XCS221 Assignment 5

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0.a

The variables for this problem would be,

$$X_j \quad (j = 1 \ldots . m)$$

The Domains would be,

$$T_j \subseteq \ 1 \ldots . . n$$

Note that we will have n constraints since our tuple is size n.

In Constraints for this problem, we have n constraint where constraint(i) implies that the sum of column i for all our variables should be X_j odd.

0.b

0.b i

There are two consistent assignments as following:

$$\{0, 1, 0\} \; and \; \{1, 0, 1\}$$

0.b ii

Call stack for backtrack ():

$Backtrack()$

$Backtrack(X1 : 0)$

$Backtrack(X1 : 0\ and\ X3 : 0)$

$Backtrack(X1 : 0\ and\ X3 : 0\ and\ X2 : 1)$

$Backtrack(X1 : 0\ and\ X3 : 1)$

$Backtrack(X1 : 1)$

$Backtrack(X1 : 1\ and\ X3 : 0)$

$Backtrack(X1 : 1\ and\ X3 : 1)$

$Backtrack(X1 : 1\ and\ X3 : 1\ and\ X2 : 0)$

The backtrack function is called 9 times.

0.b iii

Backtrack(X1 : 0)

Backtrack(X1 : 0 and X3 : 0)

Backtrack(X1 : 0 and X3 : 0 and X2 : 1)

Backtrack(X1 : 1)

Backtrack(X1 : 1 and X3 : 1)

Backtrack(X1 : 1 and X3 : 1 and X2 : 0)

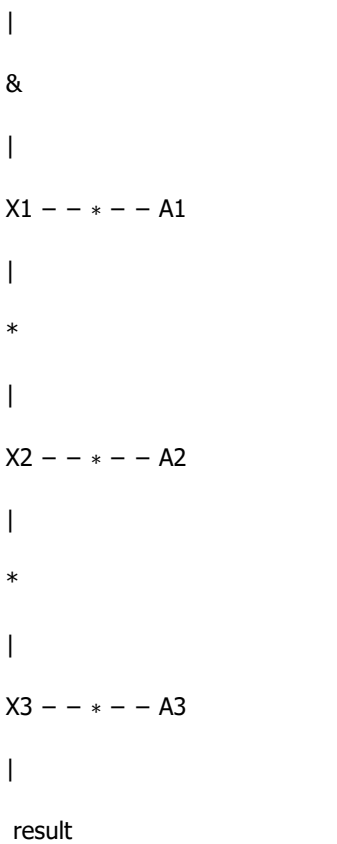
The backtrack function with AC-3 is called 7 times.

2.a

We are going to introduce the following auxiliary variables:

$$A1, A2, A3$$

which represent past, current and post pair of Xis, these variables help reduce the current ternary constrain for X1, X2, and X3 to unary and binary as shown above in the graph.



Factors:

$$A_1\,[0] == 0$$

$$A_i\,[1] == A\_(i-1)\,[3]$$

$$A_i\,[2] == X\_i$$

$$A_i[3] == A\_i\,[1] + X\_i$$

$$A_{end}\,[3] == result$$

$$result \leq K$$

Note that, as a result all the factors are unary and binary constrains.

3.c

The schedule that satisfies my requirement is:

Units: 0-3

Quarter: ['Aut2015', 'Spr2015', 'Aut2016']

Taken: {'CS109', 'CS140', 'CS145', 'CS106B', 'CS103', 'CS107', 'CS221', 'CS106X', 'CS161', 'MATH51'}

Requests:

Request{['CS229', 'CS221'] [] [] 1}

Request{['CS228'] [] [] 1}

Request{['CS246'] [] [] 1}

Found 5 optimal assignments with weight 1.000000 in 79 operations

First assignment took 37 operations

1.0

((Request{['CS229', 'CS221'] [] [] 1}, 'Aut2015'), '=', 'CS221')

((Request{['CS229', 'CS221'] [] [] 1}, 'Spr2015'), '=', None)

((Request{['CS229', 'CS221'] [] [] 1}, 'Aut2016'), '=', None)

((Request{['CS228'] [] [] 1}, 'Aut2015'), '=', None)

((Request{['CS228'] [] [] 1}, 'Spr2015'), '=', None)

((Request{['CS228'] [] [] 1}, 'Aut2016'), '=', None)

((Request{['CS246'] [] [] 1}, 'Aut2015'), '=', None)

((Request{['CS246'] [] [] 1}, 'Spr2015'), '=', None)

((Request{['CS246'] [] [] 1}, 'Aut2016'), '=', None)

(('CS229', 'Aut2015'), '=', 0)

(('CS221', 'Aut2015'), '=', 3)

(('CS228', 'Aut2015'), '=', 0)

(('CS246', 'Aut2015'), '=', 0)

(('sum', 'Total units inAut2015', ('CS229', 'Aut2015')), '=', (0, 0, 0))

(('sum', 'Total units inAut2015', ('CS221', 'Aut2015')), '=', (0, 3, 3))

(('sum', 'Total units inAut2015', ('CS228', 'Aut2015')), '=', (3, 0, 3))

(('sum', 'Total units inAut2015', ('CS246', 'Aut2015')), '=', (3, 0, 3))

(('Sum', 'Total units inAut2015', 'Final result'), '=', 3)

(('CS229', 'Spr2015'), '=', 0)

(('CS221', 'Spr2015'), '=', 0)

(('CS228', 'Spr2015'), '=', 0)

(('CS246', 'Spr2015'), '=', 0)

(('sum', 'Total units inSpr2015', ('CS229', 'Spr2015')), '=', (0, 0, 0))

(('sum', 'Total units inSpr2015', ('CS221', 'Spr2015')), '=', (0, 0, 0))

(('sum', 'Total units inSpr2015', ('CS228', 'Spr2015')), '=', (0, 0, 0))

(('sum', 'Total units inSpr2015', ('CS246', 'Spr2015')), '=', (0, 0, 0))

(('Sum', 'Total units inSpr2015', 'Final result'), '=', 0)

(('CS229', 'Aut2016'), '=', 0)

(('CS221', 'Aut2016'), '=', 0)

(('CS228', 'Aut2016'), '=', 0)

(('CS246', 'Aut2016'), '=', 0)

(('sum', 'Total units inAut2016', ('CS229', 'Aut2016')), '=', (0, 0, 0))

(('sum', 'Total units inAut2016', ('CS221', 'Aut2016')), '=', (0, 0, 0))

(('sum', 'Total units inAut2016', ('CS228', 'Aut2016')), '=', (0, 0, 0))

(('sum', 'Total units inAut2016', ('CS246', 'Aut2016')), '=', (0, 0, 0))

(('Sum', 'Total units inAut2016', 'Final result'), '=', 0)

Here's the best schedule:

Quarter	Units	Course
Aut2015	3	CS221