Department of Computer Technology and Information Systems

CTIS264 – Computer Algorithms

Spring 2019 - 2020

Lab Guide 11 - Week 15

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OBJECTIVE:

- **Horspool's Algorithm for String Search (Searching pattern in the given text file)**
- **Dijkstra's Algorithm for Shortest Path (Using dictionary)**

Q1. Write a Python program that reads a text file named impact.txt, then takes the pattern to be searched from the user and by implementing Horspool's string search algorithm, and find the first position of the string in that text. You may use the following Pseudo Codes for Horspool's Algorithm:

ALGORITHM ShiftTable(P[0..m − 1])

```
//Fills the shift table used by Horspool's
//Input: Pattern P[0..m − 1] and an alphabet of possible characters
//Output: Table[0..size − 1] indexed by the alphabet's characters and filled with shift sizes
computed by formula (7.1)
for i ← 0 to size − 1 do
        Table[i]← m
for j ← 0 to m − 2 do Table[P[j]]← m − 1− j
Return Table
```

//Implements Horspool's algorithm for string matching

```
//Input: Pattern P[0..m − 1] and text T [0..n − 1]
//Output: The index of the left end of the first matching substring or −1 if there are no matches
ShiftTable(P[0..m − 1])      //generate Table of shifts
i ← m − 1                    //position of the pattern's right end
while i ≤ n − 1 do
   k ←0
   while k ≤ m-1 and P[m-1-k]=T[i-k] do
        k ← k+1
   if k = m
        return i − m + 1
   else i ← i + Table[T [i]]
return −1
```

Output:

```
File content is

Due to the social, political and cultural context of many places throughout the world,
women are often disproportionately affected by disaster.[27] In settings where women
and children are likely to remain at home, natural disasters, such as earthquakes,
can result in greater morbidity and mortality among women. For example, during the
1993 earthquake in Maharastra, India, more women died than men as they were more
likely to be in the home, due to their role as caregivers.In the 2004 Indian Ocean
tsunami, more women died than men, partly due to the fact that fewer women knew how
to swim
Enter a string to search: social
11
```

Q2. Read a weighted connected graph adjacency matrix from the excel sheet by using pandas module (**matrix.xlsx** is given to you), then create this graph in dictionary structure. Ask the source point (**source vertex**) and target point (**target vertex**) from the user and **i**mplement Dijkstra's Shortest Path Algorithm to find the shortest path and path length between source and target.
Please try the same algorithm with different adjacency matrixes. While uploading your program, upload at least **one more adjacency matrix and the vertex lists** to moodle.

You may use the following pseudo code to implement Dijksrta's algorithm:

ALGORITHM Dijkstra(G, s)
//Dijkstra's algorithm for single-source shortest paths
//Input: A weighted connected graph G= (V,E) with nonnegative weights
// and its vertex s
//Output: The length d_v of a shortest path from s to v and its penultimate
// vertex p_v (predecessor) for every vertex *v* in V
Initialize(Q) //initialize priority queue to empty
for every vertex v in V
    $d_v \leftarrow \infty$;
    $p_v \leftarrow$ null
    Insert(Q, v, d_v) //initialize vertex priority in the priority queue
$d_s \leftarrow 0$; Decrease(Q, s, ds) //update priority of s with ds
$V_T \leftarrow \emptyset$
for i $\leftarrow$ 0 to |V| $-$ 1 do
    $u^* \leftarrow$ DeleteMin(Q) //delete the minimum priority element
    $V_T \leftarrow V_T \cup \{u^*\}$
    for every vertex u in V $-$ V_T that is adjacent to u^* do
        if $d_{u^*} + w(u^*, u) < d_u$
            $d_u \leftarrow d_u * w(u^*, u)$; $p_u \leftarrow u^*$
            Decrease(Q, u, d_u)

Output:

```
Enter the number of vertexes: 6
Enter the vertex list for the matrix:  sabcdt

Graph:  {'s': {'a': 2, 'b': 1}, 'a': {'b': 4, 'c': 8}, 'b': {'d': 2}, 'c': {'d': 7,
't': 4}, 'd': {'t': 5}, 't': {'c': 3, 'd': 5}}
Enter the source vertex: s
Enter the target vertex: t
shortest path: ['t', 'd', 'b', 's'] cost=8
```