## Twins Construction Example <br> Sudocue-top10000 \#05

## Code: copy givens

...19.....1..........3.8.1.6...493...5.8.1...945...8.9.3.4.....2.....7.....59...
After some moves of HoDoKu Techniques such as:
Locked Candidates Type 1, Naked Triple, Naked Single, Empty Rectangle, Finned Swordfish.
And before a Sue de Coq arrives.

## Copy Candidates:



Twins Construction Example

| 2 3  <br> 4 5 6 <br> 7 8  | $\begin{array}{lll} & & \\ 4 & 5 \\ 7 & 8\end{array}$ | ${ }^{2} 8{ }^{6}$ | 1 | 9 | 2 $\begin{array}{r}2 \\ 7\end{array}$ | [ $\begin{array}{lll}2 & 3 \\ 4 & 5 & 6 \\ 7 & & \end{array}$ | $4 \begin{array}{r}2 \\ 4\end{array}$ | $\begin{array}{\|rr} \hline & 23 \\ 4 & 6 \\ 7 & \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{array}{lll} & 2 & 3 \\ 4 & 5 & 6 \\ 7 & & \end{array}$ | 1 | ${ }^{2} 6$ | $\begin{array}{lll} & 2 \\ 4 & & 6 \\ 7 & 8 & \end{array}$ | ${ }^{2} 6$ | 2 5 7 7 | $\left\lvert\, \begin{array}{lll} & 2 & 3 \\ 4 & 5 & 6 \\ 7 & & \end{array}\right.$ | 9 | $\begin{array}{lr}23 \\ 4 & 6 \\ 7 & \end{array}$ |
|  2  <br> 4 5 6 <br> 7   | $\begin{array}{ll} 45 \\ 7 & 5 \\ \hline \end{array}$ | 9 | $\begin{array}{lll}4 & 2 \\ 7 & 6\end{array}$ | 3 | 2 $\begin{array}{r}2 \\ 5 \\ 7\end{array}$ | 8 | $4 \begin{aligned} & 2 \\ & 4 \\ & 4\end{aligned}$ | 1 |
| $\begin{array}{ll} 1 & 2 \\ 7 & 8 \end{array}$ | 6 | $\begin{aligned} & 12 \\ & 78 \end{aligned}$ | 7 | $\begin{aligned} & 12 \\ & 7 \end{aligned}$ | 4 | 9 | 3 | 5 |
| $23$ | 73 | 5 | 9 | 8 | 23 7 7 | 1 | $4^{2} 6$ | $\begin{array}{ll}4 & 2 \\ 7 & 6 \\ 7\end{array}$ |
| $123$ | 9 | 4 | 5 |  | $\begin{array}{lrl} 123 \\ & & 6 \\ 7 & & \\ \hline \end{array}$ |  | 8 |  |
| 9 | $\begin{array}{r}5 \\ 78 \\ \hline\end{array}$ | 3 | $\begin{array}{\|l\|} \hline \\ \hline \end{array}$ | 4 | $\begin{array}{ll}12 \\ 7 & 8\end{array}$ | 26 | $\begin{array}{ll}12 \\ & 2 \\ & 5\end{array}$ | ${ }^{2} 6$ |
| 45 | 2 |  | $3$ | 16 | 186 | 45 | 7 | 9 |
| 1   <br> 4 6  <br> 7 8  |  |  | ${ }^{2}{ }^{6} 6$ | 5 | 9 | 23 <br> 4 | $1_{4}{ }^{2} 6$ | $4 \begin{array}{r}23 \\ 6 \\ 8\end{array}$ |

U-Twins 1 from r9c8
Notice those three cells: r7c8 (red), r8c3 (blue) and r9c8 (blue).
If r9c8 is true, then r7c8 false and r8c3 true.
If r 7 c 8 is true, then r 8 c 3 and r 9 c 8 false.
Coloring:
Cycle 1: blue
Cycle 2: red
Starting by cycle 1 (blue):
From r9c8 (cycle 1)

Twins Construction Example
$=>$ r7c8 (cycle 2) strong link with r9c8
=> r7c6 (cycle 1) strong link with r7c8
$=>$ r8c3 (cycle 1) only cell in box 7 can be, because of r9c8
$=>$ r4c3 (cycle 2) only cell outside box 7 on column 3 can be a hidden strong link for r8c3
$=>\mathrm{r} 4 \mathrm{c} 5$ (cycle1) only cell outside box 4 on row 4 can be a hidden strong cell for r4c3
$=>$ r6c1 (cycle 1) only cell in box 4 can be, because of r4c5
$=>$ r9c1 (cycle 2 ) only cell outside box 4 on column 1 can be a hidden strong cell for r6c1.

Four cells r6c56 and r8c56, belonging to cycle 2 because of r4c5 (cycle 1) in box 5 and r7c6 (cycle 1) in box 8, make UTwins.

This U-Twins belongs to cycle 2, so all cells of cycle 2 contain digit 1.

$$
\text { Cycle } 2 \text { (red) = } 1
$$

Conclusion: $\mathrm{r} 4 \mathrm{c} 3=1 ; \mathrm{r} 7 \mathrm{c} 8=1$ and $\mathrm{r} 9 \mathrm{c} 1=1$.
After some basic moves, I come to the following grid.

## Copy Candidates:



| $\begin{array}{rrr} & 3 \\ 4 & 5\end{array}$ | $45^{4} \begin{array}{r}3 \\ 8\end{array}$ | 2 <br> 8 | 1 | 9 | 2 5 |  | $4 \begin{aligned} & 2 \\ & 4\end{aligned}$ | $\begin{array}{lr}23 \\ 4 & 6 \\ 7 & \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{array}{rrr} & 3 \\ 4 & 5\end{array}$ | 1 | 2 7 | $4^{4} 8$ | $7 \begin{array}{r}2 \\ 7\end{array}$ | 56 8 | 3 <br> 4 | 9 | 7 <br> 4 |
| 4 5 6 <br> 7   | $\begin{array}{l\|l} 4 & 5 \\ 7 & \\ \hline \end{array}$ | 9 | 4 2  <br> 7  6 | 3 | $7 \begin{array}{r}2 \\ 5\end{array}$ | 8 | $\begin{array}{r}2 \\ 4 \\ \hline\end{array}$ | 1 |
| 8 | 6 | 1 | 72 <br> 7 | 72 | 4 | 9 | 3 | 5 |
| $23$ |  | 5 | 9 | 8 | 3 | 1 | $4^{2} 6$ | $4^{4} \begin{aligned} & 2 \\ & 7\end{aligned}{ }^{2}$ |
| $23$ | 9 | 4 | 5 | 16 | 1 3 <br>  6 |  | 8 | 2 7 |
| 9 | 5 78 | 3 | $\square$ | 4 | $\square$ | 2 L | 1 | $2^{2} 6$ |
| 45 | 2 | $8^{6}$ | 3 | 16 |  | 45 | 7 | 9 |
| 1 | $\begin{array}{ll} 4 & \\ 7 & 8 \end{array}$ | $78^{6}$ | ${ }^{2} 86$ | 5 | 9 | 23  <br> 4 6 | $4^{2} 6$ | $4 \begin{array}{r}23 \\ 4 \\ 8\end{array}$ |

Starting by cycle 1 (blue)
From r1c2 (cycle 1)
=> r7c2 (cycle 2) only cell outside box 1 in column 2
=> r8c1 (cycle 1) strong link with r7c2
$=>$ r8c7 (cycle 2) strong link with r8c1
$=>$ r7c7 (cycle 1) strong link with r8c7
$=>$ r3c8 (cycle 1) only cell in box 3 can be, because of r1c2

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$=>$ r1c8 (cycle 2) strong link with r3c8
$=>$ r2c6 (cycle 1) only cell in box 2 can be, because of r1c2 and r3c8
$=>$ r3c6 (cycle 2) only cell in box 2 can be, because of r1c8 and r2c6
$=>$ r2c1 (cycle 2 ) only cell in box 1 can be, because of r1c8 and r3c6.

| 3 456 | $\begin{array}{r} 1 \\ 45 \\ 4 \\ 8 \end{array}$ | 2 <br> 8 | 1 | 9 | 2 5 | $\begin{array}{rrr}2 & 3 \\ 4 & & 6 \\ 7 & & \end{array}$ | $4 \begin{array}{r}2 \\ 4\end{array}$ | 23  <br> 4 6 <br> 7  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 4 4 | 1 |  | ${ }^{4} \begin{array}{rr} 6 \\ 8 \end{array}$ |  | 56 8 | 3 4 | 9 |  <br> 4 <br> 4 |
| 4 5 6 <br> 7   | 4 5 <br> 7  | 9 | $\begin{array}{lll} & 2 & \\ 4 & & 6 \\ 7 & & \end{array}$ | 3 | 2 5 7 | 8 | $4 \begin{array}{r}2 \\ 45\end{array}$ | 1 |
| 8 | 6 | 1 | $\begin{array}{r} 2 \\ 7 \end{array}$ | $\begin{array}{r} 2 \\ 7 \end{array}$ | 4 | 9 | 3 | 5 |
| $\begin{array}{r} 23 \\ 7 \end{array}$ | $7{ }^{3}$ | 5 | 9 | 8 | 3 6 | 1 | $4^{2} 6$ | $\begin{array}{ll} 4^{2} & 6 \\ 7 & \\ \end{array}$ |
| $\begin{array}{r} 23 \\ 7 \end{array}$ | 9 | 4 | 5 | 16 | $1 \begin{aligned} & 3 \\ & \\ & \end{aligned}$ | $\begin{array}{rr} 2 \\ 7 & 6 \\ \hline \end{array}$ | 8 | $\begin{aligned} & 2 \\ & 6 \\ & 7 \\ & \hline \end{aligned}$ |
| 9 | $\begin{array}{r} 5 \\ 78 \end{array}$ | 3 | $\begin{array}{ll} \hline & 2 \\ & \\ 7 & 8 \\ \hline \end{array}$ | 4 | $\begin{aligned} & 1 \\ & \hline \end{aligned}{ }^{2} 6$ | 26 | 1 | $\begin{aligned} & 2 \\ & 8 \\ & 8 \end{aligned}$ |
| 45 | 2 | $8^{6}$ | 3 | $1$ $6$ | $\begin{array}{ll} 1 & \\ & 6 \\ & 6 \end{array}$ | 45 | 7 | 9 |
| 1 | $\begin{array}{ll} 4 & \\ 7 & 8 \end{array}$ | $78^{6}$ | $\begin{array}{\|ll} \hline & 2 \\ 7 & 6 \\ 7 & 8 \end{array}$ | 5 | 9 | 23 $4 \quad 6$ | $4^{2} 6$ | $\begin{array}{rr} 2 & 3 \\ 4 & 6 \\ 4 & 8 \\ \hline \end{array}$ |

Starting from r3c2 (cycle 1) (blue), I can finish Twins in every boxes. Twins do not change their cells, even though two cells change from cycle to cycle and one cell changes because the

## Twins Construction Example

starting cell changes of course. See image above.

Note:Twins change only in boxes 1 and 2 .

This is Locked - Twins in column 2, cells r13c2, so cell r7c2 ( only cell outside box 1 on column 2) does not contain candidate.

Therefore $\mathrm{r} 8 \mathrm{c} 1=5=>\mathrm{r} 7 \mathrm{c} 7=5=>\mathrm{r} 2 \mathrm{c} 6=5$, because r1c28 and r3c28 become X-Wing.

Finally, the game needs simple techniques such as locked candidates and single digit to solve.

The game is solved.

