Statics - TAM 210 & TAM 211

Fall 2016

Discussion 1 - Intro to Matlab

Course websites

MAIN PAGE

https://courses.engr.illinois.edu/tam210/index.html

More website links here

Discussion 1 - Intro to Matlab

Discussion group activity – 8% of grade

- Work in groups of 3-4 students

- Goals:
  - **Gain experience in team-work**
  - **Apply engineering concepts learned in lecture to real-world problems or hands-on activities**

- Be prompt: if you are more than 5 minutes late, you will not be allowed to complete the activity

- You need to attend the discussion in which you are registered, otherwise, your assignment will not be graded

dubishere.com

Discussion 1 - Intro to Matlab

Forces are vectors

- Vectors have direction and magnitude

https://www.mathsisfun.com
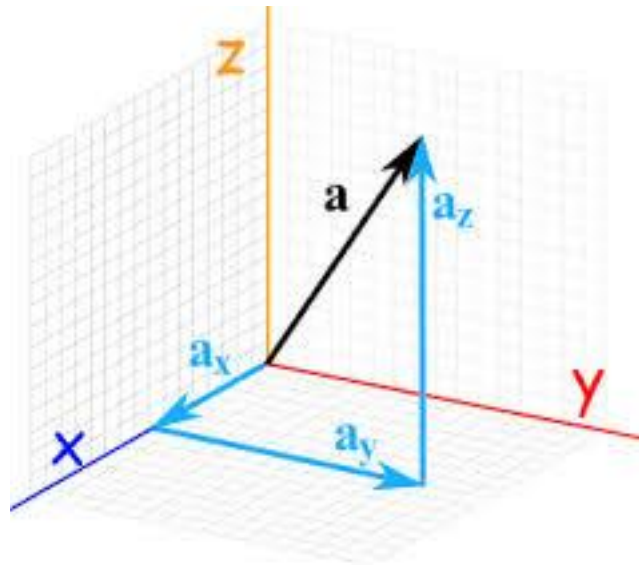
- We will use the following operations with forces
  - Adding
  - Subtracting
  - Calculating the resultant
  - Taking the dot product
  - Taking the cross product with moment arm vectors

Why use Matlab to do these operations?

- It will make our life easier!

- Avoid rounding errors

  - 1% rule for Prairie Learn and Mastering Engineering

- Faster than doing the calculations by hand, especially useful for timed quizzes and exams

What is MATLAB

- High level language for technical computing
- Stands for **MAT**rix **LAB**oratory

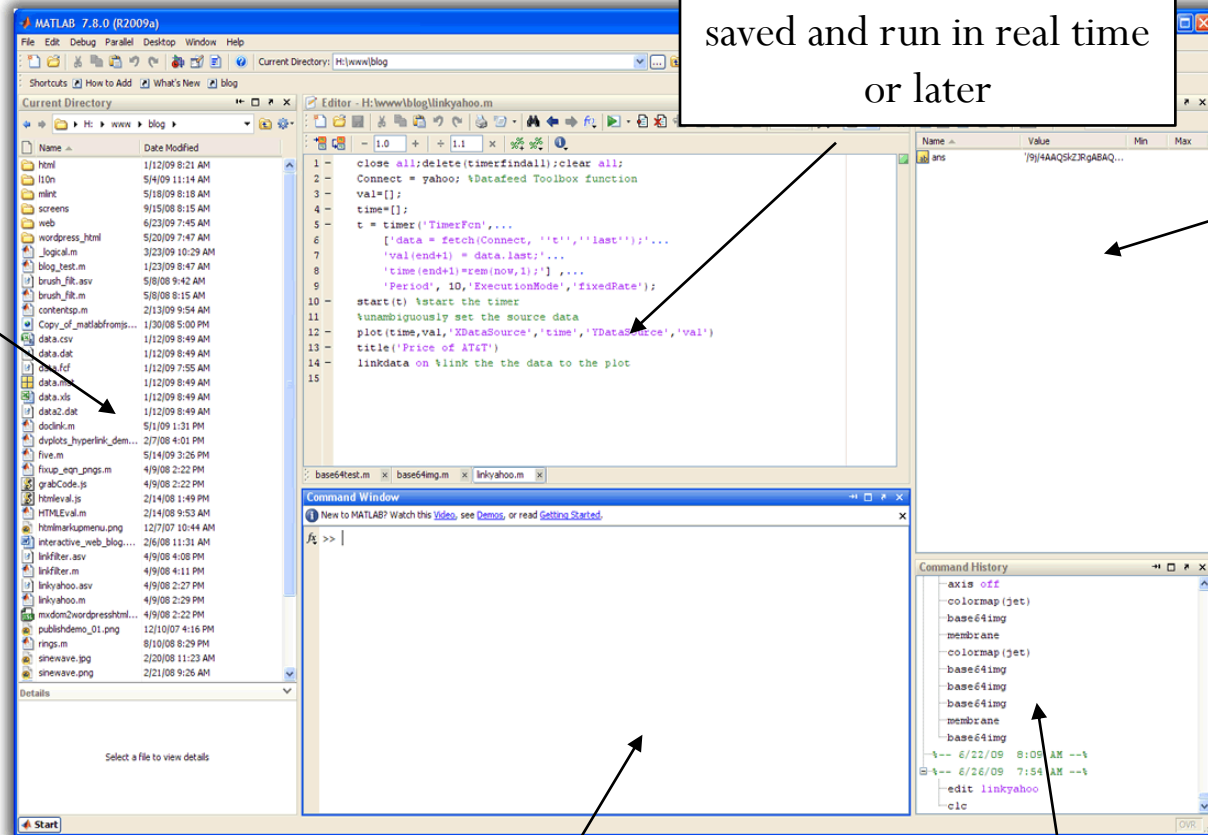- Everything is a matrix - easy to do linear algebra

http://www.mathworks.com/help/

MATLAB Desktop

Editor: A place to write commands that can be saved and run in real time or later

Current Directory: A window that shows which folder you are in and all the files that are in it

Workspace: Variables you define are displayed here

Command Window: A place to write commands, perform calculations

Command History: What you type in the box to the left of this one is saved here

Workspace

- Matlab remembers old commands

- **And** variables as well

- Each Function maintains its own scope

- The keyword `clear` removes all variables from workspace

- The keyword `who` lists the variables

Matrices & Vectors

- All (almost) entities in MATLAB are matrices

- Easy to define:

- Order of Matrix -

  - m=no. of rows, n=no. of columns

- Use ',' or ' ' to separate row elements -- use ';' to separate rows

```
>> A = [16 3; 5 10]
  A =      16       3
            5      10
```

```
>> A = [-5 1 -8]
  A =     -5 1 -8
```

Discussion 1 - Intro to Matlab

Defining vectors in Matlab

```
>> A = [-5 1 -8]
```

- A → variable name

- How many rows are in A?

- How many columns are in A?

- A(1,1) = -5   A(1,2) = 1   A(1,3) = ??

- How do we edit a vector?

Adding vectors in Matlab

```
>> A = [-5 1 -8]
```

```
>> B = [6 -3 4]
```

- To add
  - Define vector 1
  - Define vector 2

  - C = A + B; C = ??? (always define your solution as a variable, in case you need it in a later step)

- To subtract….

Dot and cross product, determinant

- `det(D)` : determinant of a square matrix

- `dot(A,B):` dot product of two vectors
- `cross(A,B):` cross product of two vectors

Useful trig functions

- Trigonometric and their inverse

  - cos(x)   acos(x)
  - sin(x)   asin(x)
  - tan(x)   atan(x)
  - cot(x)   acot(x)
  - csc(x)   acsc(x)
  - sec(x)   asec(x)
                          atan2(x,y)

Note that all of these are in radians

Cosd = cosine(# in degrees)

OR

Convert from radians to degrees
rad2deg
Deg2rad
Do the math itself, pi is predefined in Matlab as "pi"