CIS 26B
Advanced C
Programming Assignments

Homework 2

A Circular Doubly Linked List of Stacks

100 Points

Projects

`26B_H_2A.c` – Basic Stack and Queue Operations: There are a number of errors (about 10) in this program. Locate all errors, fix them run the program and save its output as a comment at the end of the source file.

`26B_H_2B.c` – Build a doubly-linked list of stacks (next pages).

Grading

Program 2A – 30Points

Program 2B – 65 Points

1. Read file name – 5
2. Read from file – 20
   (build sorted list of stacks)
3. Display list (ascending/descending) – 20
4. Search – 15
5. No memory leak – 5

Self Assessment Report: – 5Points

Write a short report (**`26B_H2Report.docx`**), briefly explaining your code and containing an assessment of your implementation based on the above grading criteria.

NOTE: Please review the following examples before you start working on this assignment:

`e_3_6_queue_driver.c`
`e_3_6_stack_driver.c`
`e_3_13_doubly_linked_list_driver.c`
`e_3_23_list_of_queues.c`

You are expected to write similar code. Reuse as much code as possible (basic stack and linked list functions and anything else you find useful).

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Program 2B

Using your favorite text editor, use the data on the next page to create a file which has a state/city string and a temperature for the city on each line such as:

```
Arizona,Tucson:107
```

For any given state/city, there may be many lines in the file. The lines towards the bottom of the file represent the most recent temperatures. Write a program which does the following:

1. Prompts the user to enter the name of the input file; if the user does not enter a name, use a default file name, such as **`temperatures.txt`**

2. Reads the data from file into an ordered list of stacks. The list is sorted in ascending order by the state/city string, a unique key. The temperature values for a given state/city are pushed onto its stack. (See example below).
   - The stack nodes contain
     - an integer (temperature) and
     - a pointer to the next stack node.
   - The list nodes contain
     - a state/city string,
     - a pointer to the next state/city node,
     - a pointer to the previous state/city node,
     - a pointer to the stack of temperature nodes for that state/city,
     - a count of the nodes in the stack, and

   Requirement: create a circular doubly-linked list with one sentinel node

3. Displays the sorted list in ascending order (state/city and only one temperature value – at the top of the stack. (A – Z)

4. Displays the sorted list in descending order (state/city and only one temperature value – at the top of the stack. (Z – A).

5. Search loop. Prompts the user for a state/city string. If the state/city string is in the list, display the most recent temperature and the average temperature for that state/city. Give an error message if the state/city string is not found in the list. Prompts the user repeatedly until s/he enters "quit".

EXAMPLE

// input file

```
Arizona,Tucson:99
Oregon,Portland:85
Arizona,Tucson:90
Oregon,Portland:75
Arizona,Tucson:100
```

// 2 nodes in the linked list: each node has its own stack

```
{Arizona,Tucson, 3} {Oregon,Portland, 2}
      //stack top                 //stack top
          100                        75
           90                        85
           99
```

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NOTE: For all homework assignments assume the input file is valid. When reading data from a file, we assume data have been validated, therefore we may consider that the file is valid and correctly formatted.

When reading data from the keyboard extensive validation is required.

INPUT FILE: **`temperatures.txt`**

```
Pennsylvania,Philadelphia:91
California,San Francisco:75
Nevada,Reno:108
Arizona,Flagstaff:81
California,Yreka:101
Arizona,Tucson:107
California,Los Angeles:78
California,Los Angeles:81
Pennsylvania,Pittsburgh:89
Oregon,Salem:90
California,Los Angeles:82
Arizona,Flagstaff:84
California,San Francisco:64
Oregon,Salem:83
California,San Francisco:68
Arizona,Tucson:99
California,Yreka:100
Arizona,Phoenix:109
Oregon,Portland:82
Arizona,Tucson:103
Oregon,Portland:79
Arizona,Phoenix:107
California,Cupertino:88
California,San Francisco:82
Arizona,Tucson:109
Oregon,Salem:85
Pennsylvania,Philadelphia:86
California,Los Angeles:97
Nevada,Reno:108
```