

CISC 621 HW U Model Solution

Joseph Stelmach

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CLRS 25.2-6 If the graph outputted by the Floyd-Warshall algorithm, $D^{(n)}$, contains a negative value at $D_{i,i}^{(n)}$ for any i , then we have a negative weight cycle. A negative value in one of these positions implies that the distance between a vertex and itself is less than zero.

CLRS 25.2-8 Consider the following algorithm to compute the transitive closure of a graph $G = (V, E)$

Transitive_Closure(V, E)

- 1: $T \leftarrow NIL$ // T will be an initially empty list of vertices
 - 2: **for** each vertex $v \in V$ **do**
 - 3: $T \leftarrow T +$ each vertex $u \in V$ that is reached while performing $\text{BFS}(G, v)$
 - 4: **end for**
 - 5: **return** T
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The complexity of the operation at line 3 is given by the complexity of BFS, which is $O(V + E)$. The outer loop runs for every vertex $v \in V$, which means it runs V times. Therefore, the complexity of Transitive_Closure can be given by $O(V^2 + VE)$. However, we know that $E \leq V^2$, which means the algorithm runs in $O(VE)$ time.