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CS590 Homework Assignment 11: Application Exercises

Due Date: April 10, 2022

Problem 13.7.39:

A customized DFS search can be performed in this case for each vertex or station, to find the stations reachable by at 4 or less links from the vertex. The DFS algorithm will be:

```
Algorithm CustDFS(G,v,depth,S)
Inputs: graph G, begin vertex v, depth to
traverse to, S sequence to store the result in
Output: a sequence S of vertices reachable
from v in at most depth hops
count ← 0
mark v as visited
if (depth = 0) then
   return S
for each edge in G.incidentEdges() do
   tov ← G.opposite(edge,v)
   if (! isVisited(tov)) then
       S.insertLast(tov)
       S ← CustDFS(G,tov,depth − 1,S)
return S
```

```
Algorithm ComputeFourSets(G)
Input: a graph G
Output: a dictionary keyed on a vertex with values being sequences of nodes 4-reachable from that vertex
D is a blank dictionary
for each v in G.vertices() do
    D.insert(v, CustDFS(G,v,4, a new sequence))
```

For a graph where every vertex is at most 4 edges away from others, n complete DFS traversals will be performed practically. So the worst-case run time is $O(n(n + m))$. But the running time is $O(nm)$ if the network is connected (when $m \geq n - 1$).