INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

CSN-261 : Data Structures Laboratory

Assignment-4

Name : **HEMANT**

Enr. No. : **18114030**

E-mail : **hemant@cs.iitr.ac.in**

Problem 1 :

Create a dictionary using Trie data structure (without using STL) having words and their meanings. You need to read the words and their respective meanings from a CSV file (uploaded in Piazza, named as TrieInput.csv), where 1st column is for words and 2nd column shows its meaning. Given a word you have to print its meaning. If no such word is found in the dictionary, then print "Invalid word". Create a GUI using Qt library to accept a word in a text box and display the meaning in an another box, as shown in the Figure 1. Also, create an installer of your program for Windows OS. You can use the software like InstallSimple or InstallShield or WIX or NSIS to do so.

Algorithms Used :

1. Storing word in tree form in the dictionary using its charachters and using hash function to search them.

Data Structure Used :

1. Tree
2. Array

Snapshots :

Problem 2 :

Implement N Queens problem to show all the possible combinations in N x N binary matrix and to display the total number of such combinations at the end, where 1 represents the position of N queens in the N x N matrix and remaining cells are represented by 0. A sample output for N=4 is shown below.

Algorithms Used :

1. Backtracking

Data Structure Used :

1. Array

Snapshots :

```
Enter size of chessboard : 4

Solution 1 is :
0 1 0 0
0 0 0 1
1 0 0 0
0 0 1 0

Solution 2 is :
0 0 1 0
1 0 0 0
0 0 0 1
0 1 0 0

Number of Solutions possible are : 2
```

Time taken :

```
real    0m3.631s
user    0m0.002s
sys     0m0.000s
```

Problem 3 :

Given an integer array having N number of elements, write a C++ program using hash map (using STL) to find the length of the largest subarray from the given input array, where the summation of the elements of the subarray is equal to n. In the output, if any solution exists then print the starting and ending index (with respect to given input array) of the largest subarray and also print its length. Otherwise, print "Not Found", as described in the following output.

Algorithms Used :

1. First storing sum in an array and then searching if n-x exist in the same array. If yes, then there is some subarray with sum n.

Data Structure Used :

1. Array

Snapshots :

```
Enter length of array : 8
Enter the array :
3 9 -3 -1 3 6 2 7
Enter sum to search for : 10
Length of longest subarray is 4
Index from 3 to 6
```

Time taken :

```
real    0m18.507s
user    0m0.002s
sys     0m0.000s
```