Programming Fundamentals

Assignment 3 (10%)

Manipulate Linked Lists with Recursion and Pointers

[Deadline: 23:59 Friday 7 May 2021]

In this assignment, you are going to write a C++ program that could reverse a doubly linked list in a special way. Given a doubly linked list, we aim to manipulate it according to four requirements as follows.

1. Each node in this linked list should be implemented as an object (belongs to **a class called Node**). Its data should be **private**, and its two links should be **public**.

2. Each node contains a positive integer (range from 0 to 99) as its data. This integer is randomly generated when the node is **created** (Hint: You could use function **rand() % 100** from **#include <stdlib.h>** . If you want to create a new object within a for loop or while loop, you may need to use **Node *nodei = new Node();**).

3. The user could input the length of this doubly linked list and the program will create it accordingly. Then, the program should print out this linked list from the beginning to the end by using **a member function of class Node**.

4. Write another **recursive** non-member function to reverse the linked list. It should set the last node in the original list as the first node and the linking order should be the **reverse** of the original one. For example, if we have a linked list [2, 1, 6, 7, 11], then the output should be [11, 7, 6, 1, 2]. Finally, print out the reversed linked list using the member function defined in point 3.

Assessment Criteria

Besides correctness of your program (90 marks), the followings are assessed (10 marks):

- ⇨ Efficiency (e.g., elegance of coding and control structures)
- ⇨ Scalability (e.g., modularization by using functions)

- ⇨ Neatness (e.g., code formatting, appropriate comments and no unnecessary duplicated code)
- ⇨ Input validation (e.g., validation of input data before processing and proper re-prompt)

Submission

Follow the steps below:

1. Create a folder and name it as A3_<student no>_<your name>.
   E.g., A3_12345678d_CHANTaiMan
2. Put all the .cpp and .h files into the folder.
3. Compress the folder (.zip, .7z, .rar, or .jar).
4. Submit the file to Blackboard.

In this assignment, only C++ syntaxes covered up to Lecture 12 and Lab 10 can be used.

Any wrong file naming and submission will be given ZERO mark in this assignment. If you are using Windows, the file extension may be hidden by the operating system. Follow the steps of below links to make sure the file extension is not hidden:

https://www.howtohaven.com/system/show-file-extensions-in-windows-explorer.shtml

If your program cannot be compiled, ZERO mark will be awarded for that program.

A maximum of 3 attempts for submission are allowed. Only the last attempt will be assessed.

The deadline of this assignment is **23:59 Friday 7 May 2021**. No late submission is allowed.

This assignment is an individual work. All work must be done on your own. Plagiarism is serious offence. The Moss (https://theory.stanford.edu/~aiken/moss/) system will be adopted for plagiarism checking. Submissions with high similarity, in terms of code patterns and structures, in addition to direct-copy-and-paste, will be treated as plagiarism. Copying code from web resources is prohibited as well. Any plagiarism cases (both copier and copiee) will be given ZERO mark in this assignment.