AI Lab-7 190031187
Radhakrishna

prelab

1. Solve the csp problem

TWO + TWO = FOUR

$$\begin{array}{cccc} & T & W & O \\ & T & W & O \\ \hline F & O & U & R \end{array}$$

→ F has to be 1, which also means that $T \geq 5$

→ The value of T depends on 'O'. So, if we look at the value of O

→ If O=0 the R would be 0, which doesn't work and 'O' can't be 1 because already F = 1

→ If O=2, then R=4 and since O=2, T must be equal to 6, so that $W < 5$ because there shouldn't be carry to T which changes the value of 'O'

$$\begin{array}{cccc} & \boxed{{}^{6}T} & \boxed{W} & \boxed{O^{2}} \\ & \boxed{{}^{6}T} & \boxed{W} & \boxed{O^{2}} \\ \hline \boxed{F^{1}} & \boxed{O^{2}} & \boxed{U} & \boxed{R^{4}} \end{array}$$

→ So the only possible value of w is 3 which implies the value of u = 6. But already T=6

So, O = 2 doesn't work

→ If O = 3 then R = 6, which forces the value of 'T' to be 6.

So, O = 3 doesn't work

→ If O = 4 then R = 8

$$\begin{array}{cccc} & \boxed{T^7} & \boxed{W^3} & \boxed{O^4} \\ & \boxed{T^7} & \boxed{W^3} & \boxed{O^4} \\ \hline \boxed{F^1} & \boxed{O^4} & \boxed{U^6} & \boxed{R^8} \end{array}$$

Since O = 4, T = 7, so that W < 5 because there shouldn't be carry to T

→ so possible values of W are 0, 2, 3

W cannot be 0 because then U becomes 0

If W = 2 U = 4 but already O = 4

so W ≠ 2

If W = 3 U = 6 which works

T = 7, W = 3, O = 4, F = 1, U = 6, R = 8

734 + 734 = 1468

→ If O = 5 then R = 0

So T should be 7 and it should get carry which implies that W ≥ 6

If W = 6, U = 3 since there is a carry from 'O' which works

765 + 765 = 1530

w can't be 7 because T is already 7

w can't be 8 because u becomes 7

but T is already 7

w can't be 9 which results u = 9

→ If O = 6 then R = 2 and T = 8 and w should be < 5 because there can't be carry to T. So w could be 0, 3 or 4

If W = 0, U = 1, which doesn't work because F is already 1

If W = 3, U = 7 which works

836 + 836 = 1672

→ If W = 4, then U = 9 which works

846 + 846 = 1692

$$\begin{array}{cccc} & \boxed{T^8} & \boxed{W^3} & \boxed{O^6} \\ & \boxed{T^8} & \boxed{W^3} & \boxed{O^6} \\ \hline \boxed{F^1} & \boxed{O^6} & \boxed{U^7} & \boxed{R^2} \end{array} \qquad \begin{array}{cccc} & \boxed{T^8} & \boxed{W^4} & \boxed{O^6} \\ & \boxed{T^8} & \boxed{W^4} & \boxed{O^6} \\ \hline \boxed{F^1} & \boxed{O^6} & \boxed{U^9} & \boxed{R^2} \end{array}$$

→ If O = 7 then R = 4 and T = 8 and w should be ≥ 5 because there has to be carry

If W = 6 U = 3 which works

867 + 867 = 1734

If W=9 then U=9 which doesn't work

→ If O=8 then R=6 and T=9 so that W < 5 because there should not be any carry so W could be 0, 2, 3, 4

If W=0 then U=1 doesn't work (U=F)

If W=2 then U=5 which works

928 + 928 = 1856

If W=3 then U=7 which works

938 + 938 = 1876

If W=4 then U=9 doesn't work because T=9

→ If O=9 then R=8 but T should be 9 which doesn't work

So 7 possible answers are

938 + 938 = 1876

928 + 928 = 1856

867 + 867 = 1734

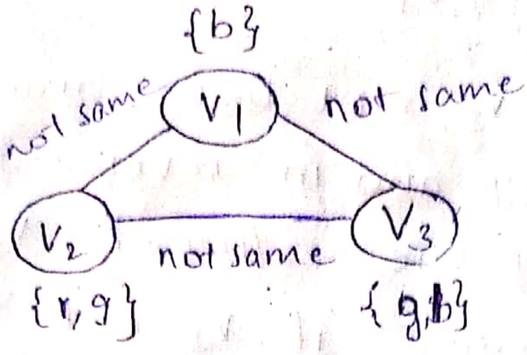
846 + 846 = 1692

836 + 836 = 1672

765 + 765 = 1530

734 + 734 = 1468

2. Apply ac1 for following



Initial domains:

$V_1 = \{b\}$

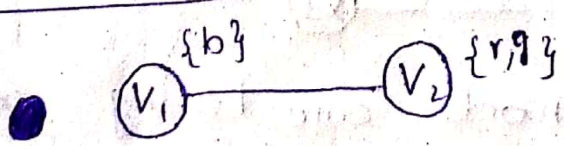
$V_2 = \{r, g\}$

$V_3 = \{g, b\}$

Each undirected constraint are is really two directed constraint arcs.

Constraint: The graph is consistent if and only if there should be atleast one color to a node and no two connected nodes have same colors

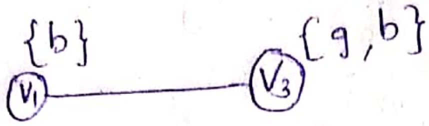
Arc Examined: $V_1 - V_2$



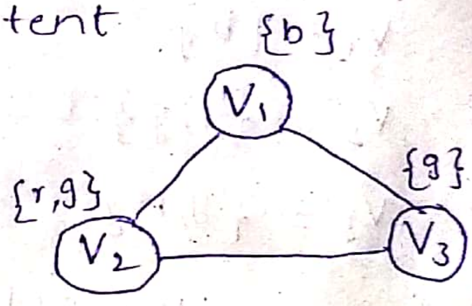
if V_1 is b then V_2 can be any color (r or g) and in reverse case since V_1 is having only b in its domain. The arc is consistent for any value of domain of V_2

Therefore no value is deleted.

Arc Examined: $V_1 - V_3$

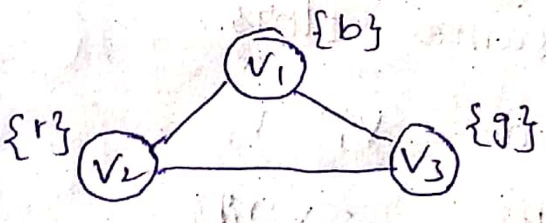


if V_1 is b then V_3 must be g and there is no inconsistency and in reverse case, since V_1 is having only one value 'b' V_3 can be g but not b because if V_3 is 'b' then arc is inconsistent (since V_1 is also b). So the value b is deleted from domain of V_3 so that the arc is consistent



Arc Examined: $V_2 - V_3$

if V_2 is r, then arc is consistent since V_3 is having only value that is g. the reverse case since V_3 is g then V_2 must be r and the arc is inconsistent, if $V_2 = g$ so $V_2 (g)$ is deleted to make arc consistent



Therefore all the nodes are having one colour and no two nodes have same colour so the graph is consistent

Arc Examined	Value Deleted
$V_1 - V_2$	None
$V_1 - V_3$	$V_3 (b)$
$V_2 - V_3$	$V_2 (g)$

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