CSc10300 - Assignment 3

Arrays/Vectors, User-defined Functions - Fall 2021

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We want to write a C++ program that performs a couple of procedures on two-dimensional (N by N) arrays. To this end:

(a) Define an integer variable named N that shows the size of the input matrix. This is the variant of your program and you as a programmer can change it to use matrices of different sizes in different runs of your program.

(b) Declare 2 two-dimensional double arrays A and B of size N*N and fill them with user-input values.

(c) Define a `print()` function that takes a matrix as input and print it in a form of a matrix using tabs.

(d) Define function areEqual() that checks corresponding elements of two given matrices and returns **true** if they were all equal. (False otherwise)

(e) Define function isIdentity() that takes a matrix as input and return **true** if the matrix is an identity matrix. (False otherwise)

(f) Define evenAndOdd() function that takes a matrix as an input, computes and returns the number of odd numbers and number of even numbers as two integer values. You should define a separate function(s) for checking if a number is even or odd.

(g) Define sumOfColumns() function that takes a matrix as input and returns a vector of sum of columns of matrix. The first element of the vector would be the sum of the first column of the matrix, the second element would be the sum of the second column, and so on.

(h) Define sumOfRows() function that takes a matrix as input and returns a pointer to an array of the sum of columns of the matrix. The first element of the array would be the sum of the first row of the matrix, the second element would be the sum of the second row, and so on.

(i) Define sortByRowAndColumn() function that takes a matrix and sort its values first by row and then by column in-place. This function does not

return any values.

$$\begin{bmatrix} 9 & 1 & 2 \\ 5 & 3 & 1 \\ 4 & 8 & 0 \end{bmatrix} \xrightarrow{\text{Sorting each row}} \begin{bmatrix} 1 & 2 & 9 \\ 1 & 3 & 5 \\ 0 & 4 & 8 \end{bmatrix} \xrightarrow{\text{Sorting each column}} \begin{bmatrix} 0 & 2 & 5 \\ 0 & 3 & 8 \\ 1 & 4 & 9 \end{bmatrix}$$

(j) Separate function definitions into separate files (a header file and a source file @zybook 6.14).

(k) Unit-test all of the functions. In the main function, you should have different pieces of code, each for testing one of the functions in your code. Separate them by comments and make sure you specify which function each part of the code belongs to. Use **N=3** for testing parts a to f of the problem, and **N=4** for testing g-j.

Instructions

- You cannot use 2D vectors instead of 2D arrays in this homework.
- We have not covered arrays by pointers yet, so you are not allowed to use dynamic memory allocations for passing arrays.
- If a parameter can be defined as a constant parameter, define it as a constant parameter.
- Make sure that your program could be compiled by the command provided on zybook 6.15.