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COS110 Practical 1

Rainfall Statistics

Due date: 14 August 2016, 23h00

Total marks: **44**

1 General instructions

- This practical should be completed individually.
- Be ready to upload your code well before the deadline, as no extension will be granted.
- If your code does not compile, you will be awarded a mark of 0. The output of your program will be primarily considered for marks, although internal structure may also be tested (eg. the presence of certain functions or classes).
- Read the specifications thoroughly before you start coding.
- To ensure that you did not plagiarize, your code will be inspected with the help of dedicated software.
- Note that plagiarism is considered a very serious offence. Plagiarism will not be tolerated and disciplinary action will be taken against offending students. Please refer to the University of Pretoria's plagiarism page at `http://www.ais.up.ac.za/plagiarism/index.htm`.

2 Overview

For this practical, you will create a module that takes the raw rainfall data from a data file and populates a three-dimensional array with the data for further processing.

3 Your task

An automatic logging rain gauge collects and records rainfall data and sends that data to a server. Rainfall statistics are computed and used for visualization tasks and in the seasonal prediction of rain and crop production. Archived rainfall data out of the 90's is found on a long-forgotten server, and a team of scientists sets out to determine how much the climate has changed since then in terms of rainfall. You are the team's dedicated programmer, and you are tasked with creating a C++ module that takes the raw rainfall data from the server (data file) and populates a three-dimensional array with the data for further processing.

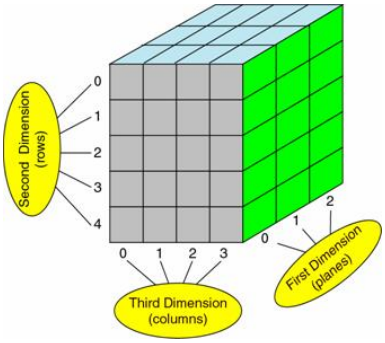
You are given a **makefile**, a main file named **rainfall.cpp**, a **h-file** called **arrayUtilities.h**, an empty source file **arrayUtilities.cpp**, as well as a data file called **raindata.txt**. You are required to implement the set of functions described in the **h-file** in the corresponding **cpp** file. The requirements of the functions are included in the **h-file**.

The given program should read the data from the given file. The following is a snippet of the data file illustrating its format:

```
1990/08/06-07:31    0
1990/08/07-07:32    0
1990/08/08-07:35    15
1990/08/09-07:34    8
1990/08/12-07:31    20
```

Each line contains a time stamp followed by a number. The number represents the number of millimeters rainfall measured for that day. The dates are in a sequential order i.e they follow in a logical order of occurence. Note, however, that data for some days may be missing. In the above example the data for 10 and 11 Aug 1990 is missing.

The rainfall data must be stored in a 3D array of shorts (smallest data size). The following is a possible visualisation of the 3D array with three planes, five rows and four columns representing `array[Planes][Rows][Columns]`



In this program you will create a 3D array `rainData[year][month][day]` with a plane for each year, a row for each month and a column for each day. When populating the 3D array, the cells representing the days for which the data is missing should be set to **-1**.

Sample Output

The following is a sample test run of the program:

```
Enter exit any time to quit
Enter the date in the form YYYY/MM/DD to display the rainfall on that day: 1990/08/08
It rained 15mm on 1990/08/08
--------------------------------------------------------------------------------
Enter the date in the form YYYY/MM/DD to display the rainfall on that day: 1990/08/11
No data found for input "1990/08/11"
--------------------------------------------------------------------------------
Enter the date in the form YYYY/MM/DD to display the rainfall on that day: 1993/08/08
It rained 7mm on 1993/08/08
--------------------------------------------------------------------------------
Enter the date in the form YYYY/MM/DD to display the rainfall on that day: 1997/08/08
No data found for input "1997/08/08"
--------------------------------------------------------------------------------
Enter the date in the form YYYY/MM/DD to display the rainfall on that day: exit
--------------------------------------------------------------------------------
```

Test your code. When you are certain it works as expected, compress all of your source code (**all** .h and .cpp files) into a single archive (either .tar.gz, .tar.bz2 or .zip) and submit it for marking to the appropriate upload link (Prac 1, Rainfall Statistics) before the deadline.

Note: You are given 5 upload attempts. Use them wisely!

The End