CE-8 Lab 2: Basic MATLAB Use - Part 2

Lab Objectives

(PLEASE BRING YOUR ROBOT AUTOMATION BOOK TO LABS.)

By the end of this lab you should be able to:

1. **Identify** what a variable is and how one is used in a program.
2. **Create** a program that properly uses IF, ELSE commands.
3. **Use** IF ELSE and FOR to give any condition and repetition to calculate multiple problems all at the same time.

Variables

You can use variables in expressions to set their values. Its important to remember when working with expressions that the right hand side of the expression is evaluated first. For example, if want our variable 'xyz' to be equal to 5 plus 3 we would simply write.

\[ xyz = 5+3 \]

This statement first computes 5 plus 3 and then sets the variable 'xyz' to that value. We can also use variables in the right hand side equation, even if its the same variable as the one on the left hand side. For example:

\[
\begin{align*}
xyz & = 5+3 \\
xyz & = xyz*2
\end{align*}
\]

What do you suppose the value of 'xyz' is? Lets look at these two commands in the way our robot will look at them. The first thing it does will add 5 and 3, it will then set 'xyz' to be equal to this value which is 8. It will then take the value of 'xyz', which is 8, and multiply it by 2, which is 16. It will then set 'xyz' to be this value, so we've effectively doubled the value of 'xyz' with this command.

‘if…..elseif…..else…..’

One of the main tools used by programmers is the IF...THEN statement. The IF...THEN statement is a simple way to direct the behavior of our robot based on the truth of some statement. The basic syntax of the IF...THEN statement is as follows:

\[
\begin{align*}
\text{if} & \quad \text{condition} \\
& \quad \text{some action}
\end{align*}
\]
We can read the syntax of the `if ….else` statement as the same way we tell someone of some action we might perform. For example, 'If it's sunny outside then I will go for a walk'. Notice the similarities in this sentence and that of our `if…..else…..` statement. What is the condition that I will go for a walk in this sentence? The condition could be anything we want it to be, in our robot we usually will use a condition based on one of our sensors or perhaps what the robot is currently doing or even the value of some variable. The ways in which we test a condition is by using comparison operators, the main operators that we use are.

<table>
<thead>
<tr>
<th>Comparison Operator Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>=</code></td>
<td>Equal</td>
</tr>
<tr>
<td><code>&lt;&gt;</code></td>
<td>Not Equal</td>
</tr>
<tr>
<td><code>&gt;</code></td>
<td>Greater Than</td>
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<td><code>&lt;</code></td>
<td>Less Than</td>
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<tr>
<td><code>&gt;=</code></td>
<td>Greater Than or Equal To</td>
</tr>
<tr>
<td><code>&lt;=</code></td>
<td>Less Than or Equal To</td>
</tr>
</tbody>
</table>

You might recognize some of these operators from your algebra class. Here is an example of a working `if…else…` statement. The variable 'xyz' will be the value you assign, and your output can be whatever you want them to be. Here is an example.

```python
xyz=1
if xyz ==1
    x=1
else
    y=2
end
```

What do you think your output on the screen?
Excercises

1. Using a ‘if…else…’ like above, print a message that if your ‘xyz’ is bigger than or equal to 0.9, then print ‘You ACE the course!!’. If your xyz is in between 0.8 and 0.9, then print, ‘You Almost aced the course’; otherwise, print ‘You ACE the course..NOT’

2. Using a DO...LOOP like in the previous lab, calculate 1 to 1000 and output the value with the same variable name and also with a different name.

3. Using a ‘if…else…’ and DO…LOOP, calculate the following.

For 3000 seconds, how many times does motor spin if motor spins at twice per a minute?
Note: your code should calculate 3000 seconds or more; otherwise, output ‘error’ on your screen.