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The BUG (Bivalue Universal Grave) principle

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Author	Message
RW Joined: 16 Mar 2006 Posts: 981 Location: Finland	Posted: Sat Jul 25, 2009 1:11 pm Post subject: quote

ronk wrote:

> **RW wrote:**
>
> > So, I placed a false vandidate and arrived at a BUG+1 grid... Before I officially bury corollary 4, I would still like to ask if someone can find any flaws in my reasoning. Is there something wrong with my BUG+1 grid (apart from it having 0 solutions), or have I missed something else?
>
> I think the *any candidate* of Corollary 4 was meant in the context of a possible BUG+n grid where, were all the extra candidates to be false, both dual candidate and single candidate cells remain.

Perhaps you could define a "possible BUG+n grid" and explain how it differs from the grid I used. As far as I see, any grid is a possible BUG+n grid. IMO the grid I used was certainly possible BUG+n grid, it did contain a BUG+1.

RW

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RW Joined: 16 Mar 2006 Posts: 981 Location: Finland	Posted: Sun Jul 26, 2009 1:07 am Post subject: quote

ronk wrote:

> I think the *any candidate* of Corollary 4 was meant in the context of a possible BUG+n grid where, were all the extra candidates to be false, both dual candidate and single candidate cells remain.
>
> Even if that's not what was meant, it's the only way the corollary has ever been used AFAIK.

Finally understood what you meant with *"all the extra candidates to be false, both dual candidate and single candidate cells remain."* That is not the only way the corollary has been used. You used it yourself in another way a couple of days ago here. All the false candidates to remain do not form a BUG+1 grid, all false candidates would look like this:

Code:

```
*-----------------------------------------------------------*
| 4569  8     45    | 456   1     569   | 2     3     7     |
| 7     46    2     | 3     48    68    | 5     1     9     |
| 59    1     3     | 57    79    2     | 6     8     4     |
|-------------------+-------------------+-------------------|
| 1     2     7     | 45    34    35    | 9     6     8     |
| 48    5     6     | 9     478   1     | 47    2     3     |
| 48    3     9     | 467   2     68    | 47    5     1     |
|-------------------+-------------------+-------------------|
| 2     9     1     | 8     6     7     | 3     4     5     |
| 3     7     8     | 2     5     4     | 1     9     6     |
| 456   46    45    | 1     39    39    | 8     7     2     |
*-----------------------------------------------------------*
```

From here you can use subsets and locked candidates to arrive at a BUG+1 grid. Now if you think it's okay to use these techniques, where do you draw the line? XY-wing? Coloring? Nice loops? Essentially all these techniques are the same as any forcing chain. Only some of them are not very long chains. This is why I said that "forces a grid into a BUG+1" must be interpreted as "can be reduced to a BUG+1 through use of logical techniques".

And if you think that it makes a difference that you had eliminated those extra candidates before you used corollary 4 and only solved singles after this, please explain the difference. To make a convincing counter-argument, you will have to give me a proof why that cannot lead to an invalid BUG+1.

RW

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David P Bird

Joined: 16 Sep 2008
Posts: 130
Location: Middle England

Posted: Sun Jul 26, 2009 1:39 am Post subject: quote

RW, I don't believe you can produce a counter example to disprove a theorem by using an invalid grid! This theorem should be based on how multiple latent deadly patterns interact.

Consider two overlapping DPs 'A' with two possible disrupting candidates, and 'B' with one. If we can pick out B from the melee and set its disruptor true, we are then possibly in a position to identify which candidates constitute the set of bivalues in 'A' and hence any resultant strong inference provided by its disruptors.

The corollary suggests that if we start by assuming what those strong inferences are for A and follow up the resultant eliminations, if they result in B being revealed those assumptions must be true, and if they don't we must try something else.

I feel that this is only valid when we are sure that this will entirely complete the puzzle, that is, in the very last stages of a solution. Otherwise how can the unveiling of a resultant latent DP prove that the provisional eliminations we have made are always true?

How acceptable this approach is to different solvers is a matter of personal preference and depends somewhat on their abilities in spotting "immediately apparent" consequences. That's why I'm not very excited about this corollary as it's currently presented.

PS I see you've posted again while I was writing this and we seem to be in accord.

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RW

Joined: 16 Mar 2006
Posts: 981
Location: Finland

Posted: Sun Jul 26, 2009 2:12 am Post subject:

quote

David P Bird wrote:

> **RW**, I don't believe you can produce a counter example to disprove a theorem by using an invalid grid!

But my grid was perfectly valid until corollary 4 made me falsely assume that I can place 5 in r4c8 as that forces a BUG+1. Corollary 4 caused the invalid grid.

David P Bird wrote:

> Consider two overlapping DPs 'A' with two possible disrupting candidates, and 'B' with one. If we can pick out B from the melee and set its disruptor true, we are then possibly in a position to identify which candidates constitute the set of bivalues in 'A' and hence any resultant strong inference provided by its disruptors.
>
> The corollary suggests that if we start by assuming what those strong inferences are for A and follow up the resultant eliminations, if they result in B being revealed those assumptions must be true, and if they don't we must try something else.

The only thing the corollary suggests is that the placement of **any** candidate that forces a BUG+1 is valid. It suggests nothing about investigating interferences in multiple overlapping deadly patterns.

David P Bird wrote:

> I feel that this is only valid when we are sure that this will entirely complete the puzzle, that is, in the very last stages of a solution.

I feel that at any point in any puzzle, any elimination or placement is valid if we are sure that this will entirely complete the puzzle. But with corollary 4, how can we be sure?

The corollary relies on the assumption that every BUG+1 grid has exactly one solution. This is where it all went wrong. Jeff didn't consider the possibility of BUG+1 grids with 0 solutions. I have now showed multiple examples of such invalid BUG+1 grids. I have also showed that we may arrive at such an invalid BUG+1 grid by placing a false candidate. I'm sorry, but I don't see much hope for the corollary anymore. If someone can prove that it is 100% foolproof in some special case, then fine, we can keep that part. But even then it needs to be radically rewritten. The way it is expressed at the moment, it is false.

RW

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eleven

Joined: 10 Feb 2008
Posts: 463

Posted: Sun Jul 26, 2009 4:16 am Post subject: quote

Congratulations on finding a counter example manually, RW.

Now it is definitely proved, that this "corollary" does not hold.

I also cant see a way to "repair" it e.g. by saying "which forces a grid into a *unique* BUG+1" (this obviously is true) , because (looking at RW's 0 solution BUG+1's) i cant see a feasible way to check, if a BUG+1 has a single solution.
Trying to repair it by additional constraints, when the placement is allowed (e.g. "near the end") or what techniques are allowed after it (e.g. "only singles") does not make any sense to me.

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ronk

Joined: 02 Nov 2005
Posts: 2489
Location: Southeastern USA

Posted: Sun Jul 26, 2009 4:32 am Post subject: quote

> **RW wrote:**
>
> > **ronk wrote:**
> >
> > I think the *any candidate* of Corollary 4 was meant in the context of a possible BUG+n grid where, were all the extra candidates to be false, both dual candidate and single candidate cells remain.
> >
> > Even if that's not what was meant, it's the only way the corollary has ever been used AFAIK.
>
> Finally understood what you meant with *"all the extra candidates to be false, both dual candidate and single candidate cells remain."* That is not the only way the corollary has been used. You used it yourself in another way a couple of days ago here. All the false candidates to remain do not form a BUG+1 grid, all false candidates would look like this:
>
> **Code:**
>
> ```
>   *-----------------------------------------------------------
> -----*
>   | 4569  8     45    | 456   1     569   | 2     3
>  7     |
>   | 7     46    2     | 3     48    68    | 5     1
>  9     |
>   | 59    1     3     | 57    79    2     | 6     8
>  4     |
>   |-------------------+-------------------+--------------
> -----|
>   | 1     2     7     | 45    34    35    | 9     6
>  8     |
> ```

```
  | 48     5      6      | 9      478    1      | 47     2
 3      |
  | 48     3      9      | 467    2      68     | 47     5
 1      |
  |-------------------+-------------------+--------------
-----|
  | 2      9      1      | 8      6      7      | 3      4
 5      |
  | 3      7      8      | 2      5      4      | 1      9
 6      |
  | 456    46     45     | 1      39     39     | 8      7
 2      |
  *------------------------------------------------------
-----*
```

That only sorta looks like the grid I posted (actually Jeff's or Nick's originally). You've selectively deleted the non-BUG candidates, forgetting the <5> in r1c1, and then added others. So to be clearer, I'll go back and edit my statement above to:

I think [i]the placement of any candidate of Corollary 4 was meant in the context of a BUG+n grid where, were all non-BUG candidates to be false, a BUG+0 grid would remain.[/i]

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David P Bird

Joined: 16 Sep 2008
Posts: 130
Location: Middle England

Posted: Sun Jul 26, 2009 4:47 am Post subject: quote

RW, It's clear that in principle we are in agreement regarding our thoughts but have differences over the best ways to describe them because we've come at this from different directions. I don't really want to get involved in nit-picking though (we have experts in that in that in the General Puzzle section).

However:
When you say "invalid grid" it conveys to me an invalid puzzle, not an invalid solution, and this is what I picked up on. Going back to Jeff's opening post here, he seems to use "grid" to mean the contents of all the remaining unsolved cells, which is the sense you have you have used though.

Now I'm not sure if I've been brainwashed or not, but I've come to believe that every assignment we make in a puzzle will disrupt one or other latent DP because there are thousands of them. If this is right, whatever logic we've used to make an assignment means we will dispose of one or more DPs regardless of whether we've been conscious of them or not.

I can't see any difference between us on your third quote - we seem to be saying identical things.

Quote:

> The corollary relies on the assumption that every BUG+1 grid has exactly one solution.

But that's true, provided the position has been though a series of valid moves. Now Jeff was lax over what was a valid placement when he defined his corollary "Any placement of a candidate which forces a grid into a BUG+1 is a valid move". Using that laxness you have found an invalid move to reach an invalid BUG+1, to point up the problem.

It seems clear that Jeff's theorems only apply when all the unsolved cells are considered together and are partitioned by selecting candidates to be considered as disruptors in some of them. Here I think we agree that for this corollary:

a) the conditions are so specific that it has little practical use
b) a definition of what constitutes a valid placement is required
c) it is too much like blind trial and error

As such it seem pointless to waste any more time on this particular corollary, and I'm far from sure that b) is even possible.

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eleven

Joined: 10 Feb 2008
Posts: 463

Posted: Sun Jul 26, 2009 5:01 am Post subject: quote

David P Bird wrote:

> b) a definition of what constitutes a valid placement is required.

A valid placement is one. which conforms to the unique solution. Thats trivial. Each such placement can be proved logically, sometimes easy, sometimes very complex.

To define valid placements in an invalid grid is absurd.

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RW

Joined: 16 Mar 2006
Posts: 981
Location: Finland

Posted: Sun Jul 26, 2009 5:28 am Post subject: quote

David P Bird wrote:

> I can't see any difference between us on your third quote - we seem to be saying identical things.

This is true. My point was that if we try to define a solution technique like "any placement of a candidate that forces a valid BUG+1 grid is valid", then we can just as well generalise it to say "any placement of a valid candidate is valid". Quite an useless technique IMO.

Quote:

> **Quote:**
>
> > The corollary relies on the assumption that every BUG+1 grid has exactly one solution.
>
> But that's true, provided the position has been though a series of valid moves. Now Jeff was lax over what was a valid placement when he defined his corollary "Any placement of a candidate which forces a grid into a BUG+1 is a valid move". Using that laxness you have found an

> invalid move to reach an invalid BUG+1, to point up the problem.

The problem is that the corollary does not even try to rely on a valid move, it tries to define a valid move, when it is in fact not valid.

Quote:

> a) the conditions are so specific that it has little practical use
> b) a definition of what constitutes a valid placement is required
> c) it is too much like blind trial and error
>
> As such it seem pointless to waste any more time on this particular corollary, and I'm far from sure that b) is even possible.

a) Has this corollary ever been proven under any specific conditions? I sure haven't seen any such proof.
b) The corollary must be able to define this by itself, otherwise it is quite useless.
c) Unless someone can find a proof for some conditions in a), in that case the corollary can be used under those conditions safely as a solving technique.

I also believe this corollary is not worth wasting time on trying to prove, because I don't think it can (because it is not valid). Problem is that it is stated as a valid solving technique in the opening post of this thread, the first post people are likely to read when they wish to learn the BUG technique. Anything we can do about that?

ronk wrote:

> I think *the placement of any candidate* of Corollary 4 was meant in the context of a BUG+n grid where, were all non-BUG candidates to be false, a BUG+0 grid would remain.

But surely ronk you must have noticed that when I used corollary 4, I used it in the context of this BUG+31 grid:

Code:

```
  *---------------------------------------------------------------
------*
  | 16     2      3      | 4      57+6   17+56  | 68+7   58+167
9      |
  | 4      5      67+1   | 19+6   8      69+17  | 37+6   13+67
2      |
  | 8      17+6   9      | 3      2      56+17  | 4      57+16
16+57  |
  |----------------------+----------------------+-----------------
------|
  | 2      8      45+6   | 7      1      3      | 9      46+5
 56     |
  | 3      79+6   57+46  | 69     46+5   2      | 1      48+567
58+67  |
  | 16     69+17  14+567 | 8      45+6   59+6   | 37+6   2
37+56  |
  |----------------------+----------------------+-----------------
------|
  | 5      4      16     | 2      3      17+6   | 68+7   9
78+16  |
  | 7      3      2      | 16     9      8      | 5      16
 4      |
  | 9       16      8       | 5       67      4       | 2       37+16
13+67   |
  *-----------------------------------------------------------------
------*
```

😀

RW

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aran

Joined: 02 Mar 2007
Posts: 356

Posted: Sun Jul 26, 2009 6:32 am Post subject:

quote

RW wrote:

> This is why I said that "forces a grid into a BUG+1" must be interpreted as "can be reduced to a BUG+1 through use of logical techniques".

Agreed

RW wrote:

> I also believe this corollary is not worth wasting time on trying to prove, because I don't think it can (because it is not valid)

Agreed...and it doesn't feel true either 😀

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ronk

Joined: 02 Nov 2005
Posts: 2489
Location: Southeastern USA

Posted: Sun Jul 26, 2009 7:36 am Post subject:

quote

RW wrote:

> But surely ronk you must noticed that when I used corollary 4, I used it in the context of this BUG+31 grid:
>
> **Code:**

```
  *---------------------------------------------------------
---------------*
  | 16      2       3       | 4       57+6    17+56   | 68+7
 58+167 9       |
  | 4       5       67+1    | 19+6    8       69+17   | 37+6
 13+67   2       |
  | 8       17+6    9       | 3       2       56+17   | 4
57+16   16+57   |
  |----------------------+----------------------+--------
---------------|
  | 2       8       45+6    | 7       1       3       | 9
46+5    56      |
  | 3       79+6    57+46   | 69      46+5    2       | 1
48+567  58+67   |
  | 16      69+17   14+567  | 8       45+6    59+6    | 37+6
 2       37+56   |
  |----------------------+----------------------+--------
---------------|
  | 5       4       16      | 2       3       17+6    | 68+7
 9       78+16   |
  | 7       3       2       | 16      9       8       | 5
16      4       |
    | 9        16      8       | 5       67      4       | 2
37+16   13+67   |
    *-----------------------------------------------------------
---------------*
```

Cute, but surely you've noticed that corollary 4 can be disproved from the following BUG+5 (which triggered this discussion) ... without adding more non-BUG candidates.

Code:

```
*-----------------------------------------------------------*
| 69+5  8     45    | 46    1     59    | 2     3     7     |
| 7     46    2     | 3     48+6  68    | 5     1     9     |
| 59    1     3     | 57    79    2     | 6     8     4     |
|-------------------+-------------------+-------------------|
| 1     2     7     | 45    34    35    | 9     6     8     |
| 48    5     6     | 9     78    1     | 47    2     3     |
| 48    3     9     | 67    2     68+7  | 47    5     1     |
|-------------------+-------------------+-------------------|
| 2     9     1     | 8     6+7   7+6   | 3     4     5     |
| 3     7     8     | 2     5     4     | 1     9     6     |
| 56    46    45    | 1     39    39    | 8     7     2     |
*-----------------------------------------------------------*
```

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daj95376

Posted: Sun Jul 26, 2009 11:01 am Post subject: quote

Joined: 15 May 2006
Posts: 1486

[Withdrawn]

Last edited by daj95376 on Sun Jul 26, 2009 4:05 pm; edited 1 time in total

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eleven

Posted: Sun Jul 26, 2009 11:24 am Post subject: quote

Joined: 10 Feb 2008
Posts: 463

ronk wrote:

> Cute, but surely you've noticed that corollary 4 can be disproved from the following BUG+5 (which triggered this discussion) ... without adding more non-BUG candidates.
>
> **Code:**
>
> ```
> *-----------------------------------------------------------*
> | 69+5  8     45    | 46    1     59    | 2     3     7     |
> | 7     46    2     | 3     48+6  68    | 5     1     9     |
> | 59    1     3     | 57    79    2     | 6     8     4     |
> |-------------------+-------------------+-------------------|
> | 1     2     7     | 45    34    35    | 9     6     8     |
> | 48    5     6     | 9     78    1     | 47    2     3     |
> | 48    3     9     | 67    2     68+7  | 47    5     1     |
> |-------------------+-------------------+-------------------|
> | 2     9     1     | 8     6+7   7+6   | 3     4     5     |
> | 3     7     8     | 2     5     4     | 1     9     6     |
> | 56    46    45    | 1     39    39    | 8     7     2     |
> *-----------------------------------------------------------*
> ```

Cant see that, must be tricky.

I suspect, that the corollary is true, when the BUG+1 is a subset of a BUG+n (before the placement, the extra candidate being one of the n before). But thats just a guess now.

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ronk

Joined: 02 Nov 2005
Posts: 2489
Location: Southeastern USA

Posted: Sun Jul 26, 2009 1:09 pm Post subject:

quote

> **eleven wrote:**
>
> > **ronk wrote:**
> >
> > Cute, but surely you've noticed that corollary 4 can be disproved from the following BUG+5 (which triggered this discussion) ... without adding more non-BUG candidates.
> >
> > **Code:**
> >
> > ```
> >  *-----------------------------------------------------
> > --*
> >  | 69+5  8     45    | 46    1     59    | 2     3     7
> >   |
> >  | 7     46    2     | 3     48+6  68    | 5     1     9
> >   |
> >  | 59    1     3     | 57    79    2     | 6     8     4
> >   |
> >  |----------------+----------------+--------------
> > --|
> >  | 1     2     7     | 45    34    35    | 9     6     8
> >   |
> >  | 48    5     6     | 9     78    1     | 47    2     3
> >   |
> >  | 48    3     9     | 67    2     68+7  | 47    5     1
> >   |
> >  |----------------+----------------+--------------
> > --|
> >  | 2     9     1     | 8     6+7   7+6   | 3     4     5
> >   |
> >  | 3     7     8     | 2     5     4     | 1     9     6
> >   |
> >  | 56    46    45    | 1     39    39    | 8     7     2
> >   |
> >  *-----------------------------------------------------
> > --*
> > ```
>
> Cant see that, must be tricky.

1) We have a valid BUG+5, so we know at least one of the non-BUG candidates must be true. However, only one of the non-BUG candidates might ultimately be true, so each non-BUG candidate being individually true must have the same outcome. For example, r5c5<>7 is a common outcome.

2) We have r7c5=6 as *any placement of a candidate* which leads to a valid BUG+1 as per Corollary 4. However, based on 1) alone, it is impossible for non-BUG candidate r7c5=7 to have r7c5=6 as an outcome. IOW r7c5=7 implying r7c5<>7 would not be based on the BUG principle.

I suppose it's still possible for an exception ... a valid exception ... for non-BUG candidates of bivalued cells, such as r7c5 and r7c6 above, but think it's highly unlikely.

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eleven

Joined: 10 Feb 2008
Posts: 463

Posted: Sun Jul 26, 2009 1:34 pm Post subject: quote

I dont get that. I can see, that all extra candidates imply r5c5=8, which leads to a BUG+1. A "normal" solution.
But i cant see a connection with the corollary.

btw i could not find an argument for my conjecture above. Probably it just makes it a bit harder to find a counter example.

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