Writing Functions in MATLAB

Functions of MATLAB can be grouped under four titles such as shown below:

1. Functions with Input & Output
   
   These functions contain input and output variables at the same time. General structure for functions with multiple inputs & outputs is
   
   ```matlab
   function [output_1,...,output_n]=function_name(input_1,...,input_n)
   
   For example,
   
   ```matlab
   function sonuc=topla(sayi1,sayi2)
   sonuc=sayi1+sayi2;
   
   You can use your program by calling it in command window:
   ```matlab
   >> a=2;
   >> b=3;
   >> c=topla(a,b)
   c =
   5
   ```
It is also possible to call your function in another function such as

```matlab
function [toplam,fark]=topla_ve_cikar(sayi1,sayi2)
toplam=topla(sayi1,sayi2) % This is the function we have written before
fark=sayi1-sayi2;
```

As it can be seen from `topla_ve_cikar` function, we can use multiple output parameters

```matlab
function [toplam,fark]=topla_ve_cikar(sayi1,sayi2)
```

However, don’t forget to use brackets to define multiple output parameters.

2. Functions with Input & No Output

Sometimes, our function does not give any result so it isn’t required to assign an output parameter. The general function is given as:

```matlab
function function_name(input_1,...,input_n)
```

Let’s look at the example function given below:

```matlab
function ciz(Input_Signal)
plot(Input_Signal)
```

The mission of `ciz` function is only to visualize our input signal. We don’t have to use an output variable for this function. Now consider the example usage of this function for a sinusoidal input signal:

```matlab
>> t=0:0.001:1;
>> signal=sin(2*pi*2.*t);
>> ciz(signal)
```
What can you say about display command of MATLAB? What type of function is it?

3. Functions with No Input & Output

This type of functions are not used oftenly. But, it may be advantageous to know their structure.

\[
\text{function } \{\text{output}_1, \ldots, \text{output}_n\} = \text{function\_name}
\]

An example code is given below:

```matlab
function \text{y}=\text{generate\_sinusoidal\_signal}

% This function generates and plot one period of a sinusoidal signal
% with amplitude=10 V and frequency= 5 Hz.
\text{t}=\text{linspace}(0,0.2,1000) \ % Divide one period of signal to 1000 points
\text{y}=10*\text{sin}(2*\text{pi}*5.*\text{t}); \ % Amplitude=10 V and Frequency=5 Hz
\text{plot}(\text{t},\text{y});\text{grid};

\text{Call the function in command window as:}

\text{>> y}=\text{generate\_sinusoidal\_signal;}
```

As it can be seen, we haven’t used any input parameters. Since we assign the generated signal to an output parameter, after running of program we get the parameter \text{y} in the workspace of MATLAB.
The signal is plotted also in our function. So, the figure that show the signal will exist as given below:

4. Functions with No Input & No Output

Some functions contain neither input nor output. They have only their names. Can you give examples from MATLAB’s built-in functions? (Hint: Think of cleaning screen command ). One of built-in functions of MATLAB is “clear” command. What does clear command do?

The structure for this function is given as:

```
function function_name
```

We can modify the `generate_sinusoidal_signal` function given in previous function. Let’s give the name of `modified_generate_sinusoidal_signal` to our new function:

```
function modified_generate_sinusoidal_signal
% This function generates and plot one period of a sinusoidal signal with amplitude=10 V and frequency= 5 Hz.
t=linspace(0,0.2,1000) % Divide one period of signal to 1000 points
y=10*sin(2*pi*5.*t); % Amplitude=10 V and Frequency=5 Hz
plot(t,y);grid;
```
This function does not use any input or output variables. If you call this program, it will generate data and only plot it:

```matlab
>> modified_generate_sinusoidal_signal
```

As mentioned before, “clc” and “clear” commands are the example built-in functions of MATLAB which do not require input or output variables.