CS1337 – Fall 2022

Homework Assignment #2 –File Processing, Arrays and Structures

October 4, 2022
Due Date: October 14, 2022 – 10:00pm

Introduction

In this assignment you will write a small C++ program. Your program should compile correctly and produce the specified output.

Ask if you have any questions. Original work is required.

Problem Statement

The program will read a file (`cityInfo.txt`) containing city information. This information includes city id, group, location (x, y) and city name.

The `cityInfo.txt` has the following format:

```
int   char  double     double     string
```

For example:

```
107   S     18.30      66.10      San Juan, P.R.
45    H     21.18      157.50     Honolulu, Hawaii
54    K     24.33      81.48      Key West, Fla.
67    M     25.46      80.12      Miami, Fla.
119   T     27.57      82.27      Tampa, Fla.
103   S     29.23      98.33      San Antonio, Tex.
47    H     29.45      95.21      Houston, Tex.
```

Table 1: Input File Example

Where:

- Column 1 is the ID – A unique integer value. It may not be continuous,
- Column 2 is the group – an upper-case character [A-Z]
- Column 3 is city's location X coordinate
- Column 4 is city's location Y coordinate,
- Column 5 is city name. It may include spaces, commas, dots, to indicate state/province and country.

After reading the file the program will display a menu. Using the menu, the user can select to display the cities with ID within a range (e.g., display the city info for all the cities with ID >=6 and ID<= 15), or by group (e.g., display the city info for all the cities with group = A), choose two cities (by id), namely city1 and city2, and compute the linear (Euclidean) distance between the two chosen cities, and an option to exit the program.

The assignment: write a program to

1) Define a structure to store the information for one city. This is, the structure must contain a data member for each of the parameters coming from column 1 to 5 in the file. (**5 points**)
2) Define an array of structures. Assume the maximum number is 1000. i.e., the file will always have information of no more than 1000 cities. (**5 points**)
3) Read the data from the input file and store it in the array defined in 2). (**15 points**)

4) Display a menu (**10 points**):

```
a. Display cities by ID range
b. Display cities by group
c. Enter City 1
d. Enter City 2
e. Compute Distance
f. Exit
```

- **Notice:** Make sure your options are letters (numbers are not allowed)

5) When the menu option a) is selected, the program asks the user for the min_id and max_id values. Input validation is required: min_id<max_id, min_id >=0, 0<= max_id (**10 points**)
6) When option b) from the menu is selected, the program asks the user to enter a character. This character (e.g., group_char) must be in the range [A, Z]. (**5 points**)

- **Notice:** for options **a** and **b**, display the city info as in table 1. All the columns are left aligned. Use 6 positions (byte fields) for ID, 8 positions for group, 10 positions with precision 2 for X and Y coordinates, and at least 30 positions for the city name.

7) When option c) or d) are selected, the program asks for an integer. If the integers entered for city 1 and city 2 are the same, a message should warn the user and ask to try a different value for the latter (the last one that was chosen). If either id does not exist, the program must warn the user and ask to enter the id again (**20 points**)

- **Notice:** city id is not the same as the city index (index refers to its position in the array, while id, is the value found in the first column of the input file)

8) If option e) is chosen:
    a. Determine if the ids for city 1 and 2 have been entered. If not, warn the user and display the menu again. This is, if none or only the id of city 1, or only the id of city 2 are defined, the program cannot compute the distance. (**10 points**)
    b. Compute the linear distance and display it on the screen (8-byte fields, with precision 2). *You can reuse any of your functions from previous homework assignment or any function written in class or available in your textbook/slides. Avoid copy and paste from google search or anywhere else*. (**5 points**)
9) After any of the options **a** to **e** is chosen, the menu should be displayed again (**5 points**).
10) The program will finish only when option **f** is chosen (**5 points**).

11) If any other option is selected (i.e., any option different of a-f), display a message indicating that the option is invalid. (**5 points**)
12) Flowchart or pseudocode (**10 points**)

Hint: Linear distance between two points (i.e., P_1 and P_2) with coordinates (x_1, y_1) and (x_2, y_2), on a 2D plane:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Deliverables

You will turn in a file with the flowchart drawing or pseudcode, C++ source code file (.cpp) and a screenshot(s) (using ptrscr or you can also take a picture with your phone or mobile device), in jpg/gif/png format. The screenshot(s) should be showing the input and output of your program, showing how it works for each menu option.

Make sure to add in your source code any assumption you have made, clearly explained.

Remember: The C++ source code file should, comply with all the formatting requirements already discussed (description at the top of your cpp/h file, comments per line/function, closing brackets, etc.).

Topics: flow control, files, arrays and structures. See the corresponding chapters/slides for reference.