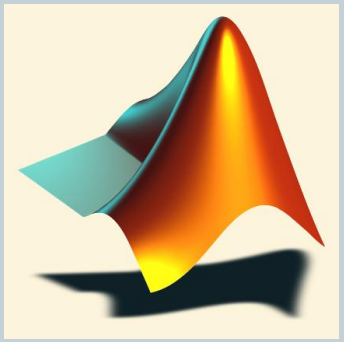
Lecture Series – 5

M File Script and Function



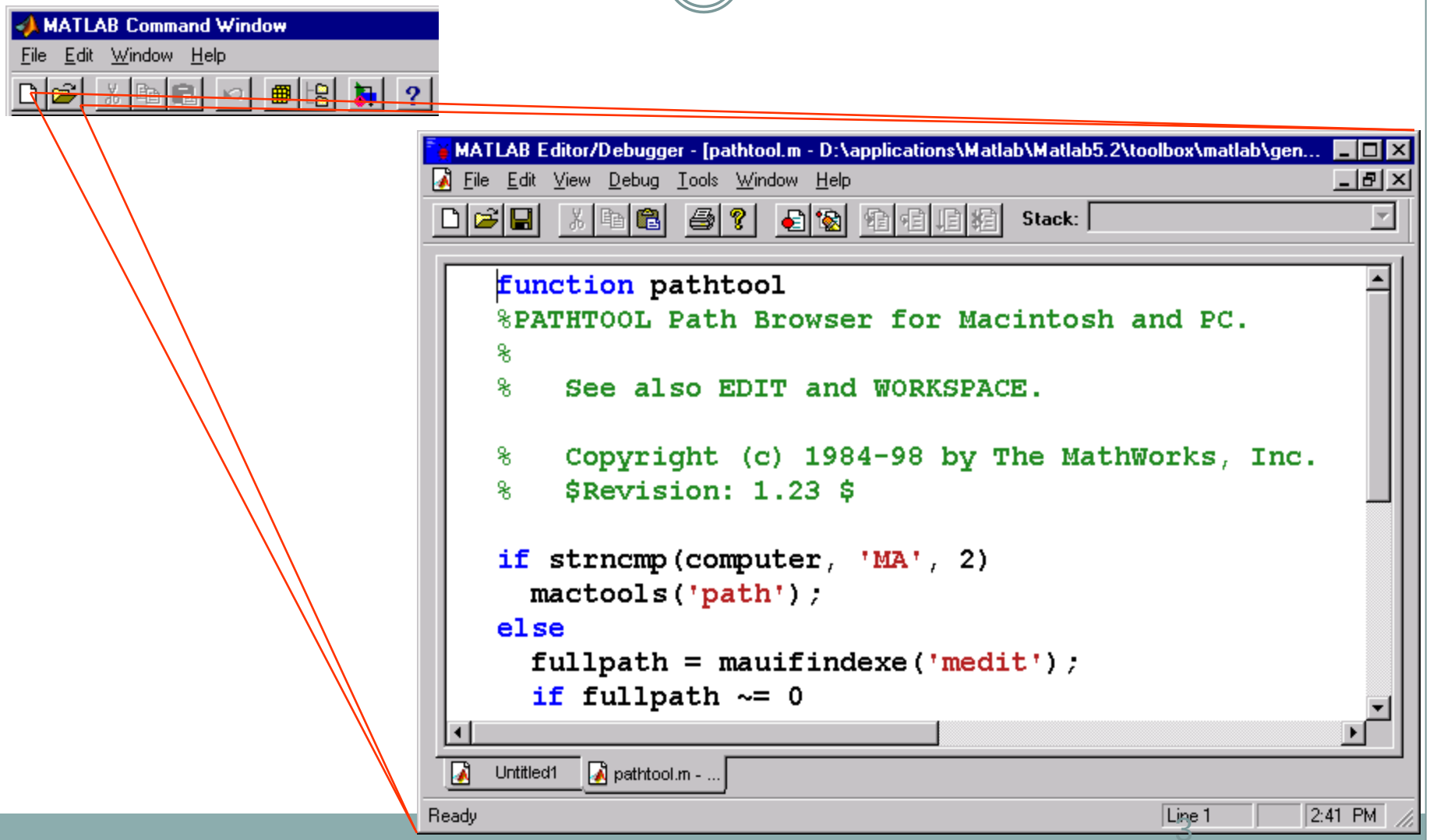
by

Shameer Koya

Files used in MATLAB

- .m files
  - Both functions and scripts are stored in .m files
- .mat files
  - The MATLAB workspace (or specific variables) can be saved in .mat files
  - These files are easy to save and load, and MATLAB accessing them is very efficient
- .fig files (*next week*)
  - Plots can be saved in .fig files, and then the figure can be edited without reloading data

MATLAB Editor/Debugger



.m files

- Code can be saved in .m files and run in the command window – exact implementation depends on whether the code is a function or a script

Script

- Simplest kind of m-file
- Type up a bunch of commands and save as *filename.m*
- Type *filename* in command window to run
- Example: first_program.m

Command Window

```
>> first_program
Hello World
>>
```

Editor - C:\Research\classes\ATprog\Week14\first_program.m

File Edit Text Cell Tools Debug Desktop Window Help

Stack: Base

```
1   %first_program.m
2   % The universal first program, prints 'Hello World' to the screen.
3
4 - display('Hello World');
```

Function

- Functions are more complex than scripts
- Functions have their own local variables
- Functions return output as specified, and can accept input as specified

Commenting

- Comment your code!
- Any line starting with % is a comment
- Comments can be added to the end of existing lines by adding a %
  - Note that anything after % will be ignored
- In editor screen comments are green
- Any comments written at the beginning of an m-file will be displayed by the command `help` *`filename`*

Flow control

- Conditional control – if, else, switch
- Loop control – for, while, continue, break
- Program termination – return

Conditional control – if, else, elseif

if *test statement*
    statements
elseif *test statement*
    statements
else
    statements
end

Note that ==,~=,>,< are all scalar tests.

```
if I == J
  A(I,J) = 2;
elseif abs(I-J) == 1
  A(I,J) = -1;
else
  A(I,J) = 0;
end
```

Loop control – for, while

for *varname* = *min*:*max*
  statements
end

while *condition is true*
  statements
end

```
N=10;
for I = 1:N
  for J = 1:N
    A(I,J) = 1/(I+J-1);
  end
end
```

```
I=1; N=10;
while I<=N
   J=1;
   while J<=N
      A(I,J)=1/(I+J-1);
      J=J+1;
   end
   I=I+1;
end
```

MATLAB Examples

- Find the number of positive numbers in a vector

```
x = input( 'Enter a vector: ' );
count = 0;
for ii = 1:length(x),
   if ( x(ii) > 0 ),
      count = count + 1;
   end
end
fprintf('Number of positive numbers is %d\n', count);
```

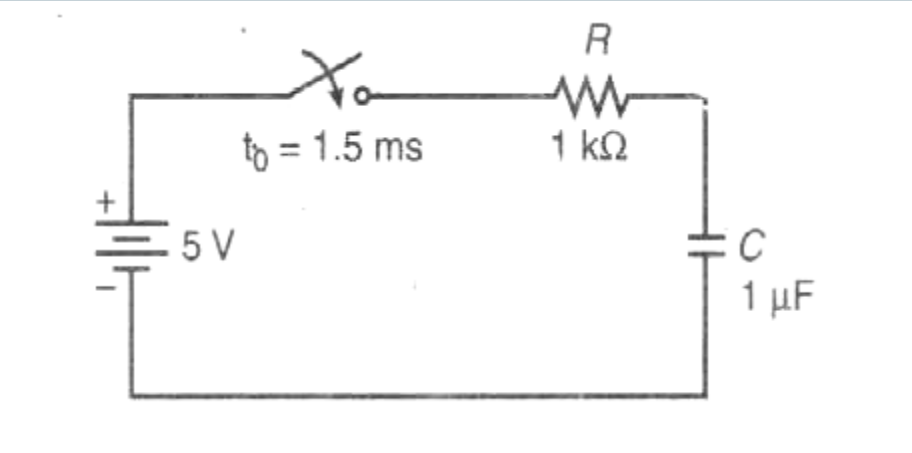
MATLAB Examples

- Program to find grade from the mark

```
s=input('Enter the Mark: '); % enter the mark
if s>= 90
    disp ('Grade: A');
elseif s>=80
    disp ('Grade: B');
elseif s>=70
    disp ('Grade: C');
elseif s>=60
    disp ('Grade: D');
else
    disp ('Grade: F');
end
```

MATLAB Examples

Plot the switching response of a given RC circuit



$$V_c(t) = \begin{cases} V_{ci} & for\, 0 \le t \le 1.5ms \\ V_{cf} + (V_{ci} - V_{cf})e^{-(t-t_0)/RC} & for\, t \ge 1.5ms \end{cases}$$

- Where V_{ci} is the initial capacitor voltage; V_{cf} is the voltage the capacitor will reach if it charges for an infinite amount of time.

MATLAB Examples

Plot the switching response of a given RC circuit

```
Vci = input('Enter initial capacitor voltage, Vci: ');
Vcf = input('Enter Final capacitor voltage, Vcf: ');
R = input('Enter Resistance value, R: ');
C = input('Enter Capacitance value, C: ');
to = input('Enter Switching time, to: ');
tf = input('Enter Simulation end time, tf: ');
t=linspace(0,tf,1000);
Vc=zeros(1,1000);
for i=1:1000
if t(i)<to
Vc(i)=Vci;
else Vc(i)=Vcf+(Vci-Vcf)*exp(-(t(i)-to)/(R*C));
end
end
plot(t*1000,Vc);
title('RC Step Response')
ylabel('Capacitor voltage')
xlabel('time in msec')
grid on
```

MATLAB Examples

- Find the index of the largest number in a vector

```
x = input( 'Enter a vector: ' );
max_value = x(1);
max_index = 1;
for ii = 2:length(x),
    if ( x(ii) > max_value ),
        max_value = x(ii);
        max_index = ii;
    end
end
fprintf( 'Max value is %d\n', max_value );
fprintf( 'Its index is %d\n', max_index );
```

- What if the max value occurs more than once?

- Write program to find step response of RL circuit
- Program to make p w m signals

Thanks

Questions ??