CSCI-570: Homework # 3

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Saket Choudhary
skchoudh@usc.edu
2170058637

Contents

HW3

(2)

A) The intersections can be viewed as the nodes of a directed graph. An intersection I_i can be reached from I_j given that there is an edge incident from I_j to I_i that is $(I_j, I_i) \in E$ where E= set of edges of Graph $G(V, E)$
If such a directed graph allows to reach from any point to any other point, it needs to be strongly connected implying there is a path from I_i to I_j and from I_j to I_i. Checking if a path from I_j exists to I_i will involve reversing the edge directions in the directed graph and checking if I_i can be reached from I_j. So if the mayor is right, it should be possible to traverse from I_j to I_i with the edges inverted.
Such a strongly connected directed graph can be traversed in linear time using DFS with a run time of O(n+m)
B) Since the mayor's original claim is false $\implies$ G is not strongly connected. However the focus shifts to the town hall being "strongly connected" with the rest of the nodes. In order for this to happen the node for town hall say T must be a sink of a strongly connected component. The approach would involve determining all such components containing T such that they are strongly connected. Next run a DFS in $O(n + m)$ to determine all nodes reachable from T if all these nodes belong to to same strongly connected component, it should be possible to travel from T to these and back.

(3: Ch#3 Ex#3)

(4)

A) The intersections can be viewed as nodes of a directed

(5: Ch#4 Ex#3)

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(7: Ch#4 Ex#4)

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