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I have read and agree to the collaboration policy. Davie Truong

Homework Heavy

CMPS 102 – Spring 2017 – Homework 3

Solution to problem 3

A.

V1 V3 The algorithm will choose:

V4 (V1, V2), (V2, V5) L = 2

V2 V5 The correct algorithm would give:

(V1, V3), (V3, V4), (V4, V5) L = 3

B.

OPT(i) = length of the longest path from V1 to Vi

OPT(i) = 0 if j = 0,1

Max (OPT(j)) + 1 for all j that is reachable from I

For i = 1 to n

M[i] = -1

M [1] = 0

For i =1 to n

If m[i] 0

For each node j that can be reached from i

M[j] = max (m[i] + 1, m[j])

Return m[n];

Description:

The formula in the algorithm assigns the max value that is either the previous value + 1 or the current value. Wrapped around the formula, is a loop to apply the formula to all nodes reachable from the main outer loop.

Proof of Correctness:

The formula inside the double loop guarantees that m[i] contains the length of the longest path from m[1] to m[i]. The structure of the double loop checks every node and every node that it can reach, thus updating all nodes to contain the highest possible length from m[1] to m[i].

Time Complexity:

O ( because the outer for loop runs n times and the inner for loop runs worse case n-1 times if the node can reach all other nodes. This resulting in a (n-1)(n) time complexity.

Space Complexity:

O (n) because an array is used to update the length of each node.