ENGG1003 - Tuesday Week 10

Relational Operators
Flow Control
and Functions

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Octave on Phones

- MATLAB doesn't run on phones & tables but Octave does
- Recommended app is "Anoc Octave Editor"

Relational Operators

- MATLAB supports the following relational operators:
  - Less than: <
  - Greater than: >
  - Less than or equal: <=
  - Greater than or equal: >=
  - Equal to: ==
  - Not equal to: ~=
- 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)
  - NOR: $\sim$
- 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