

CS401 Intro to Algorithm

Group Name: ERROR 404

Group Leader: Mark Decello

Group Members: Mark Decello, Julius Lopez, Gene Olivia,
Hanel Duran, Naglaa Saeid

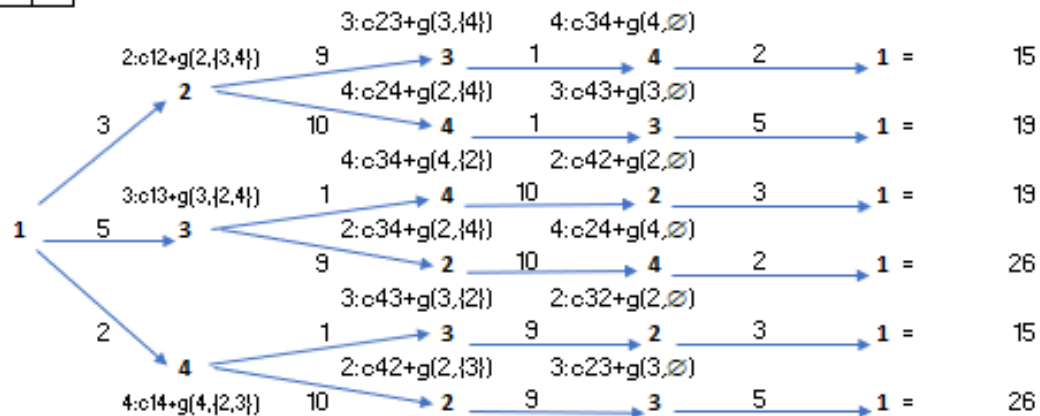
Topic: Dynamic Approach

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Example 1

D_0

	1	2	3	4
1	0	3	5	2
2	3	0	9	10
3	5	9	0	1
4	2	10	1	0



$S = \emptyset$

$S = \{2\}, \{3\}, \{4\}$

$S = \{2,3\}, \{2,4\}, \{3,4\}$

$g(2, \emptyset) = 3$
 $g(3, \emptyset) = 5$
 $g(4, \emptyset) = 2$

$g(2, \{3\}) = C_{23} + g(3, \emptyset)$	
$= 9 + 5 = 14$	
$g(2, \{4\}) = C_{24} + g(4, \emptyset)$	
$= 10 + 2 = 12$	
$g(3, \{2\}) = C_{32} + g(2, \emptyset)$	
$= 9 + 3 = 12$	
$g(3, \{4\}) = C_{34} + g(4, \emptyset)$	
$= 1 + 2 = 3$	
$g(4, \{3\}) = C_{43} + g(3, \emptyset)$	
$= 1 + 5 = 6$	
$g(4, \{2\}) = C_{42} + g(2, \emptyset)$	
$= 10 + 3 = 13$	

$g(2, \{3,4\}) = \min\{C_{23} + g(3, \{4\}), C_{24} + g(4, \{3\})\}$
$= \min\{9 + 3, 10 + 6\}$
$= \min\{12, 16\}$
$= 12$
$g(3, \{2,4\}) = \min\{C_{32} + g(2, \{4\}), C_{34} + g(4, \{2\})\}$
$= \min\{9 + 12, 1 + 13\}$
$= \min\{21, 14\}$
$= 14$
$g(4, \{2,3\}) = \min\{C_{42} + g(2, \{3\}), C_{43} + g(3, \{2\})\}$
$= \min\{10 + 14, 1 + 12\}$
$= \min\{24, 13\}$
$= 13$

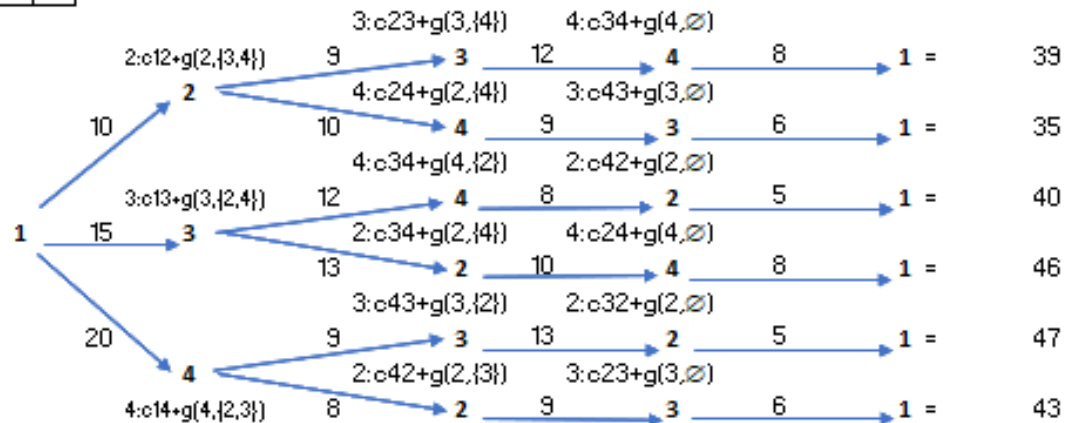
$S = \{2,3,4\}$

$g(1, \{2,3,4\}) = \min\{C_{12} + g(2, \{3,4\}), C_{13} + g(3, \{2,4\}), C_{14} + g(4, \{2,3\})\}$
 $= \min\{3 + g(2, \{3,4\}), 5 + g(3, \{2,4\}), 2 + g(4, \{2,3\})\}$
 $= \min\{3 + 12, 5 + 14, 2 + 13\}$
 $= \min\{15, 19, 15\}$
 $= 15$

Exercise 2

D_0

	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0



$S = \emptyset$

$g(2, \emptyset) = 5$
 $g(3, \emptyset) = 6$
 $g(4, \emptyset) = 8$

$S = \{2\}, \{3\}, \{4\}$

$g(2, \{3\}) = c_{23} + g(3, \emptyset)$	$= 9 + 6 = 15$
$g(2, \{4\}) = c_{24} + g(4, \emptyset)$	$= 10 + 8 = 18$
$g(3, \{2\}) = c_{32} + g(2, \emptyset)$	$= 13 + 5 = 18$
$g(3, \{4\}) = c_{34} + g(4, \emptyset)$	$= 12 + 8 = 20$
$g(4, \{3\}) = c_{43} + g(3, \emptyset)$	$= 9 + 6 = 15$
$g(4, \{2\}) = c_{42} + g(2, \emptyset)$	$= 8 + 5 = 13$

$S = \{2, 3\}, \{2, 4\}, \{3, 4\}$

$g(2, \{3, 4\}) = \min\{c_{23} + g(3, \{4\}), c_{24} + g(4, \{3\})\}$	$= \min\{9 + 20, 10 + 15\}$
$= \min\{29, 25\}$	$= 25$
$g(3, \{2, 4\}) = \min\{c_{32} + g(2, \{4\}), c_{34} + g(4, \{2\})\}$	$= \min\{13 + 18, 12 + 13\}$
$= \min\{31, 25\}$	$= 25$
$g(4, \{2, 3\}) = \min\{c_{42} + g(2, \{3\}), c_{43} + g(3, \{2\})\}$	$= \min\{8 + 15, 9 + 18\}$
$= \min\{23, 27\}$	$= 23$

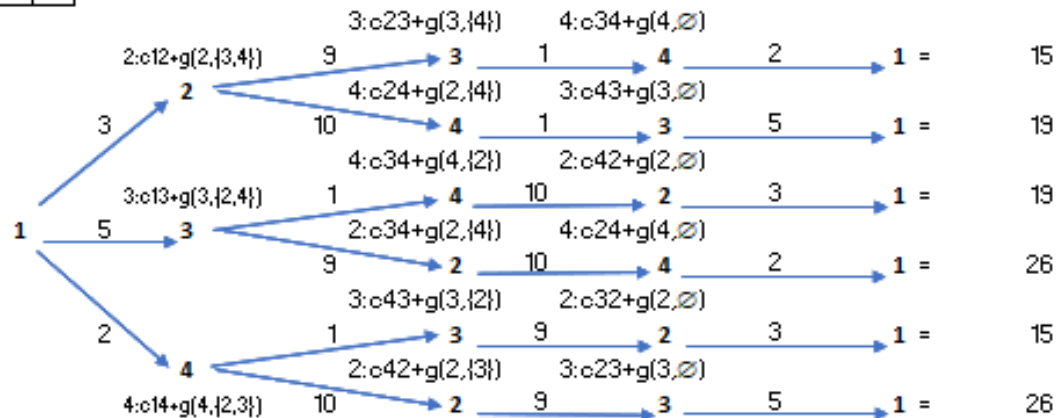
$S = \{2, 3, 4\}$

$g(1, \{2, 3, 4\}) = \min\{c_{12} + g(2, \{3, 4\}), c_{13} + g(3, \{2, 4\}), c_{14} + g(4, \{2, 3\})\}$
 $= \min\{10 + 25, 15 + 25, 20 + 23\}$
 $= \min\{35, 40, 43\}$
 $= 35$

Exercise 3

D_0

	1	2	3	4
1	0	3	5	2
2	3	0	9	10
3	5	9	0	1
4	2	10	1	0



$S = \emptyset$

$g(2, \emptyset) = 3$
 $g(3, \emptyset) = 5$
 $g(4, \emptyset) = 2$

$S = \{2\}, \{3\}, \{4\}$

$g(2, \{3\}) = c_{23} + g(3, \emptyset)$	$= 9 + 5 = 14$
$g(2, \{4\}) = c_{24} + g(4, \emptyset)$	$= 10 + 2 = 12$
$g(3, \{2\}) = c_{32} + g(2, \emptyset)$	$= 9 + 3 = 12$
$g(3, \{4\}) = c_{34} + g(4, \emptyset)$	$= 1 + 2 = 3$
$g(4, \{3\}) = c_{43} + g(3, \emptyset)$	$= 1 + 5 = 6$
$g(4, \{2\}) = c_{42} + g(2, \emptyset)$	$= 10 + 3 = 13$

$S = \{2, 3\}, \{2, 4\}, \{3, 4\}$

$g(2, \{3, 4\}) = \min\{c_{23} + g(3, \{4\}), c_{24} + g(4, \{3\})\}$ $= \min\{9 + 3, 10 + 6\}$ $= \min\{12, 16\}$ $= 12$
$g(3, \{2, 4\}) = \min\{c_{32} + g(2, \{4\}), c_{34} + g(4, \{2\})\}$ $= \min\{9 + 12, 1 + 13\}$ $= \min\{21, 14\}$ $= 14$
$g(4, \{2, 3\}) = \min\{c_{42} + g(2, \{3\}), c_{43} + g(3, \{2\})\}$ $= \min\{10 + 14, 1 + 12\}$ $= \min\{24, 13\}$ $= 13$

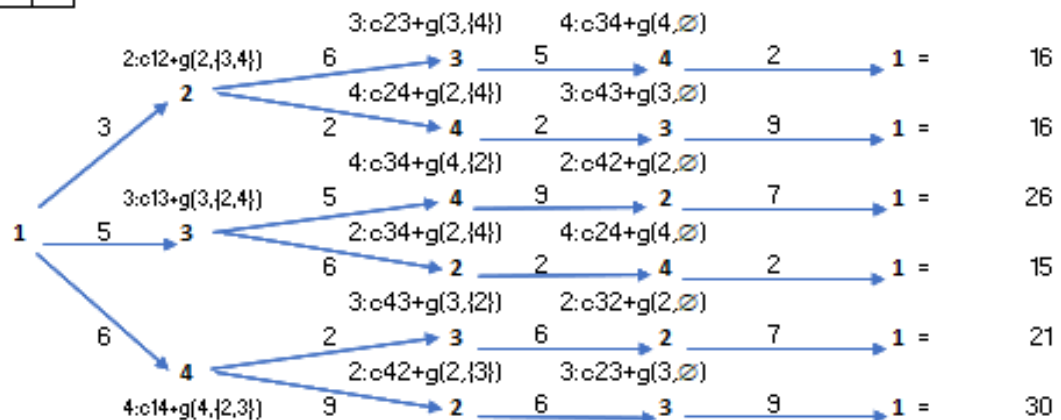
$S = \{2, 3, 4\}$

$g(1, \{2, 3, 4\}) = \min\{c_{12} + g(2, \{3, 4\}), c_{13} + g(3, \{2, 4\}), c_{14} + g(4, \{2, 3\})\}$
 $= \min\{3 + 12, 5 + 14, 2 + 13\}$
 $= \min\{15, 19, 15\}$
 $= 15$

Exercise 4

D_0

	1	2	3	4
1	0	3	5	6
2	7	0	6	2
3	9	6	0	5
4	2	9	2	0



$S = \emptyset$

$S = \{2\}, \{3\}, \{4\}$

$S = \{2,3\}, \{2,4\}, \{3,4\}$

$g(2, \emptyset) = 7$

$g(3, \emptyset) = 9$

$g(4, \emptyset) = 2$

$g(2, \{3\}) = C_{23} + g(3, \emptyset)$	$= 6 + 9 = 15$
$g(2, \{4\}) = C_{24} + g(4, \emptyset)$	$= 2 + 2 = 4$
$g(3, \{2\}) = C_{32} + g(2, \emptyset)$	$= 6 + 7 = 13$
$g(3, \{4\}) = C_{34} + g(4, \emptyset)$	$= 5 + 2 = 7$
$g(4, \{3\}) = C_{43} + g(3, \emptyset)$	$= 2 + 9 = 11$
$g(4, \{2\}) = C_{42} + g(2, \emptyset)$	$= 9 + 7 = 16$

$g(2, \{3,4\}) = \min\{C_{23} + g(3, \{4\}), C_{24} + g(4, \{3\})\}$	$= \min\{6 + 7, 2 + 11\}$	$= \min\{13, 13\}$	$= 13$
$g(3, \{2,4\}) = \min\{C_{32} + g(2, \{4\}), C_{34} + g(4, \{2\})\}$	$= \min\{6 + 4, 5 + 16\}$	$= \min\{10, 21\}$	$= 10$
$g(4, \{2,3\}) = \min\{C_{42} + g(2, \{3\}), C_{43} + g(3, \{2\})\}$	$= \min\{9 + 15, 2 + 13\}$	$= \min\{24, 15\}$	$= 15$

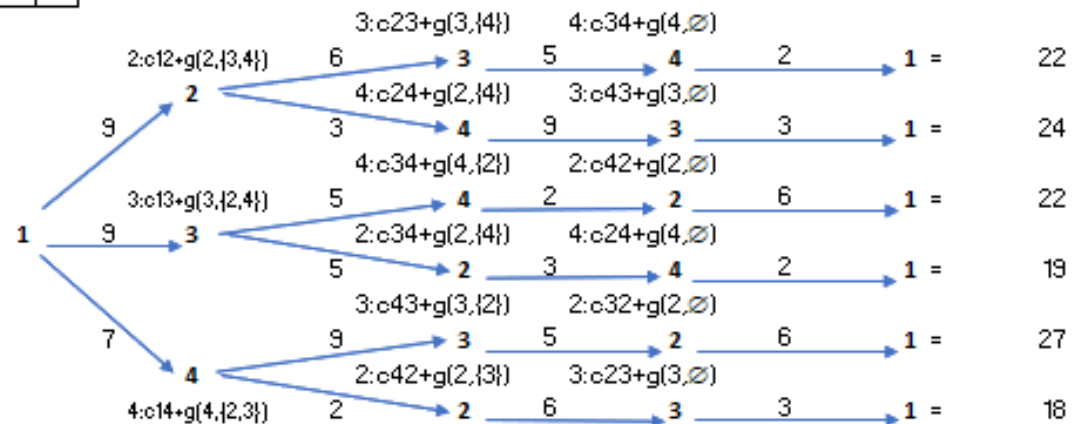
$S = \{2,3,4\}$

$$\begin{aligned}
 g(1, \{2,3,4\}) &= \min\{C_{12} + g(2, \{3,4\}), C_{13} + g(3, \{2,4\}), C_{14} + g(4, \{2,3\})\} \\
 &= \min\{3 + g(2, \{3,4\}), 5 + g(3, \{2,4\}), 6 + g(4, \{2,3\})\} \\
 &= \min\{3 + 13, 5 + 10, 6 + 15\} \\
 &= \min\{16, 15, 21\} \\
 &= 15
 \end{aligned}$$

Exercise 5

D_0

	1	2	3	4
1	0	9	9	7
2	6	0	6	3
3	3	5	0	5
4	2	2	9	0



$S = \emptyset$

$g(2, \emptyset) = 6$
 $g(3, \emptyset) = 3$
 $g(4, \emptyset) = 2$

$S = \{2\}, \{3\}, \{4\}$

$g(2, \{3\}) = C_{23} + g(3, \emptyset)$	$= 6 + 3 = 9$
$g(2, \{4\}) = C_{24} + g(4, \emptyset)$	$= 3 + 2 = 5$
$g(3, \{2\}) = C_{32} + g(2, \emptyset)$	$= 5 + 6 = 11$
$g(3, \{4\}) = C_{34} + g(4, \emptyset)$	$= 5 + 2 = 7$
$g(4, \{3\}) = C_{43} + g(3, \emptyset)$	$= 9 + 3 = 12$
$g(4, \{2\}) = C_{42} + g(2, \emptyset)$	$= 2 + 6 = 8$

$S = \{2, 3\}, \{2, 4\}, \{3, 4\}$

$g(2, \{3, 4\}) = \min\{C_{23} + g(3, \{4\}), C_{24} + g(4, \{3\})\}$ $= \min\{6 + 7, 3 + 12\}$ $= \min\{13, 15\}$ $= 13$
$g(3, \{2, 4\}) = \min\{C_{32} + g(2, \{4\}), C_{34} + g(4, \{2\})\}$ $= \min\{5 + 5, 5 + 8\}$ $= \min\{10, 13\}$ $= 10$
$g(4, \{2, 3\}) = \min\{C_{42} + g(2, \{3\}), C_{43} + g(3, \{2\})\}$ $= \min\{2 + 9, 9 + 11\}$ $= \min\{11, 20\}$ $= 11$

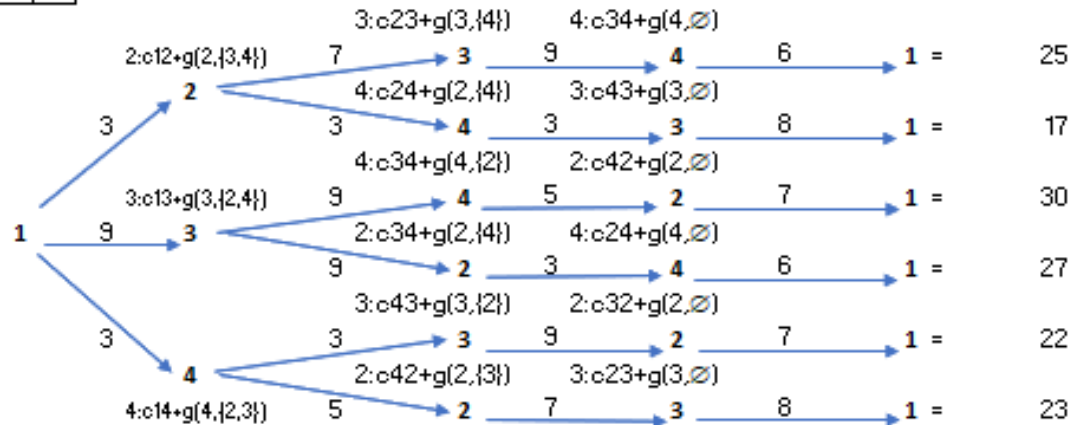
$S = \{2, 3, 4\}$

$g(1, \{2, 3, 4\}) = \min\{C_{12} + g(2, \{3, 4\}), C_{13} + g(3, \{2, 4\}), C_{14} + g(4, \{2, 3\})\}$
 $= \min\{9 + 13, 9 + 10, 7 + 11\}$
 $= \min\{22, 19, 18\}$
 $= 18$

Exercise 6

D_0

	1	2	3	4
1	0	3	9	3
2	7	0	7	3
3	8	9	0	9
4	6	5	3	0



$S = \emptyset$

$g(2, \emptyset) = 7$
 $g(3, \emptyset) = 8$
 $g(4, \emptyset) = 6$

$S = \{2\}, \{3\}, \{4\}$

$g(2, \{3\}) = C_{23} + g(3, \emptyset)$	
$= 7 + 8 = 15$	
$g(2, \{4\}) = C_{24} + g(4, \emptyset)$	
$= 3 + 6 = 9$	
$g(3, \{2\}) = C_{32} + g(2, \emptyset)$	
$= 9 + 7 = 16$	
$g(3, \{4\}) = C_{34} + g(4, \emptyset)$	
$= 9 + 6 = 15$	
$g(4, \{3\}) = C_{43} + g(3, \emptyset)$	
$= 3 + 8 = 11$	
$g(4, \{2\}) = C_{42} + g(2, \emptyset)$	
$= 5 + 7 = 12$	

$S = \{2, 3\}, \{2, 4\}, \{3, 4\}$

$g(2, \{3, 4\}) = \min\{C_{23} + g(3, \{4\}), C_{24} + g(4, \{3\})\}$	
$= \min\{7 + 15, 3 + 11\}$	
$= \min\{22, 14\}$	
$= 14$	
$g(3, \{2, 4\}) = \min\{C_{32} + g(2, \{4\}), C_{34} + g(4, \{2\})\}$	
$= \min\{9 + 9, 9 + 12\}$	
$= \min\{18, 21\}$	
$= 18$	
$g(4, \{2, 3\}) = \min\{C_{42} + g(2, \{3\}), C_{43} + g(3, \{2\})\}$	
$= \min\{5 + 15, 3 + 16\}$	
$= \min\{20, 19\}$	
$= 19$	

$S = \{2, 3, 4\}$

$g(1, \{2, 3, 4\}) = \min\{C_{12} + g(2, \{3, 4\}), C_{13} + g(3, \{2, 4\}), C_{14} + g(4, \{2, 3\})\}$
 $= \min\{3 + g(2, \{3, 4\}), 9 + g(3, \{2, 4\}), 3 + g(4, \{2, 3\})\}$
 $= \min\{3 + 14, 9 + 18, 3 + 19\}$
 $= \min\{17, 27, 22\}$
 $= 17$