ENGG1003 - Monday 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: <=
  - ▶ 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 aka "vertical slash")
  - ▶ 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