Matlab Basics

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Outline

- for, while, if statements
- M-files, Scripts and Functions
- Text Processing
- Diary
- Plotting data
For loops

- \( x = []; \) for \( i = 1:4 \), \( x = [x, i^2] \), end
- \( x = []; \)
  - for \( i = 1:n \)
    - for \( j = 1:m \)
      - \( x = [x, i^2, j^3] \)
    - end
  - end
end
While Loops

- while relation
  statements
end

- n = 0;
  while $2^n < 10$
    n = n + 1;
  end

>> n=0;  
>> while $2^n<10$  
  n=n+1;  
end  
>> n  
n =  
  4
If statements

- if relation
  statements
end

- if \( a < 10 \)
  \( c = 5; \)
elseif
  \( d = 8; \)
else
  \( k = 5; \)
end

- if \( A=B \)
  statements
end

- if \( A=B \) else
  statements
end

- if \( \text{any(any}(A\sim B)) \)
  statements
end
Relations and Logical Ops

- `<`  less than
- `>`  greater than
- `<=` less than or equal
- `>=` greater than or equal
- `==` equal
- `~=` not equal

- `&`  and
- `|`  or
- `~`  not
If statement examples

• if A=B
  statements
end

• if A=B else
  statements
end

• if any(any(A~B))
  statements
end

• Run statements if each element in A = B.

• Run statements if any element in A is not equivalent in B.

• Run statements if any element in A is not equivalent in B.
Subtlety in equivalence

- if $A \sim= B$, statement, end
- Run statements if *each* of the elements in $A$ and $B$ differ.
M-Files

- files that end in "\".m\"
- Can be scripts or functions
- Searches PATH for M-Files
- addpath /home/jser/mfiles
- rmpath /home/jser/bin
Searching for M-Files

- **what** – returns all m-files in the directory
- **which** – returns the full path of functions
- **lookfor** – searches all m-files for keyword in the first line of help text
Scripts

- Text file with regular matlab statements
- Can reference other m-files
- Can call recursively itself
function a = randint(m,n,a,b)

%RANDINT Randomly generated integral matrix.
% randint(m,n) returns an m-by-n such matrix with entries
% between 0 and 9.
% rand(m,n,a,b) return entries between integers a and b.

if nargin < 3, a = 0; b = 9; end

a = floor((b-a+1)*rand(m,n)) + a;
More About Functions

- M-file name should be same as function name
- nargin – number of arguments in
- functions can be recursive
Text Processing

- \( s = \text{‘some random string’} \)
- \( \text{disp(‘message to be displayed’) } \)
- \( \text{error(‘matrix does not compute’) } \)
- \( \text{size = input(‘Enter size of vector: ‘) } \)
Diary

- *diary filename*
  Stores all text output to file “filename”
- *diary on*
- *diary off*
Plotting Data

- \texttt{plot(x1, y1, s1, x2, y2, s3, \ldots);}
- plot values in \( x \) and \( y \) vectors
- \( s \) is a string containing plotting characteristics for a particular \( x,y \) pair
Plotting String

- y yellow . point - solid
- m magenta o circle : dotted
- c cyan x x-mark -. dashdot
- r red + plus -- dashed
- g green * star
- b blue s square
- w white d diamond
- k black v triangle (down)
- ^ triangle (up)
- < triangle (left)
- > triangle (right)
- p pentagram
- h hexagram
Plot Labels

- **title** – set the title of the plot
- **xlabel** – set the label for x-axis
- **ylabel** – set the label for y-axis
- **gtext** – add text in the plot
- **text** – add text at a particular position
x = -4:.01:4; y = sin(x);
plot(x,y,'yo',x+1,y,'bo');
title 'plot example'
xlabel 'x values'
ylabel 'y=sin(x)'
gtext 'gtext label'
Printing Plots

- `print --djpeg90 filename.jpg`
- `print --deps2 filename.ps`
- `print --Pprinter`
3D Mesh Plots

- `mesh(z)`
- `z` – matrix containing xy coordinate values
- `meshgrid` – returns matrices corresponding to x and y vectors for 3D plots
Mesh Plot Example

- \( x = -4::0.01:4; \)
- \( y = x; \)
- \([xx,yy] = \text{meshgrid}(x,y);\)
- \( z = \sin(xx+yy); \)
- \( \text{mesh}(z); \)
Other 3D Plots

- surf, surfc, surfl – surface plots
- waterfall – column lines are not drawn
References

http://www.glue.umd.edu/~nsw/ench250/primer.htm