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COP3530: Data Structures and Algorithms

Programming Assignment 1: Line Editor

Due: Friday, September 21, 2018

<u>**Commentary Document**</u>

Q1. What is the computational complexity of the methods in the implementation?

   a) **Line Class (Implemented Node class)**

All the methods in this class have a computational complexity of O(1). Accessing a Node's values/attributes and/or setting them is done in constant time always.

Method	Computational Complexity
Line::Line() (Constructor)	O(1)
Line::getId()	O(1)
Line::getValue()	O(1)
Line::getNext()	O(1)
Line::setId()	O(1)
Line::setValue()	O(1)
Line::setNext()	O(1)

   b) **Page Class (Implemented Linked List class)**

Most of the methods in this class have a computational complexity of O(n) because I did not make use of an iterator. Each time, I start at the head Node and then traverse to the location where an operation needs to be performed. With an iterator in place, the operations will have a complexity of O(1) since there are only a constant number of instructions to be executed.

The Page::search() method has a complexity of n^3 (n-cubed) because I have two nested for-loops inside of a while-loop. This is because my search compares every possible substring of each Line in the Editor Page. Just like with a file stored on a computer, it is a lot faster to access the file with a known location than that with unknown location. The entire file has to be searched to see which filename matches.

Method	Computational Complexity
Page::Page() (Constructor)	O(1)
Page::insertEnd()	O(n)
Page::insert()	O(n)
Page::edit()	O(n)
Page::search()	O(n^3)
Page::deleteLine()	O(n)
Page::print()	O(n)

Q2. Your thoughts on the use of linked lists for implementing a line editor. What are the advantages and disadvantages?

Answer: A Linked List is the best way to implement a line editor.

Advantages	Disadvantages
Access, Insertion and Deletion is O(1) assuming that an iterator is already pointing to the target Node	Complexity is O(n) when no iterator is used. The target Node can only be reached by traversing from the head Node
Insertion, Deletion and Editing is very easy and takes a lot less time and memory space in comparison to an Array-based Editor	

Q3. What did you learn from this assignment and what would you do differently if you had to start over?

Answer: I learned how to implement a line editor using linked lists. I would not do anything differently if I had to start over because I implemented accessors and mutators in order to protect the data stored in each node (See the methods of the Line class).