Sudoku Players' Forums

Fully supersymmetric chains

Goto page **Previous 1**, **2**, **3** ... , **16**, 17, **18 Next**

📝 newtopic   📝 postreply   **Sudoku Players' Forums Forum Index** -> **Advanced solving techniques**

View previous topic :: **View next topic**

Author	Message
Red Ed Joined: 06 Jun 2005 Posts: 948	🗋 Posted: Sun Nov 22, 2009 9:24 pm Post subject: 💬 quote **denis_berthier wrote:** I've already stated many times that I didn't allow loops in "my" chains, whips, braids. But some seem not to have understood why. **denis_berthier wrote:** I have used the no-loops condition from the beginning and it has been present in all the versions of SudoRules. See **p. 336 of my book: definition: a 3D-chain is a sequence of candidates, ALL DIFFERENT, such that any two consecutive candidates are nrc-linked.** It's just occurred to me that banning re-use of "L" (left-linking) candidates might invalidate the braids T&E theorem. Recall that said theorem includes the following reasoning: **Quote:** 2) The sequel is done by recursion. If we have been able to replace the T&E procedure upto the nth assertion step, then we can replace it by a longer nrczt-braid upto the (n+1)th assertion step. Name n'r'c' the nth candidate asserted. Suppose first that the (n+1)th assertion made by T&E relies on NS: say r'c'=n' If this assertion can be made, it can only be because: - n'r'c' is not nrc-linked to n0r0c0 or to any of the previous candidates asserted in any of the previous steps, i.e. to any of the right-linking candidates of the partial nrczt-braid we've already built (otherwise it would have been eliminated by ECP); - all the other candidates for cell r'c' have been eliminated by the assertions of n0r0c0 and of all the previously asserted candidates, which supposes that each of them is individually nrc-linked to the target or to some of the previous right-linking candidates; - there is a candidate n1r'c' in cell r'c' which is nrc-linked to n0r0c0 OR to a previous right-linking candidate n2r2c2. Take {n1r'c' n'r'c'} as the next cell of our braid. NOTICE THAT IT WOULD BLOCK HERE IF WE CONSIDERED WHIPS INSTEAD OF BRAIDS.

> The new cell of our nrczt-braid, {n1r'c' n'r'c'}, is appended to the right
> of n2r2c2 (all the other candidates in cell r'c' are z- or t- candidates wrt
> to already existing branches of the net).

Emphasis in red is mine.

I didn't notice anything in the proof demonstrating that there must exist an n1r'c'
that's not already been used in an earlier part of the chain.

Did I overlook something in the proof, or can you supply the missing details?

If "no" to both then might it be worth allowing "L" reuse for braids? You'd be
making a slightly larger break from whips, and indeed from 3D-chains in
general, but you'd get to keep the T&E theorem.

Back to top   [profile] [pm]

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denis_berthier   Posted: Mon Nov 23, 2009 6:29 am   Post subject: [quote] [edit]

Joined: 19 Jun 2007
Posts: 1010
Location: Paris, France

Red Ed,

As is often the case, you're so eager to find contradictions everywhere that
you're confusing everything:

- firstly, you're confusing loops and the re-use of llc's; with the re-use of llc's,
loops are useless, be it in chains, whips or braids;

- secondly, you're confusing chains/whips with braids; worse, you're taking the
definition of a chain/whip to discuss a theorem on braids; very strange for an
advocate of good science!;

- thirdly, as I already explained to you, the no-loop condition is not an *a priori*
arbitrary condition on chain or whips; I have excluded loops lately from chains
and whips because they appeared to introduce complexity while adding no
resolution power; I've then introduced the notion of a standard whip to name a
whip satisfying the no-loop condition; YOU requested me to add this to my first
post on chains/whips (http://www.sudoku.com/boards/viewtopic.php?t=5591),
which didn't mention loops at all!

Regarding braids - which weren't defined in my book! - I first gave their definition
in this post: http://www.sudoku.com/boards/viewtopic.php?
t=5591&postdays=0&postorder=asc&start=150
Where do you see that re-using llc's (i.e. having two identical llc's, to be more
precise) is not allowed for braids?
Instead, I introduce the notion of a **minimal braid**.

In fact, I even defined two braids being **equivalent** (or a braid being equivalent
to a whip) when they have the same SET of right-linking candidates
(http://www.sudoku.com/boards/viewtopic.php?t=6390&start=111) -
regardless of their left-linking candidates - and I mentioned that this is
explicitly used in SudoRules for optimisation purposes. As you're preying on

every bit of what I write, you can't have missed this.

Notice that one could also define "standard braids" in which llc re-use is not allowed. It is very likely that they will have the same resolution power, because one can always accumulate rlc's along several branches. But they will be harder to study from a theoretical POV.

Back to top   [profile] [pm] [www]

Red Ed

Joined: 06 Jun 2005
Posts: 948

☐ Posted: Mon Nov 23, 2009 7:51 am   Post subject: [quote]

I'm not trying to find contradictions: I'm trying to clear up my understanding of whips/braids in order that progress can be made on the "Algorithms ..." thread of which you are so disdainful.

Your morphing of the definitions of late has made it difficult to keep up, but regarding llc and rlc reuse (if neither by themselves constitutes looping then fair enough - but that's an odd definition of "loop") you seem to be saying:

- (standard) whips - no llc reuse, no rlc reuse
- (standard) braids - llc reuse okay, but no rlc reuse

Correct?

PS: a couple of your grumbles touched on below:
> **Quote:**
>
> you're taking the definition of a chain/whip to discuss a theorem on braids

actually just there to illustrate that llc reuse is another thing that differentiates braids from whips (I read you somewhere - won't go looking now - stating that the only thing differentiating braids from whips was that Ln needn't depend only on Rn-1); just there for clarification
> **Quote:**
>
> - thirdly, as I already explained to you, the no-loop condition is not an *a priori* arbitrary condition on chain or whips; I have excluded loops lately from chains and whips because they appeared to introduce complexity while adding no resolution power; I've then introduced the notion of a standard whip to name a whip satisfying the no-loop condition; YOU requested me to add this to my first post on chains/whips

Until recently most people probably thought a whip was a whip, period.

Back to top   [profile] [pm]

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denis_berthier

Joined: 19 Jun 2007
Posts: 1010
Location: Paris, France

☐ Posted: Mon Nov 23, 2009 9:01 am   Post subject: [quote] [edit]

> **Red Ed wrote:**
>
> Your morphing of the definitions of late

You're again trying to generate confusion. But there has been no "morphing" of any definition. It's just that you've been unable to understand correctly the

definition of braids.

> **Red Ed wrote:**
>
> regarding llc and rlc reuse (if neither by themselves constitutes looping then fair enough - but that's an odd definition of "loop")

Again your inability to understand a definition.
My definition of an inner loop is the most natural one, considering that chains/whips must satisfy the nrc continuity condition.
Just "re-using" an llc doesn't imply this continuity condition.

> **Red Ed wrote:**
>
> you seem to be saying:
>
> - (standard) whips - no llc reuse, no rlc reuse
> - (standard) braids - llc reuse okay, but no rlc reuse
>
> Correct?

I say:
- chains/whips/braids: linear sequence of candidates (the pleonasm is for you) ...
[and remember that the z- or t- candidates don't belong to the chain/whip/braid]
- chains/whips/braids: no a priori restriction on candidates being different
- standard chains/whips: all the candidates different (= no-loop)
- braids: no a priori restriction; rlc re-use can be proven to be useless.

From a theoretical POV:
- no-loop (or standard) whips are the good concept,
- braids with no a priori restriction are the good concept.

From a practical POV
- no-loop (or standard) whips are the useful concept (allowing loops or re-use is subsumed by braids);
- it is highly likely that braids with no re-use of llc's are the useful concept.

For the rest, you seem to believe a theory drops all cooked from heaven. This is certainly due to your lack of contact with real science.

Back to top   profile | pm | www

Red Ed   Posted: Mon Nov 23, 2009 5:10 pm   Post subject: quote

Joined: 06 Jun 2005
Posts: 948

What a long-winded answer to a simple question. But ... good: my worry about you not allowing loops in "your" braids is unfounded. It seems that your comment

> **denis_berthier wrote:**
>
> I've already stated many times that I didn't allow loops in "my" chains, whips, braids. But some seem not to have understood why.

was just a blip on an otherwise unblemished record of precision, concision, and

good manners. *Bravo*, Berthier!

Back to top [profile] [pm]

denis_berthier

Posted: Mon Nov 23, 2009 6:07 pm   Post subject: [quote] [edit]

Joined: 19 Jun 2007
Posts: 1010
Location: Paris, France

You need things to be repeated so many times before you start understanding...

For the good manners, do I have to remind you of yours in this thread:
http://www.sudoku.com/boards/viewtopic.php?t=14615

And this is after I have accepted to delete some of our best posts at your request.

Back to top [profile] [pm] [www]

Red Ed

Posted: Mon Nov 23, 2009 7:12 pm   Post subject: [quote]

Joined: 06 Jun 2005
Posts: 948

Oh, that was a *great* thread, thanks for the reminder! I *loved* the way that, after I'd already posted a unbiased sampling formula, you pompously chose to ignore it and started a new thread WITH ITS TITLE IN CAPITAL LETTERS in which you proceeded to completely *balls up* the theory which you evidently had not understood in the first place! What a blast! 😃

Back to top [profile] [pm]

denis_berthier

Posted: Mon Nov 23, 2009 7:19 pm   Post subject: [quote] [edit]

Joined: 19 Jun 2007
Posts: 1010
Location: Paris, France

Your "unbiased sampling formula" is 81! / (81 - n)! / n!
What a great theory !!!
I won't waste my time repeating what I said there.

Back to top [profile] [pm] [www]

coloin

Posted: Tue Nov 24, 2009 12:05 am   Post subject: [quote]

Joined: 06 May 2005
Posts: 1104
Location: Devon UK

Whilst I cant possibly comment on the disaggreements -ive no doubt that the "discussions" between Ed and Dennis have undoubtably furthured the theoretical understanding of the numbers game we have here.

It is obviously important whether/if a whip/loop/braid starts and finishes and ends in a contradiction.

the length of which is also relevant.

however........

in our hardest puzzles we have in any one cell - for example - 1 correct pm and say 3 incorrect pms.

The correct one wont lead to a contradiction - and we dont try this option.
The three incorrect ones will lead to a contradiction

how you decide to start is not clear - and the innocent reader here will be completely baffled. [including me]

Please dont go down the route of who said what first, and acknowledge that you both have a part to play in the elucudation of the rather large "ball-game " we have here.

You wouldnt do it if you didnt enjoy it !

C

| Back to top | profile | pm |

| **PIsaacson** | Posted: Tue Nov 24, 2009 12:56 am   Post subject: | quote |

Joined: 02 Jul 2008
Posts: 327
Location: Campbell, CA

coloin wrote:
> in our hardest puzzles we have in any one cell - for example - 1 correct pm and say 3 incorrect pms.
>
> The correct one wont lead to a contradiction - and we dont try this option. The three incorrect ones will lead to a contradiction

It's is not necessarily true that the incorrect candidates will always produce a whip conflict/contradiction. Often, the chain simply dead-ends and cannot be extended, or on a more practical note, the solver runs out of memory when attempting to construct extremely long chains. Without prior knowledge of which candidates are inclusive to the solution, it is not possible to bypass them. I have included "cheat" code in my nrczt engine that uses the solution as well as pre-determined backdoors, but that's an optional feature and not something that I normally use. Without the cheat enabled, the engine will attempt to construct a chain/whip for every candidate, including those that cannot possibly lead to a contradiction. They simply dead-end at some depth and remain unresolved.

Cheers,
Paul

| Back to top | profile | pm |

| **denis_berthier** | Posted: Tue Nov 24, 2009 6:10 am   Post subject: | quote | edit |

Joined: 19 Jun 2007
Posts: 1010
Location: Paris, France

coloin wrote:
> how you decide to start is not clear - and the innocent reader here will be completely baffled. [including me]

This question has no answer.
Where to start, i.e. which candidates one should try to eliminate first, is part of what I've named the "strategic level" (http://www.sudoku.com/boards/viewtopic.php?t=6376). One could write "meta-rules" saying which kind of pattern to look for in a given situation.
Whereas a beginner is likely to try randomly, an advanced player will have vague

rules of thumb telling him where to try. Unfortunately, this topic has never raised much interest and none of these meta-rules has ever been stated clearly. It may also belong to their nature proper that they can't be stated clearly.

My approach relies heavily on the results obtained in the "rating" thread (http://www.sudoku.com/boards/viewtopic.php?t=5995). One of the main general results there is that the nrczt hierarchy constitutes a very simple scale of reference in which all the known rules (Subset rules, ALS chains, AICs,...) naturally find their place and that this scale is statistically a good logarithmic measure of complexity. The second main general result is that most of the random puzzles need chains no longer than 5.

The most natural rational strategy is therefore to look for patterns in increasing order of complexity (among one's preferred patterns - whichever they are). Of course, a real player will have a more opportunistic strategy and he will take whatever comes, but, unless he finds some complex pattern by chance, it would be very irrational to look specifically for complex patterns systematically before simpler ones.

In this respect, what *I* am completely baffled with is the multiplication of infinitesimal variants of already complex patterns, with almost null added resolution power.

Back to top   [profile] [pm] [www]

Allan Barker   Posted: Tue Nov 24, 2009 3:04 pm   Post subject: [quote]

Joined: 21 Feb 2008
Posts: 394
Location: Bangkok

> **coloin wrote:**
> however........
>
> in our hardest puzzles we have in any one cell - for example - 1 correct pm and say 3 incorrect pms.
>
> The correct one wont lead to a contradiction - and we dont try this option.
> The three incorrect ones will lead to a contradiction

> **PIsaacson wrote:**
> It's is not necessarily true that the incorrect candidates will always produce a whip conflict/contradiction. ....

If I understand you correctly, this is exactly what my permutation analyzer does. It's a bit similar to chains except it adds full constraints (sets) rather than bi-value links. In *this* case, all candidates in a set except one will certaintly lead to a contradiction.

If you start with the remaining candidate, it leads to the puzzle's solution!. If the puzzle has multiple sountions, it will find them all at one shot. Champagne has tried this concept out at one point, perhaps that's how it got to the patterns game??

Both approaches, nrczt type chains and using full complexity, have their power and their limitations. Somewhere between the nrctz chains and using full complexity, there must be a *mighty fine solver*, me thinks. 💡

Back to top   [profile] [pm] [www]

aran   🗋 Posted: Tue Nov 24, 2009 4:03 pm   Post subject: [quote]

Joined: 02 Mar 2007
Posts: 428

> **Allan Barker wrote:**
>
> If I understand you correctly, this is exactly what my permutation analyzer does. It's a bit similar to chains except it adds full constraints (sets) rather than bi-value links. In *this* case, all candidates in a set except one will certaintly lead to a contradiction

Allan
I'm not exactly sure what you are saying. Could you paraphrase yourself ? 😃

Back to top   [profile] [pm]

Allan Barker   🗋 Posted: Tue Nov 24, 2009 5:28 pm   Post subject: [quote]

Joined: 21 Feb 2008
Posts: 394
Location: Bangkok

> **Aran wrote:**
>
> Allan
> I'm not exactly sure what you are saying. Could you paraphrase yourself ? 😃

Starting from scratch (most all of which you know)

Simple chains are made by assuming a candidate is true and then adding a series of bi-value/bi-local pairs (2 candidate constraints, strong links) linked end to end. Each new step in the chain propagates the initial assumed truth along the length of the chain until a contradiction occurs.

Nrczt chains work the same way except they can use more than 2 candidates in a strong link <u>if</u> all but 2 of the candidates are false because they see a prior assumed truth in the chain. This allows a degree of complexity.

A permutation chain works again in a similar way by adding a series of successive constraints. However, it does not require the propagation of a single candidate truth at each new step. Rather, it keeps track of all possible arrangements of true and false candidates in the chain as the chain progresses. Each possible arrangement is a permutation.

A simple bi-value chain has only one permutation at all times. As 1s and 0s it would be T - 0 = 1 - 0 = 1 - 0 = 1 .... or just T01010101. Same for an nrczt chain. A two permutation chain would have 2 possible arrangements of candidates i.e. 0101010 and 1010101. There can be many permutations.

A simple chain ends on a contradiction, which means the assumed arrangement T - 0 = 1 - 0 = 1 - 0 = 1 is false, thus the premise was false and there are no

valid permutations. Likewise, a permutation chain ends in contradiction when **all** permutations have proven to be false. Thus the premise was false.

If however, the permutation chain began on a candidate that in fact is true, i.e., part of the solution, then no contradiction can be found! What happens? As the chain progresses eventually all the permutations except one will become false. The last remaining permutation is the solution to the puzzle. If it ends with more than one permutation, the puzzle has multiple solutions. Although a permutation chain is complex, it can handle all logic.

Back to top   (profile) (pm) (www)

aran   ⎙ Posted: Tue Nov 24, 2009 7:04 pm   Post subject: (quote)

Joined: 02 Mar 2007
Posts: 428

Allan
Thanks, I follow you.
In some situations I suppose the number of permutations necessary to eliminate a starting false candidate must run high.
Any idea of your record for the highest number of permutations needed for a single elimination ?

Back to top   (profile) (pm)

Display posts from previous: [All Posts ▲▼]   [Oldest First ▲▼]   [Go]

(newtopic) (postreply)   **Sudoku Players'
Forums Forum
Index -> Advanced
solving techniques**   **Goto page Previous 1, 2, 3 … , 16, 17, 18 Next**   All times are GMT

Page 17 of 18

Stop watching this topic   Jump to: [Advanced solving techniques ▲▼] [Go]

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