Birzeit University - Faculty of Engineering and Technology
Electrical & Computer Systems Engineering Department - ENCS313
Linux Laboratory - 1^{st} semester - 2014/15

Project #2
Shell scripting under Linux
Due: January 3, 2015

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Complex Matrix manipulation

We would like to create a shell script that is able to perform different operations on matrices, namely addition, subtraction, multiplication of a matrix by a constant, multiplication of 2 matrices and transpose of a matrix. The shell script should be able to handle matrices with either real numbers or complex numbers.

Once run, the shell script should offer a main menu from which a user can pick an action. The menu can look like:

```
              Matrix operations
              -----------------


1.  Addition of 2 matrices
2.  Subtraction of 2 matrices
3.  Multiply a matrix by a constant
4.  Multiply two matrices
5.  A matrix to the power of a positive integer constant
6.  Transpose of a matrix
7.  Display a matrix
8.  Save matrix

      -> Your choice:
```

Note that once the user makes a choice, another menu (called submenu) might be needed to handle the user's request by asking her/him to add more input. As an example, consider that the user chooses option 7 (Display a matrix), a submenu should pop the user to enter the name of the file that contains the data of the matrix to display.

The files that contain the matrix data should have the following format:

```
numberOfRows,numberOfColumns
val11 val12 ... val1n
val21 va212 ... va21n
.
.
.
valn1 val12 ... valnm
```

As an example, consider that we have the file `matrix_1.txt` that contains the data for a 2×3 matrix:

```
2,3
1+j 2  3-2j
9   8j 7-j
```

The last menu option (Save matrix) might be called to save the result of a previous successful operation (e.g. Transpose of a matrix). Thus, the saved matrix can be used in further matrix operations.

Users must be notified in case an error or multiple errors have been encountered (e.g. the number of columns of matrix 1 do not match the number of rows of matrix 2 so the multiplication will fail, etc). The shell script should not display wrong results in case errors are encountered but notify the user about these errors and exit peacefully.