CSOC 2430: HW2

Overview:

Write a Java program for basic matrix operations. Your program should read in two matrices as inputs from two different text files and employ a singly/doubly linked list representation to store the two matrices internally and perform the following operations on them.

- Add
- Subtract
- Multiply
- Transpose
- Determinant

Technical Requirement of Solution:

You are required to create your own singly or doubly linked list data structures from scratch. That means:

- Your solution cannot use any existing collection framework or other library methods in Java for matrix based operations.
- You should not use existing variants of Array, List, ArrayList, Vector for storing integers and two-dimensional arrays are strictly prohibited.
- You are allowed to read the input file EXACTLY ONCE for all operations.
- For determinant operation, you may augment your linked list node to retain row/column id and employ recursion to directly implement the standard method for computing determinant of a

matrix. You are encouraged to design your own node representation (e.g., each node element has two pointers: one to its next right and another to its next bottom element that facilitate both horizontal and vertical traversals like one gets in a 2d array)

- You will need to complete this assignment in Java.

Implementation Detail:

Inputs

The program takes 3 or 4 arguments. Assuming input matrix are in space deliminated files `a.txt` and `b.txt` , the format for each operation query will be:

- For Addition: `add a.txt b.txt output.txt`
- For Subtraction: `sub a.txt b.txt output.txt`
- For Multiplication: `mul a.txt b.txt output.txt`
- For Transpose: `tra a.txt output.txt`
- For Determinant: `det a.txt output.txt`

For example:

```
$ java HW2 add a.txt b.txt output.txt
```

The input file can contains only integer (e.g. -3). However your output should be in floating point format with 1 decimal place (e.g. -3.0).

Click here to download sample input and output. The zip file contains 2 test set. For example, the first test case have input 1_a.txt and 1_b.txt. The corresponding addition output is 1_add.txt. The compile and run shell scripts that will be used for grading are also provided.

Run the program on Linux:

Create a directory on the Linux server, **its name must be hw2**

```
$ mkdir hw2
```

Change your current directory to the hw2

```
$ cd hw2
```

Run the shell script to compile the program

```
$ sh compile_java.sh
```

Evaluate your results with the true results

```
$ sh test_java.sh
```