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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(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, we can simplify to O(MN)

Part 2: Constructing an NFA from a regular expression