Functions

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Week 3

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Punctions in MATLAB

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The Command Window works well, when you want to execute commands one by one.

However, to do more complex tasks, Command Window is usually not the best choice.

Better way is to write a *program*, i.e. a file with a collection of commands.

In MATLAB, you can write an .m file.

An .m file is either...

- a script, which is just a collection of commands, or
- a function file, which can be used to define a function.

Let's first see what scripts are.

.m Files

To make an .m file, click the [Home] > [New Script] button.

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A new window named Editor will appear.

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Let us make an .m file which does something we have done last week.

To indicate that we are working on the Editor, we will shade the background. Type in the following commands in the Editor.

```
hello_KAIST = 142;
welcome = 857;
neopjuk = hello_KAIST + welcome;
```

disp(neopjuk) % The function 'disp' prints the value.

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.m Files

To run the .m file we have just wrote, press the F5 key in the keyboard, or click button [Editor] > [Run].

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To run the .m file we have just wrote, press the F5 key in the keyboard, or click button [Editor] > [Run].

Before you actually run the code, MATLAB will force you to save the .m file. Let us save it with the name hello.m.

.m Files

The result:

hello.m _____

```
hello_KAIST = 142;
welcome = 857;
neopjuk = hello_KAIST + welcome;
```

disp(neopjuk) % The function 'disp' prints the value.

>> hello 999

>>

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Recall that .m files have two roles: it is either...

- a script, which is just a collection of commands, or
- a function file, which can be used to define a function.

Now let's look at the second usage.

Let us start with a basic example.

Suppose we want to make a function triple which triples the input.

The basic template for defining functions is: function $\langle output \rangle = \langle function name \rangle (\langle inputs \rangle)$

We make an .m file as below.

The file name MUST be the same with the function name.

triple.m ______
function res = triple(x)
res = 3 * x;

Save the file triple.m. You *should* be able to see the file triple.m in the Current Folder panel on the left of the Editor window.

Once you saved the file, you can use the function triple as any other functions you have seen so far.

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A function can take multiple inputs.

axpy.m _______
function res = axpy(a, x, y) % ''a x plus y''
res = a * x + y;

>> axpy(4, 7, 9)

ans =

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If you are keep working on the same folder, then you will still have triple.m in the Current Folder. Then you can even do something like this:

```
actually_double.m _____
```

```
function res = actually_double(x)
res = triple(x);
```

```
res = res - x;
```

```
>> actually_double(5)
```

ans =

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Why do we use the name actually_double instead of just double?

This is because there already exists a predefined (built-in) MATLAB function double.

Built-in functions have higher priority than user-defined functions. Since the built-in double is not a function which doubles the input, we will see unexpected behaviors. Functions also can have multiple outputs.

head_tail.m _____

```
function [H, T] = head_tail(x) % Use square brackets!
H = x(1);
n = numel(x); % number of elements in x
T = x(n);
```

>> x = [2, 3, 5, 7, 11];

>> head_tail(x)

ans =

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The automatically generated variable ans only stores the first output. But we know what to do.

```
>> x = [2, 3, 5, 7, 11];
>> [h, t] = head_tail(x)
h =
      2
t.
  =
     11
```

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You might forget what your function does. You can add a description as follows.

```
head_tail.m
function [H, T] = head_tail(x)
% Takes a vector x. Returns H and T,
% where H is the first element of x
% and T is the last element of x.
H = x(1);
n = numel(x);
T = x(n);
```

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After modifying head_tail.m as the previous slide, you can use the help command to see the description you wrote.

```
>> help head_tail
Takes a vector x. Returns H and T,
where H is the first element of x
and T is the last element of x.
```

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You can use help to see descriptions of built-in functions and variables. For example,

>> help eye

will show you a description on the built-in function eye, and

>> help pi

will show you a description on the predefined variable pi.

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Thank you!

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