Practice - Stacks - Midterm I

August 29, 2016

1. Given a Chain, Device a method to reverse the list using a stack.
2. Given the following notations
   (a) Prefix notation - Here instead of having something like X+Y, you have operators written before their operands. +XY
   (b) Postfix notation - Here instead of having something like X+Y, you have operators written after their operands XY+

   Use an stack to convert from Prefix to Postfix notation when they are provided using an Array Linear List.

   Note: Postfix and Prefix are mirror expressions.
3. Given arithmetic expressions (+,-) without parenthesis in postfix notation using a Chain, give a way of evaluating them using a stack.
4. A palindrome is a string of characters (a word, phrase, or sentence) that is the same regardless of whether you read it forward or backward—assuming that you ignore spaces, punctuation, and case. For example, Race car is a palindrome. So is A man, a plan, a canal: Panama.
   (a) Describe how you could use a stack to test whether a string is a palindrome.
   (b) Give a java code for this
5. Suppose that you read a binary string—that is, a string of 0s and 1s—one character at a time.
   (a) Describe how you could use a stack but no arithmetic to see whether the number of 0s is equal to the number of 1s. When these counts are not equal, state how you could tell which character—0 or 1—occurs most frequently and by how much its count exceeds the other's.
   (b) Provide a java code for doing this.
6. If you are writing a shell for command interpretation, How you implement a buffer for the past instructions using two stacks?

7. How would you design a stack which, in addition to push and pop, also has a function min which returns the minimum element? Push, pop and min should all operate in O(1) time.

8. Write a linked-list–based stack implementation that keeps items on the list in order from least recently inserted to most recently inserted. You will need to use a doubly linked list.

9. Write an output method for what is in the stack using the derived implementations

   (a) ArrayLinearList

   (b) Chain List

10. Implement a multi-pop method in your scratch implementation with the following behavior

    (a) It gets an integer k and it pops k elements from the stack

    (b) If k $>$ size of the stack throws an error.

11. The ADT stack lets you peek at its top entry without removing it. For some applications of stacks, you also need to peek at the entry beneath the top entry without removing it. We will call such an operation peek2. If the stack has more than one entry, peek2 returns the second entry from the top without altering the stack. If the stack has fewer than two entries, peek2 returns null. Write a linked implementation of a stack that includes a method peek2.

12. Imagine a linked implementation of the ADT stack that places the top entry of the stack at the end of a chain of linked nodes. Describe how you can define the stack operations push , pop , and peek so that they do not traverse the chain.