: Middle England

StormNorm, There are errors in your grid in box 7 and this is what it should look like:

Code:

17	17	45	8	6	2	39	49	35
68	568	9	1	4	3	58	7	2
48	3	2	9	7	5	1	48	6
3	68	68	2	1	7	4	5	9
5	9	1	4	3	6	7	2	8
2	4	7	5	9	8	6	3	1
46789	5678	4568	3	58	1	2	689	57
79	2	58	6	58	4	39	1	37
168	1568	3	7	2	9	58	68	4

If you are looking for URs you should be looking for almost X-wings too as a UR is two Xwings confined to two boxes that coincide. An Xwing hunt shows that (5)r29c27 is already an Xwing which will exclude (5)r7c2

Now there is a (58)AUR:r78c38 => r7c3 <> 58

You were looking for a strong inference provided by URs, well these exclusions have just provided one! The rectangle of cells r47c23 now contains

68 68
678 46

This would have been a (68)AUR if we hadn't just excluded (8)r7c3 which would have provided the inference:

(7)r7c2 = (68)NP:r47c2 -[AUR]- (68)NP:r47c3 = (4)r7c3

But that inference is still valid except that this rectangle is now called an Almost Unavoidable Set. Unavoidable sets are discussed in greater detail in various threads but in the context of UR cell patterns, provided none of the cells is a given, no rectangle of cells in two boxes can be solved using just two digits, ie these rectangles must always hold at least three digits.

So, although there are umpteen ways of solving this grid, using the cells you were focussing on, we can get:

(7)r7c2 = (68)NP:r47c2 -[AUS]- (68)NP:r47c3 = (4)r7c3 - (4=5)r1c3 - (5)r2c2 = (68)NP:r24c2 => r7c2 <> 68

This is the alternating inference chain you were trying to use:

(68)NP:r78c2 - (68)NP:r24c2 = (5)r2c2 - (5)r2c7 = (5-3)r1c9 = (3-9)r1c7 = (9)r1c8 - (9)r7c8 = (68)NP:r79c8 -[UR]- (68)NP:r78c2

but it doesn't provide any exclusions, just the obvious fact that (68)HP:r78c2 is false, but that can be shown as an AIC by:

(68)NP:r78c2 - (8=6)r4c2 - (68)NP:r78c2

[Back to top](#)

 [profile](#)  [pm](#)

storm_norm

📅 Posted: Sat Jul 18, 2009 8:53 pm Post subject:

 [quote](#)

Joined: 27 Feb 2008
Posts: 122

Daved, aran, ttt,
thank you, I see the error in my logic, and I didn't know that my grid was erroneously posted either.

[Back to top](#)

 [profile](#)  [pm](#)

Myth Jellies

📅 Posted: Sun Jul 19, 2009 1:28 am Post subject:

 [quote](#)

Joined: 19 Sep 2005
Posts: 623

Code:

17	17	45	8	6	2	39	49	35
*68	*68+5	9	1	4	3	58	7	2
#48	3	2	9	7	5	1	48	6
3	*68	*68	2	1	7	4	5	9
5	9	1	4	3	6	7	2	8

2	4	7	5	9	8	6	3	1
*68+479	*68+57	*68+45	3	58	1	2	*68+9	57
79	2	#58	6	58	4	39	1	37
*68+1	*68+15	3	7	2	9	#58	*68	4

Using the digit that can't escape the deadly pattern can be extended beyond the simple x-wing. Consider the deadly extended uniqueness 68-pattern marked with asterisks above. One can quickly see that the only digit that can escape the deadly pattern is the eight. Furthermore, if you look at where the eights can escape in b1479, they all directly prevent the eight in r9c1. Here, there happens to be a simple two-string kite that performs the same deduction; but that isn't always the case.

[Back to top](#)



David P Bird

Posted: Sun Jul 19, 2009 2:18 am Post subject:



Joined: 16 Sep 2008
 Posts: 138
 Location: Middle England

Welcome back **Myth!**

Have you any examples of a BUG pattern where one of the deadly pattern digits has already been excluded from a cell? That would parallel the solution path I used above with the 4 cell almost unavoidable set.

[Back to top](#)



aran

Posted: Sun Jul 19, 2009 4:03 pm Post subject:



Joined: 02 Mar 2007
 Posts: 356

Myth Jellies wrote:

Code:

```

|-----|-----|-----|
| 17     17  45  | 8     6   2   | 39    49   |
35      | *68    *68+5  9  | 1     4   3   | 58    7    2  |
|#48    | 3     2   | 9     7   5   | 1     48   6   |
|-----|-----|-----|
| 3     *68  *68  | 2     1   7   | 4     5    9   |
| 5     | 9     1   | 4     3   6   | 7     2    8   |
| 2     | 4     7   | 5     9   8   | 6     3    1   |
|-----|-----|-----|
| *68+479 *68+57 *68+45 | 3     58   1   | 2     *68+9  |
57      | 79    | 2     #58  | 6     58   4   | 39    1    |
37      | *68+1  *68+15 3   | 7     2    9   | #58   *68   4   |
|-----|-----|-----|
    
```

-----|

Using the digit that can't escape the deadly pattern can be extended beyond the simple x-wing. Consider the deadly extended uniqueness 68-pattern marked with asterisks above. One can quickly see that the only digit that can escape the deadly pattern is the eight. Furthermore, if you look at where the eights can escape in b1479, they all directly prevent the eight in r9c1. Here, there happens to be a simple two-string kite that performs the same deduction; but that isn't always the case.

Myth

Very interesting approach, if I understand.

A "normal" deadly pattern for 68 might involve the sequence :

r4c2-r4c3-r7c3-r7c8-r9c8-r9c1-r2c1-r2c2-r4c2

(extra candidates in r2c2 r7c3 r7c8 r9c1).

This sequence (impossible under uniqueness of solution) is then extended (with r7c1 r7c2 r9c2) :

r4c2-r4c3-r7c3-r7c8-r9c8-**r9c2**-r2c2-r2c1-r9c1-**r7c1-r7c2**-r4c2

to produce a pattern impossible under uniqueness of solution as compounded by uniqueness of candidates per unit (68 cannot occur at r2479c2).

Since 6 is locked into this latter sequence, 8 has to escape and all escape routes imply a common conclusion.

So as I see it, an imaginative extension of a deadly pattern, and an interesting take on deadly avoidance as "escape" for otherwise trapped candidates.

[Back to top](#)



Myth Jellies

Posted: Sun Jul 19, 2009 6:55 pm Post subject:



Joined: 19 Sep 2005
Posts: 623

Aran,

This was actually RW's original idea, which was called Extended Uniqueness.

Essentially, no matter where you put the 6's and the 8's in the starred cells, if you solve for every other digit in the starred cells (and the entire rest of the puzzle) you will have a deadly pattern in 6's and 8's left.

My take on this is if you have a digit, 'a', and for every cell where 'a' appears there is a digit, 'b'; then for the puzzle to have a unique solution it must be the case that 'b' must appear in one of the cells that does not currently contain 'a' in a house where 'a' has not been solved.

[Back to top](#)



Myth Jellies

Posted: Sun Jul 19, 2009 7:23 pm Post subject:



Joined: 19 Sep 2005
Posts: 623

DPB,

Any BUG+1 or 2 grid probably has a host of xy-chains which will kill a root

candidate. The BUG deduction still exists after the fact and one could "imagine" the candidate still exists if it makes it easier.

But this is really not necessary. Any pattern really can only depend on givens and the candidates that have to be missing and not on the candidates that are left. A naked triple is really three cells in the same house that are missing the same six candidates. That's why the deduction holds even if some of the cells are missing more candidates. The same is going to hold for finned fish, swordfish, ALS's, and (of course) uniqueness deadly patterns. Thus it makes no difference to the deduction if the deadly pattern is missing a candidate. It might make it harder for humans to "see" though 😊

[Back to top](#)



David P Bird

📅 Posted: Mon Jul 20, 2009 12:53 am Post subject:



Joined: 16 Sep 2008
Posts: 138
Location: Middle England

Myth, I agree with everything you've said in your responses to Aran and me.

As I was responding to Storm_Norm I realised that the way that some pattern criteria are defined and therefore the way they are sought can be misleading. Your naked triple example is a good one for illustrating where everyone accepts it is absent candidates in a cell set that determine if the pattern is true or not.

However, a definition of a BUG patterns written in terms of absent candidates would become virtually incomprehensible to a newcomer. As a result I believe so far everyone has identified the bigger BUG patterns where all the deadly pattern digits are all present. As you say, recognising an incomplete one would be very difficult, but I don't know if anyone has ever even tried to do this.

[Back to top](#)



aran

📅 Posted: Mon Jul 20, 2009 5:48 am Post subject:



Joined: 02 Mar 2007
Posts: 356

Myth Jellies wrote:

Aran,

This was actually RW's original idea, which was called Extended Uniqueness. Essentially, no matter where you put the 6's and the 8's in the starred cells, if you solve for every other digit in the starred cells (and the entire rest of the puzzle) you will have a deadly pattern in 6's and 8's left.

My take on this is if you have a digit, 'a', and for every cell where 'a' appears there is a digit, 'b'; then for the puzzle to have a unique solution it must be the case that 'b' must appear in one of the cells that does not currently contain 'a' in a house where 'a' has not been solved.

Myth

Another way of thinking about the same idea : there can be no two perfectly congruent fish since this would equate to an impossible pattern.

In our example we have :

6 and 8 as perfectly congruent sashimi jellyfish on r2479c1238 except for 3 outside

8s

So one of those must be true etc.

[Back to top](#)**Myth Jellies**

Posted: Mon Jul 20, 2009 8:51 pm Post subject:

Joined: 19 Sep 2005
Posts: 623

Aran,

That is another good way of looking at it. I, personally, can never recognize a jellyfish except by analysis after the fact, so I tend to focus on markers that are easier for me to see (such as all connected unsolved candidates for a particular digit).

I think there is an advantage to using your approach that will become apparent when one attempts to incorporate more than two digits in an extended uniqueness deduction--an area that hasn't received a lot of attention in recent times.

Here is a related thread started by RW

<http://www.sudoku.com/boards/viewtopic.php?t=4432&start=0&postdays=0&postorder=asc&highlight=>

Last edited by Myth Jellies on Mon Jul 20, 2009 9:23 pm; edited 1 time in total

[Back to top](#)**Myth Jellies**

Posted: Mon Jul 20, 2009 9:00 pm Post subject:

Joined: 19 Sep 2005
Posts: 623

DPB,

I seem to recall some puzzles in the original BUG threads that did not quite resolve nicely into BUG+n grids. My way of handling them, which seemed to work pretty well, was to create mega BUG-lites with just a couple of cells not participating in the deadly pattern. I seem to recall Jeff and others trying to do something like adding imaginary candidates to solved cells to get to a full BUG grid. You might try hunting up some of those puzzles and see what you can come up with.

[Back to top](#)**RW**

Posted: Mon Jul 20, 2009 9:42 pm Post subject:

Joined: 16 Mar 2006
Posts: 981
Location: Finland**Myth Jellies wrote:**

Any BUG+1 or 2 grid probably has a host of xy-chains which will kill a root candidate. The BUG deduction still exists after the fact and one could "imagine" the candidate still exists if it makes it easier.

BUG grids with missing candidates would be very rare. I also dare to suggest that this cannot happen in a BUG+1 or +2 grid, it requires at least a BUG+3.

By definition, the root candidates in a BUG grid appear twice in every unit. Removing one root candidate mostly solves the whole puzzle. To be able to remove a root candidate without solving the puzzle, you need to find a root candidate that a) lies in a +cell itself (otherwise the cell is solved) and b) appears as an extra candidate in at least 2 other +cells covering all three units our removed candidate lies in (row column and box).

I pulled a random example from the original BUG thread where I did this:

Code:

1	28	3	4	5	6	7	29+8	89
4	5	7	3	89	29	12	6	18
6	28	9	7	18	12	4	5	3
9	7	4	5	3	8	12	12	6
5	3	6	19	2	19	8	4	7
8	1	2	6	4	7	9	3	5
27	9	1	28	6	3	5	78	4
27	6	5	28	19	4	3	7+19	19+8
3	4	8	19	7	5	6	19	2

I could remove root candidate 8 from r8c8 without immediately solving the puzzle, because that candidate exists as extra candidate in the same row, column and box.

Not the best example, because this is actually a BUG-lite (in r78c148) but it does fill the criteria for a full BUG+3 grid also I think.

RW

[Back to top](#)



daj95376

Posted: Mon Jul 20, 2009 9:42 pm Post subject:



Joined: 15 May 2006
Posts: 1487

Myth Jellies wrote:

DPB,

I seem to recall some puzzles in the original BUG threads that did not quite resolve nicely into BUG+n grids. My way of handling them, which seemed to work pretty well, was to create mega BUG-lites with just a couple of cells not participating in the deadly pattern. I seem to recall Jeff and others trying to do something like adding imaginary candidates to solved cells to get to a full BUG grid. You might try hunting up some of those puzzles and see what you can come up with.

I fully admit that I don't understand this thread. However, I ran across this PM this morning and it doesn't qualify as a BUG+4 from what I can tell. Maybe it can be used to demonstrate your point.

Code:

```
DP in <12>
[r4c7]=9 [r5c7]=1 [r9c7]<>1
```



```
[r5c2]=7 [r5c1]=9 [r5c7]=1 [r9c7]<>1
[r7c4]=3 [r9c4]=1 [r9c7]<>1
[r9c6]=7 [r9c9]=8 [r9c2]=3 [r9c4]=1 [r9c7]<>1
+-----+-----+-----+
| 4 5 8 | *12 *12 6 | 3 7 9 |
| 3 6 7 | 4 8 9 | 5 *12 *12 |
| 1 9 2 | 7 3 5 | 8 6 4 |
+-----+-----+-----+
| 89 18 3 | 6 7 4 | *12+9 5 *12 |
| 79 *12+7 4 | 5 *12 3 | 19 8 6 |
| 6 *12 5 | 8 9 *12 | 7 4 3 |
+-----+-----+-----+
| 27 37 9 | *12+3 6 8 | 4 *12 5 |
| 28 4 1 | 9 5 27 | 6 3 78 |
| 5 38 6 | 13 4 *12+7 | *12 9 78 |
+-----+-----+-----+
# 30 eliminations remain

BUG+1 = 1 [r5c2]
```

[Back to top](#)

 [profile](#)  [pm](#)

Display posts from previous:

 [new topic](#)

 [postreply](#)

Sudoku Players' Forums Forum
[Index](#) -> [Advanced solving techniques](#)

All times are GMT - 8 Hours
 Goto page [Previous](#) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#) [Next](#)

Page 3 of 6

Jump to:

- You **cannot** post new topics in this forum
- You **cannot** reply to topics in this forum
- You **cannot** edit your posts in this forum
- You **cannot** delete your posts in this forum
- You **cannot** vote in polls in this forum