

ARRAYS

Lecture Date : 12 SEP 16

The array is the fundamental form that MATLAB uses to store and manipulate data

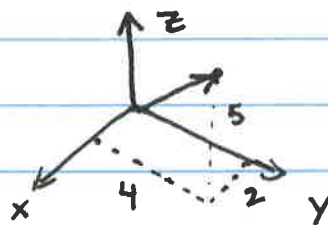
ARRAY - List of numbers arranged in rows and/or columns

In science/engineering

1D arrays \rightarrow Vectors

2D arrays \rightarrow Matrices

1D Array - a list of numbers arranged in a row OR column
ex) representation of a point in space in 3D



$$A(2, 4, 5)$$

$$r_A = 2i + 4j + 5k$$

MATLAB: $A = [2 \ 4 \ 5]$ \leftarrow square brackets
ROW VECTOR \uparrow space between elements

MATLAB $A = [2; 4; 5;]$
COLUMN VECTOR \uparrow

elements in ~~MAT~~ array can be
ANYTHING, including mathematical
equations

Creating a vector with constant spacing

if the difference between elements in vector is constant

Variable-name = $[m:q:n]$

\uparrow first term \uparrow spacing
 \uparrow last term
 can be positive OR negative

Creating a vector with linear spacing by specifying 1st, last, and num of terms

variable-name = $\text{ linspace } (x_i, x_f, n)$

\uparrow first element \uparrow last element \uparrow number of elements

ex)

$va = \text{linspace}(0, 8, 6)$

2-D ARRAY (MATRIX)

has numbers in rows and columns

a $m \times n$ matrix as m rows and n columns

variable-name = $[1^{\text{st}} \text{ row elements ; } 2^{\text{nd}} \text{ row ; etc}]$

ALL ROWS MUST HAVE SAME # OF ELEMENTS!

ex) $cd = 6$ $e = 3$ $h = 4$ $\text{MAT} = \begin{bmatrix} e \cdot cd * h \cos \pi/3 ; \\ h^2 \sqrt{h * h / cd} \quad 14 \end{bmatrix}$

TRANSPOSE OPERATOR

switches row vector to column vector or vice versa
or

switches rows to columns for MATRIX

$$\text{ex) } aa = [3 \ 8 \ 1]$$

$$bb = aa'$$

ARRAY ADDRESSING

Elements in an array (vector or matrix) can be addressed individually OR in subgroups

Why?

- you need to redefine only SOME of the elements
- only specific elements are needed for a computation
- subgroup defines a new variable

Vector ex

$$ve = 35 \ 46 \ 72 \ 92 \ 72 \ 47 \ 39$$

ve(k) refers to ve vector @ pos k

indexing starts at 1

$$ve(4) = 92$$

can name a new variable new = ve(3)

can also use in expressions

$$ve(4) + ve(2) - \text{sqrt}(ve(7))$$

Matrix Ex

$$ma = \begin{bmatrix} 3 & 11 & 6 & 5 \\ 4 & 7 & 10 & 2 \\ 13 & 9 & 0 & 8 \end{bmatrix}$$

Address is $ma(m,n)$ where m is row and n is col

$ma(2,2)$ ~~11~~

you can change the value in an array by assigning it something new

$$ma(2,2) = 20$$

What if you want multiple lines?

Colon Operator :

→ used to address RANGE of elements within an array

$va(:)$ all elements of vector va

$va(m:n)$ elements m through n

$$\text{~~va~~} \quad u = va(3:7)$$

FOR MATRIX

$A(:, n)$ all rows in column n

$A(n, :)$ all columns of row n

$A(m:n, :)$ elements in all columns between rows m and n

etc

Adding elements...

to a vector

$$DF = 1:4$$

$$DF(5:10) = 10:5:35$$

$$DF(20) = 75$$

to a matrix

Note: must be done carefully since added rows or columns must fit existing matrix

$$E = [1 \ 2 \ 3 \ 4; \ 5 \ 6 \ 7 \ 8]$$

$$E(3,:) = 10:4:22$$

Deleting elements

vector

$$DF(11:20) = []$$

matrix

$$E(3,:) = []$$