

COP3530: Programming Assignment 1 Write-Up

1. What is the complexity of the methods in the program?

The time complexities are as follows:

```
void addEnd(std::string line) – O(1)  
void insert(int index, std::string line) – O(n)  
void remove(int index) – O(n)  
void edit(int index, std::string newline) – O(n)  
void search(std::string line) – O(n)  
void display() – O(n)  
bool checkForQuotes(std::string s) – O(n)
```

The addend method only has to find the tail pointer and link a node to the end, so it operates in $O(1)$. All other methods have to iterate through the list, creating a runtime complexity of $O(n)$.

2. What are the advantages and disadvantages of using a linked list for a line editor?

Using a linked list for a line editor makes adding new lines simple and efficient, as the `addEnd(std::string line)` method operates in $O(1)$ time (assuming the list implementation includes a field for the tail of the list). This makes sense for a line editor, as the majority of new lines will likely be added to the end of the document and not in the middle. The linked list implementation can also grow as needed, which is beneficial for documents of potentially widely varying sizes. However, linked lists access elements more slowly than a list with an array implementation, so if elements need to be accessed often, an array implementation may offer better performance. Lastly, array implementations do not need to store pointers, meaning they may require less memory than a linked list implementation.

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

This assignment helped me to gain more experience with C++ and allowed me to better understand how the standard library implementation of linked lists operates. It also gave me practical experience in identifying code complexity and in using pointers. If I had to start over, I would begin the project earlier as some of the bugs I encountered took longer to fix than I anticipated. However, my laptop was broken for a few days during the project assignment period, preventing me from starting as early as I intended.