06.11.2023

CENG205 DATA STRUCTURES

ASSIGNMENT 1

Write a C program for multiplication of two upper triangular matrices.

- Read an input file (with a fixed name of input.txt) that is located near your executable.
- Input file contains 3 lines of information:
  - 1st line contains dimension (N) of triangular matrices that will be multiplied. Notice that upper triangular matrices are square matrices of N x N.
  - 2nd line contains content of first upper triangular matrix (matrix A) in a 1D array form excluding zeros. Non-zero values in the matrix are separated with blank characters.
  - 3rd line contains content of first upper triangular matrix (matrix B) in a 1D array form excluding zeros. Non-zero values in the matrix are separated with blank characters.
- Example input file content:

```
4
1 2 3 4 6 7 8 11 12 16
16 15 14 13 11 10 9 6 5 1
```

- Example matrices given above can be demonstrated as:

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 6 & 7 & 8 \\ 0 & 0 & 11 & 12 \\ 0 & 0 & 0 & 16 \end{bmatrix} \qquad B = \begin{bmatrix} 16 & 15 & 14 & 13 \\ 0 & 11 & 10 & 9 \\ 0 & 0 & 6 & 5 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

- Represent all of the triangular matrices using a **1D array** structure, excluding zeros, in your program. You are **not allowed** to use 2D arrays or any other data structure. You **must perform** the multiplication using those 1D arrays.
- Result of the multiplication of the example matrices:

$$C = A \times B = \begin{bmatrix} 16 & 37 & 52 & 50 \\ 0 & 66 & 102 & 97 \\ 0 & 0 & 66 & 67 \\ 0 & 0 & 0 & 16 \end{bmatrix}$$

- Print the multiplication result as a 1D array in the same format of the input matrices and also as a traditional matrix (2D array) in which values in each row are separated by tab (“\t”) characters. Use a blank line between these two output forms.
- Example output of the above given matrices:

```
16 37 52 50 66 102 97 66 67 16


16    37    52    50
0     66    102   97
0     0     66    67
0     0     0     16
```

Matters needing attention:

- Submission file structure must conform the template given below:

  < NameSurname_Studentnumber>.zip
  |---*.c

  (Name and surname information must be included in the file. Necessary information should be written separately as a description line (comment line) in the code file submission.)

- Submissions should contain only the code files but not the executables or project files.
- Assignments confronting with these submission rules will be penalized.
- Assignments should be uploaded via Gazi LMS. No other submission methods (e-mail, message) will be accepted.
- Assignments must be submitted on time. No late submissions will be accepted.
- Codes in assignments should be written in standard C programming language. Code::Blocks IDE with GCC will be used for evaluation and it is your responsibility to be sure your code works properly on this setup.
- Assignments should be prepared in English.
- Coding standards should be followed, and full attention should be paid to details such as indentation, variable/function naming. It should be detailed with comment lines.
- All external ideas, algorithms and codes must be referenced properly as comment in the code. Otherwise, assignments will be considered as copies.
- Sloppy or copy-paste assignments will be penalized.
- Must no copy, zero will be given when a copy is detected.

  (Assignments will be subject to pairwise code comparison and similar assignments will be considered as copies.)