

ENGG1003 - Tuesday Week 10

Relational Operators
Flow Control
and Functions

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Octave and MATLAB on Phones

- ▶ MATLAB doesn't run natively on phones & tablets but Octave does
- ▶ Recommended app is “Anoc Octave Editor”
- ▶ MATLAB is possible on a phone if it connects to MATLAB running on a PC. Poor reviews YMMV: <https://play.google.com/store/apps/details?id=com.mathworks.matlabmobile&hl=en>

Relational Operators

- ▶ MATLAB supports the following relational operators:
 - ▶ Less than: $<$
 - ▶ Greater than: $>$
 - ▶ Less than or equal: \leq
 - ▶ Greater than or equal: \geq
 - ▶ Equal to: $==$
 - ▶ Not equal to: \sim
- ▶ They perform element by element comparisons between arrays
- ▶ The results are an array of Boolean values
- ▶ ...Do an example

If Statements

- ▶ Syntax:

```
if expression
    statements
elseif expression
    statements
else
    statements
end
```

- ▶ The expressions don't need parentheses
- ▶ If `expression` is a matrix it is only “true” if *every* element is non-zero
 - ▶ MATLAB is just like C: non-zero is “true” and zero is “false”

While Loops

- ▶ `while` loop syntax is much the same as `if`:

```
while expression
    statements
end
```

- ▶ (Serious) Do I still need to explain the syntax details or are we getting it by now?
- ▶ MATLAB does not support DO...WHILE
 - ▶ Octave does in the form of `do...until`
 - ▶ Documentation:
https://octave.org/doc/v4.2.1/The-do_002duntil-Statement.html

Boolean Operators

- ▶ MATLAB Supports the following Boolean operators:
 - ▶ AND: `&`
 - ▶ OR: `|` (pipe symbol aka “vertical slash”)
 - ▶ NOR: `~`
- ▶ All these operators perform element-wise operations on array / matrix data
- ▶ MATLAB also supports *short-circuiting* logical operators on scalar data:
 - ▶ AND: `&&`
 - ▶ OR: `||`

Functions

- ▶ To write a MATLAB function:

1. Create a new `.m` file

- ▶ The file name must match the function name

2. Write the function syntax:

```
function [out1,out2, ..., outN] = myfun(  
    in1,in2,in3, ..., inN)
```

- ▶ The `[out1, out2, ...]` are the returned variables. Allocate values to them before the end of file.
- ▶ The function name `myfun` must match the file name
- ▶ The argument list, `(in1, in2,)` etc, become variables inside the function

3. Write the function body below

Function Notes

- ▶ One or more return values can be ignored
- ▶ Not all arguments are required
 - ▶ See `help` page for any function you use. Many have different behaviours for different argument counts.
- ▶ The function returns at end of file
- ▶ You can use a `return` statement to return early

Useful Built-in Functions

- ▶ `length()` - Returns the longest dimension of a vector or matrix
- ▶ `max()` - Returns the largest element of an array
- ▶ `size()` - Returns a 2 (or 3) element array indicating the size of a variable in `[rows cols pages]` format
- ▶ `mean()` - Returns the mean of a 1D array or mean of each column for 2D matrices
- ▶ There are 2504 functions in the documentation
 - ▶ This does not include any toolboxes