Topics: 1-dimensional array, program trace

Reading (ML): Sec 2.1–2.4, 2.8 for discussion on 1-d array, make sure you’ve done all the required reading!

1-Dimensional Array: Vector

An array is a named collection of data values organized into rows and/or columns. A 1-d array is a row or a column, also known as a vector. An index is a positive integer that identifies the position of a value in the vector.

Suppose vector \( \mathbf{v} \) is a collection of 4 values, i.e., vector \( \mathbf{v} \) has 4 cells.

The \( i \)th value can be accessed as \( v(i) \).

Assign a value of 9 to into the 4th cell of vector \( \mathbf{v} \): \( v(4) = 9 \).

Copy the value in the 4th cell to the 2nd cell of vector \( \mathbf{v} \): \( v(2) = v(4) \).

Copy the value in the current cell to the next cell of vector \( \mathbf{v} \): \( v(i+1) = v(i) \).

The length of vector \( \mathbf{v} \): length(\( \mathbf{v} \)).

Array Initialization

MATLAB function zeros: \( \text{vecA} = \text{zeros}(1,5) \)

MATLAB function ones: \( \text{vecB} = \text{ones}(5,1) \)

MATLAB short-cut expression for consecutive numbers: \( 1:6 \) or \( 1:1:6 \)

“Manual”: vecC(5) = 10

Example 1

Can you write a program for calculating the average of 10 numbers (Example 1 from 2/5 lecture) that stores all the data entered by the user? Below is the original program that doesn’t store all user input.

% Average 10 numbers from user input

\[ n = 10; \quad \% \text{number of data values} \]
\[ \text{total} = 0; \quad \% \text{current sum (initialized to zero)} \]
\[ i = 1; \quad \% \text{initialize counter} \]
\[ \text{while } (i<n) \]
\[ \quad \% \text{read and process input value} \]
\[ \quad \text{num} = \text{input('Enter a number: ')}; \]
\[ \quad \text{total} = \text{total} + \text{num}; \]
\[ \quad \% \text{update} \]
\[ \quad i = i + 1; \]
\[ \text{end} \]
\[ \text{ave} = \text{total}/n \quad \% \text{average of n numbers} \]

What are some useful MATLAB built-in functions for the above problem?
Example 2

Write a program segment that calculates the cumulative sums of a given vector \( \mathbf{v} \). The cumulative sums should be stored in a vector of the same length as \( \mathbf{v} \). E.g., the cumulative sums for the sequence 1,3,5,0 is 1,4,9,9. Do not use MATLAB predefined functions other than \texttt{length}.

Program Trace

Trace the execution of the following program:

```matlab
n=18; x=3; y=10;
while (n>0)
    if (mod(n,2)==0)
        n = n/2;
    else
        n = n-1;
        x = 10*x+3;
        y = y*10;
    end
end
y = (y-1)/3;
```

<table>
<thead>
<tr>
<th>n</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>3</td>
</tr>
<tr>
<td>y</td>
<td>10</td>
</tr>
</tbody>
</table>

Time →