

Lab 9: Problem Solving with Stack

Input Handling with a Stack

In this lab, you will be working with input from the keyboard and performing stack operations to implement a reverse polish notation calculator. In this lab, we will work on handling input from the keyboard and using a stack to check if a string of parentheses ("(", ")") is "balanced".

Balanced parentheses mean that each opening symbol has a corresponding closing symbol and the pairs of parentheses are properly nested. Consider the following correctly balanced strings of parentheses:

```
(( () () ))  
((( )))  
(( ( ( ) ) ) )
```

Compare those with the following, which are not balanced:

```
((((( )))  
( ))  
( ) ( )
```

Algorithm:

1) Read input from keyboard.

2)

a) If the current character is a starting bracket ('(') then push it to stack.

b) If the current character is a closing bracket (')') then pop from stack and if the popped character is the matching starting bracket then fine else parenthesis are not balanced and exit.

3) Input string is complete when a newline character is encountered. If there is some starting bracket left in stack then it's not balanced else it is balanced.

Implementation

Your code should read input from the keyboard and echo it to the screen. You may assume that the string is terminated when a newline character is encountered and that the input string will consist of only the parenthesis, space, newline characters. To check if the parentheses are balanced, you must write a subroutine IS_BALANCED that accepts the current character in R0 and performs the push or pop operation and if it detects unbalanced parentheses (step 2b of algorithm) it sets R5 to -1. If space character is encountered, it should be ignored.

In the end, if your program detects balanced parentheses, it should set R5 to 1. Complete your code in the file lab9.asm in your lab9 folder. This lab is graded only on functionality. If your code does not assemble you will receive 0.

What to Submit

- Submit your code of lab9.asm to MySTU
- In the lab, demonstrate your implementation of lab9 in front of a teaching assistant, answer questions, and sign your name.