Algorithms and Datastructures

Assignment 9

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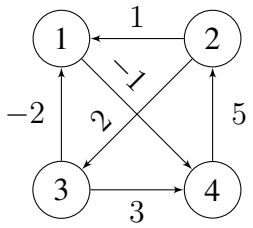
1

$D^{(0)}$



	1	2	3	4
1	0	∞	∞	-1
2	1	0	2	∞
3	-2	∞	0	3
4	∞	5	∞	0

$D^{(1)}$

	1	2	3	4
1	0	∞	∞	-1
2	1	0	2	0
3	-2	∞	0	-3
4	∞	5	∞	0

$D^{(2)}$

	1	2	3	4
1	0	∞	∞	-1
2	1	0	2	0
3	-2	∞	0	-3
4	6	5	7	0

$D^{(3)}$

	1	2	3	4
1	0	∞	∞	-1
2	0	0	2	-1
3	-2	∞	0	-3
4	5	5	7	0

$D^{(4)}$

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

2

If the distance from a node to itself no longer is zero, we know that there is a negative cycle. For example, in the graph of exercise 1, if $4 \to 1$ would be 3 then we would get $1 \to 1 = -1$, which should never be possible. This is the case because 4 will go to 1 through 2, with a total path of 0.

3

A top-down implementation is a recursive function that starts at the top (with the most elements) and then it recursively calls itself producing the result. Memoization comes into play so we do not have to recalculate the previous recursive calls that we have already done, instead we can read from a table that we have calculated. This increases space complexity but is makes the algorithm faster because we no longer have to recompute a lot of things.