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Assignment 5

CS6420

Part 1: Extending basic regular expressions

I'll be using Big O notation to analyze the runtime of the `recognizes()` function.

First, it calls the `constructNFA` function which has a runtime of $O(M)$, where M is the length of the pattern. This is because the `constructNFA` goes character by character across the length of the pattern.

The second part of the `recognizes` algorithm tests the text to see if it matches the pattern:

- A DFS is performed which has a runtime of $O(E + V)$ where E = edges & V = vertices.
 - V will be $M+1$
 - E will be a low multiple of M (ex: 3). With the addition of multiway or, one vertex would have an out degree equal to the number of 'or' meta characters + 1.
 - The DFS will can be approximated to $O(\alpha M)$
- A for loop goes over the text, size N , looking for meta characters and containing an internal for loop:
 - The internal for loop iterates over the reachable parts of the pattern. If all parts are reachable, this could be as large as M
 - This combination of for loops has runtime of $O(MN)$
- Adding these all up together $O(\alpha M) + O(MN)$, we can simplify to $O(MN)$

Part 2: Constructing an NFA from a regular expression

