MATLAB Assignment 6

Introduction to Linear Algebra (Week 6) **Fall, 2019**

1. (*Programming in* MATLAB)

   In this problem, we want to program to compute a determinant of an $n \times n$ matrix by using a cofactor expansion along the first column without using the MATLAB command `det`. Actually there are many way to write code for our purposes, but at this time let's think about programming using **recursive method**. In order to do this, we need to know about followings

   - function file
   - recursive function call.

   A **function** begins with a function definition line, which has a well-defined list of inputs and outputs. The syntax of the function definition line is as follows:

   $$\texttt{function}\ [\textit{output variables}] \ = \ \textit{function\_name}(\textit{input variables})$$

   Problem (1). Write a function `mySum` which produces $a + b$ as an output when it takes two numbers a and b as inputs. Call the function in the command window by using a command:

   ```
   >> aPb = mySum(3, 5)
   ```

   Problem (2). Write a function `myPM` which produces $a + b$, and $a - b$ as outputs when it takes two numbers a and b as inputs. Call the function in the command window by using a command:

   ```
   >> [aPb, aMb] = myPM(3, 5)
   ```

   In a function, the **recursive method** is used to produce 'more complex results' from 'the bottommost result'. For example, the factorial function can be defined recursively with the basic result

   $$0! = 1$$

   and a rule

   $$n! = n \times (n-1)!, \quad \forall\, n > 0.$$

   This is an example of a recursive factorial function. Observe that the function `myFactorial` is reused within its own code:

   ```
   function NFac = myFactorial(N)
      if N==0
         NFac=1;
      else
         NFac=N*myFactorial(N-1);
      end
   end
   ```

Considering the items below, write a function file `myDet.m` to compute the determinant of a matrix A by using the co-factor expansion along the first column for the smaller matrices.

- Make a new function file with a function name `myDet`. Make a matrix A an input to the function, and the determinant of A an output.
- Using the recursive functional call, compute $\det(A)$ by cofactor expansion along the first column. For a 2×2 matrix $A = (a_{ij})$, the determinant is $a_{11}a_{22} - a_{12}a_{21}$. You may use `if-else if-if` statement and `for` loop, symultaniously.
- On the MATLAB, execute the function file `myDet.m` by typing the command:

```
>> myDet(A)
```

Problem (3). For a matrix

$$A = \begin{bmatrix} 2 & 3 & -1 & 1 \\ -3 & 2 & 0 & 3 \\ 3 & -2 & 1 & 0 \\ 3 & -2 & 1 & 4 \end{bmatrix},$$

find the determinant of A using `myDet`. Compare your result with the result of MATLAB command `det`.

2. Read the attachment "MATLAB_Week6.pdf" and practice by yourself.

There is **nothing** to submit in this assignment.
Study and practice by yourself, and please try to make a lot of questions.
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