Date handed out: 01/11/2022
Date submission due: 15/11/2022

Earthquakes Data Analysis

This assignment aims to help you practice the linked list data structure by using its based and advance operations. The overall goal here is to create a C program that takes in Earthquakes data collected by a digital table and allows the analysis and interpretation of the data.

Place	**Date**	**Magnitude**	**Latitude**	**Longitude**	**Tsunami**
$Country_1$	2016-11-13	4.9	-42.2914	173.8065	1
$Country_2$	2018-12-14	4.6	-17.4442	-174.1893	0
$Country_2$	2020-05-16	5.1	-24.9817	-179.9581	1
$Country_2$	2019-07-18	4.7	6.1803	-82.4554	1
$Country_7$	2015-09-12	2.3	38.7666	142.1254	1
$Country_6$	2014-02-18	6.3	9.9203	145.3497	0
Ocean X	2005-07-20	3	2.8662	126.6018	1
…..	….	….	...	...	..
$Country_n$	2010-01-23	4.3	-37.5235	179.2126	1

Table 1: Example of Earthquakes Data

Table 1 shows general information about each earthquake that happened. Each line of the table holds the characteristics of an earthquake within a country or an ocean. For each earthquake, the following details are provided: **Place:** where the earthquake happened, **Date** (when did the earthquake occur), **Magnitude** is the size of the earthquake which varies from (2.5 or less up to 8.0 or more) and as the number grows the damage of the earthquake increases. **Latitude** and **Longitude** represent the exact location of an earthquake. Finally, some earthquakes may lead to a **Tsunami**, and accordingly 1 means that there was a Tsunami and 0 means there was not.

You will need to read the processed data and represent it in your program as follows: create a linked list to store the place (country or ocean) and for each, you need to create a linked list where each node stores information about a particular earthquake (i.e about each entry in the given Table 1). An illustration can be found in figure 1.

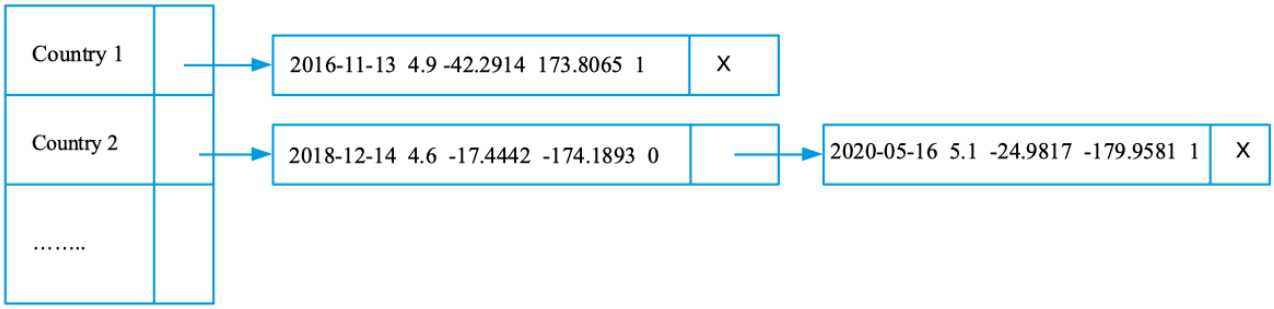

Figure 1 Illustration of Data Representation

Once you read the processed data from a file, you will need to implement some basic operation of linked lists, such as the insertion and deletion of nodes. Once you create the required data structure with its basic operations, you will need then to provide some statistics about the earthquake data to the users and also allow them to interact with your application as given bellow.

Programming Requirement:

First of all, you need to define a data structure to represent the data given in Figure 1. Please note that you need to use a linked list to represent the earthquakes characteristics for each country or oceans and you will need another one to keep track of these linked lists. You must not make any assumption about the number of earthquakes and also you must not make any assumption about the list of countries. Your program will need to follow these steps:

1) You need to read the data of the earthquake from an external file. Please note, you cannot make an assumption about the number of earthquakes in a file. Assume that the file is given in the format in Table 1. Assume that the data in the file is separated by comma. For example as follow:
$Country_1$, 2016,11,13, 4.9, -42.2914, 173,.8065, 1

2) You will then need to create the data structure as illustrated in Figure 1 to represent the list of earthquakes characteristics for each country.

3) you will then ask the user whether they would like to remove the data or not. If they would like to remove the data then the program will ask them to enter a threshold value for the magnitude of an earthquake, and the program will delete all the earthquakes with magnitude bellow that threshold.

4) You will then display the following statistics of to the user:
- The number of earthquakes for a particular country, basically the number of nodes created for a particular country.
- Average earthquake magnitude for a particular country or ocean and the number of tsunamis occurrence.

In order to achieve these steps, you need to have the following functions. Please, strictly follow the requirements on the functions given below!

- **load_data**: This function will take the file name as an input. It will then load the data from the file to your data structure defines in Figure 1. This data structure will be returned by this function.

  input: file name that will be used to load earthquakes
  return: a data structure to represent the overall data, see Figure 1.

- **remove_earthquake**: This function will take the data structure represented in Figure 1 and a threshold value. It will then remove all the nodes from all the countries, oceans that have earthquake with a magnitude below that threshold value.

  input: a data structure to represent the overall data, see Figure 1.
  return: void

- **average_magnitude:** This function will get a linked list of earthquakes characteristics recorded for a country and it will return the average of magnitude characteristic in that list.

  input: a linked list of earthquake features for a particular country or ocean
  return: the average magnitude of earthquake.

- **count_earthquakes:** This function will get a linked list of earthquakes recorded for a country or ocean and it will return the number of earthquakes (i.e, nodes) in that list.

  input: a linked list of earthquakes features for a particular country
  return: the number of earthquakes

Grading:

your program will be graded as follows:

Grading Point	Mark (out of 100)
Data Structure Representation	5
Main function to control and coordinate the commands	15
load_data	25
remove_earthquake	25
show_statistics	5
average_magnitude	15
count_earthquakes	10

Important Notes:

- Remember to have a good programming style (appropriate comments, variable names, formulation of selection statements and loops, reusability, extensibility ...etc). Each of the items above will include 10% for the programming style.
- Read rules regarding the assignments from the syllabus carefully.
- If you code does not compile due to syntax error, you will automatically get zero.
- If your code includes a variable declaration inside a for loop such as for(int i=0, i<5, i++), you will automatically get a zero.
- If your code includes global variables, you will automatically get zero.

Sample Run:

[input are shown in bold]

Welcome to Earthquakes Data Analysis Program
Enter file name: Earth.txt
The earthquake characteristics is successfully loaded.

Operations Menu
---
1. Remove Earthquake
2. Show Statistics
3. Exit

Enter your option: 1
Enter a threshold value for the magnitude: 2.5
The number of removed nodes: 1

Operations Menu
---
1. Remove Earthquake
2. Show Statistics
3. Exit

Enter your option: 2
Enter a user name: $Country_2$
The number of earthquake is: 3 and the Tsunami is 2
The average of earthquake magnitude is: 4.8

Operations Menu
---
1. Remove Earthquake
2. Show Statistics
3. Exit

Enter your option: 3
See you, bye bye!