CSC210 Advanced Algorithm and Design Lab
23/01/2023

Time: 1 Hour

Instructions
1. Write the programs with proper comments and indentation
2. Create a directory <Admission Number>_<Date> [21JEXXXX_090122], copy all the files into it and **upload in Google Class Room**
3. Submit a single C/C++ source file
4. Do not use STL calls
5. Each program should start with these comment lines:
/*
Name:
ID No:
***/**

Q1. Consider a mesh data structure as shown in Figure 1. We have 81 numbers (int.txt). We would like to distribute them in a mesh of size 9 (rows) x 9 (columns). Let us make a two-dimensional linked-list representation of this array. The entire structure is accessed by a single pointer A pointing to the cell at the top left corner of the mesh. Apart from that some nodes contain skip pointers, such that node 3*x+1 points to 3*(x+1), for x=0,1,2, … For other nodes skip pointer points to NULL.

Part 1: Define a data type to store a node in the mesh. Each node should store a number, and three pointers: horizontal, vertical, and skip. Also, define a pointer to a node of this type to point to the mesh. [5]

Part 2: Write a function *initnumber* to create a 9 × 9 mesh using dynamic memory allocation to the cells of the mesh. The initial entries in all the cells are initialized to 0. A pointer A to the cell at the top left corner is to be returned by the function. In all future references to the mesh, you pass only this pointer A to access the entire mesh. [10]

Part3: Write a function *storenumber* that takes A pointer as input and read numbers sequentially from the file and insert them in the mesh as follows. The entire mesh should be sorted. (see figure 1). [15]

Part4: Write a function *traversecount* that, given A and number as inputs, print the details of the path, number of skip pointers used, and total hops traversed from top left corner pointed by A. [15]

Part5: Write a function *traversepaircount* that, given A and two number (source, target) as inputs, print the details of the path, number of skip pointers used, and total hops traversed from between source and target. [15]

The **main()** function:

1. Call *initnumber* to allocate memory to the mesh and initialize all entries.
2. Call *storenumber* to read numbers from file and accordingly add it to the mesh.
3. Call *traversecount* to print the path, skip pointers, number of hops traversed to find a number from top left corner.
4. Call *traversepaircount* to print the path, skip pointers, number of hops traversed to find the path between source and target.

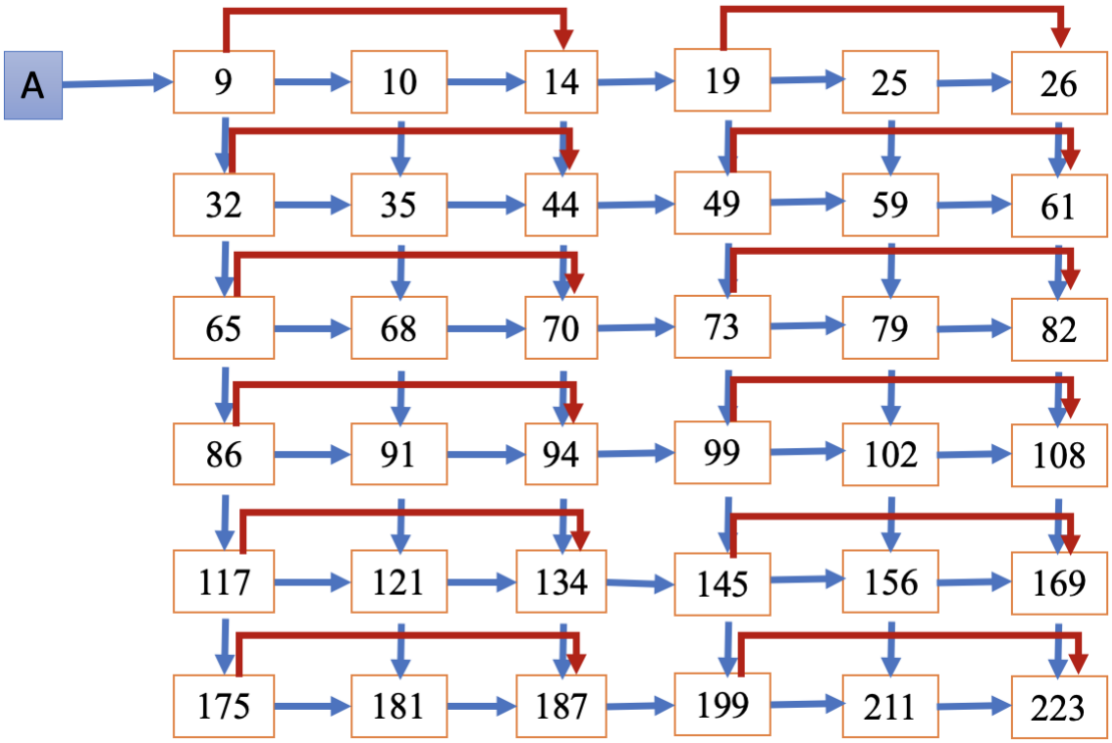

Figure 1: Distribution of numbers in 9x9 mesh