Assignment1 Software Design Document

CS2300 Section 4 Fall 2021

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Project Description

The goal of this program is to generate several matrices. Once generated, those matrices must be saved to one text file each . A second program reads those text files and then attempts to add those matrices and multiply them. The resulting matrices, or an error message where appropriate, are then printed to additional text files.

Approach

I used two methods to generate the matrices: one which populated the rows first, and another which populated the columns first. These methods were printed to a text document using the Printwriter class.
A second program read the files, it used a method to read them in. Once stored in memory, another method added them, and then passed them to a third method to multiply them. Because matrix multiplication is not commutative, it passed them twice, in swapped order. Both the addition and the multiplication functions printed the answers to a file.
To multiply the matrices, I used three nested for loops, one controlled the column that needed to be populated, which is also the column needed to be read from on one matrix. The second was the same for the row. The third was needed to add all the products together correctly.

Detailed Design

I wrote this program in java

It utilized two classes, one which created and printed the matrices, the other which read, summed and multiplied them.

Flowchart showing how the modules interact (not needed if you only have one module)

I only used two dimensional arrays for this project. I should have created a matrix object, This would have made the code less redundant, but also probably longer.

Pseudocode

Generate each of the matrices using the matrixColumnFirst method or the matrixRowFirst method as appropriate.

- Use a nested pair of for loops to travel around the matrix, place a number in each element by iterating by one argument and starting by another.

Print the matrices to a text document using the printMatricies method.

- Also uses a nested pair of for loops to move around the matrix, it prints each element to a file using textWriter

Read the matrices from the text document using the readMatrix method

- Also uses a nested pair of for loops to move through the matrix, in addition it uses the nextDouble function in the Scanner class.

Pass the matrices, and their names, to the writeMatSum method

- If the methods are the same size
  - Use a nested pair of for loops to add each corresponding element
  - Print that element to a file
- If not, print an error message.

and then passes them to the writeMatProd method twice. Once for each orientation

- If the matrices are appropriate size to be multiplied(the length of the first is equal to the height of the second)
  - Use three nested for loops to move around the matrices, multiply the appropriate element in the two input matrices and sum them together to calculate each output.
  - Print that matrix to a file
- If not
- Print an error message

Program ends