MATLAB
圖形架構與資料繪製

盧家鋒 助理教授
alvin4016@ym.edu.tw

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請先下載本週上課資料

- http://www.ym.edu.tw/~cflu
- 點選左欄 [課程資料] → [MATLAB圖形使用者介面]
- 下載第6週 [上課資料] materials_L6.zip，檔案大小約62KB

- 請先將Current Directory切換至materials_L6資料夾!

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本週內容

- 圖形架構與曲線繪製
- 影像繪製

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圖形架構與曲線繪製

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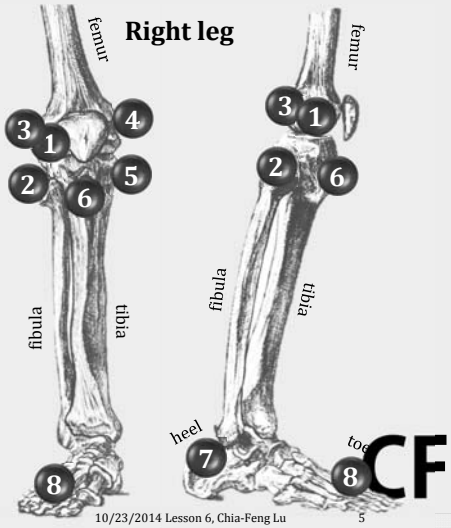
Motion Capture

- Record 3D coordinates of VICON markers during walking.

	A	B	C	D	E	F	G	
1	LHEE			LTOE			LKNE	
2	X	Y	Z	X	Y	Z	X	Y
3	mm	mm	mm	mm	mm	mm	mm	mm
4	-1302.26	307.536	12.3714	-1119.62	337.254	68.9596	-1294.77	36
5	-1301.05	307.203	12.0885	-1116.68	335.3	61.5159	-1284.19	36
6	-1301.23	307.717	13.0365	-1113.79	333.352	51.0494	-1273.63	36
7	-1299.83	308.384	14.4994	-1109.92	332.139	41.7682	-1264.29	3
8	-1297.92	309.451	16.0093	-1105.4	328.969	41.0194	-1253.56	36
9	-1296.22	309.963	16.4667	-1102.85	324.964	41.4886	-1243.55	36
10	-1295.63	310.073	16.7895	-1102.34	325.143	38.4809	-1234.22	36
11	-1295.23	310.269	17.2871	-1101.25	328.34	34.4016	-1225.65	36
12	-1294.74	310.584	17.6068	-1099.79	328.815	32.8019	-1217.95	3
13	-1294.54	310.872	17.7651	-1098.96	327.292	32.9457	-1211.36	36
14	-1294.56	311.232	17.7646	-1098.72	327.367	32.11	-1205.89	36
15	-1294.63	311.509	17.6302	-1098.77	328.069	30.5484	-1201.45	3
16	-1294.77	311.814	17.4298	-1098.8	327.865	30.7754	-1197.4	36



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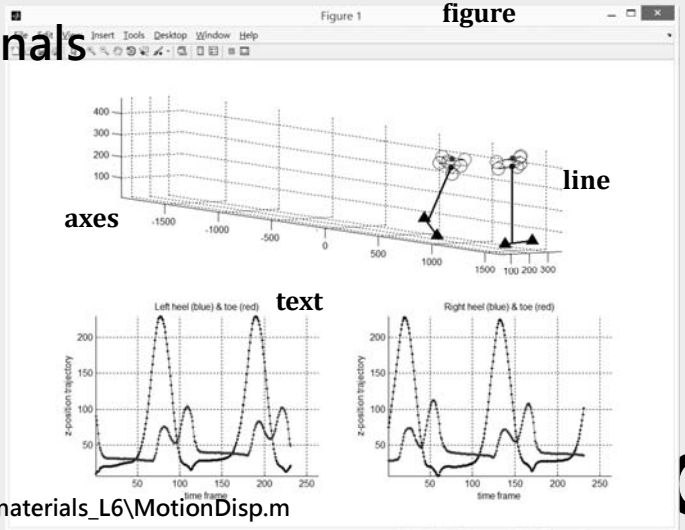
Plot Signals



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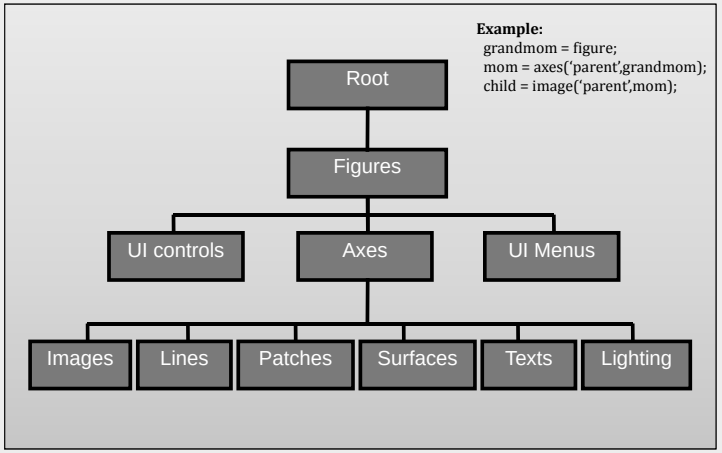
Hierarchical relation plot of objects



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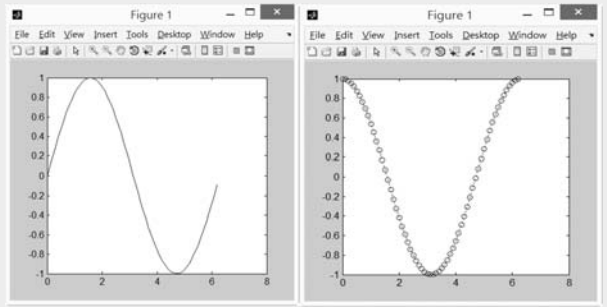
Plot Your First Line!

```
x=[0:0.1:2*pi];
figure,
plot(x,sin(x))

plot(x,cos(x),'ro:')
```



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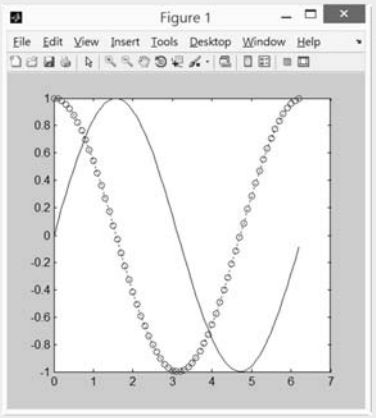
Plot Two Lines Together

```
x=[0:0.1:2*pi];
figure,
plot(x,sin(x))
hold on
plot(x,cos(x),'ro:')
```



HINT:
hold on指令可以在同一圖軸上使用plot繪製多條線。

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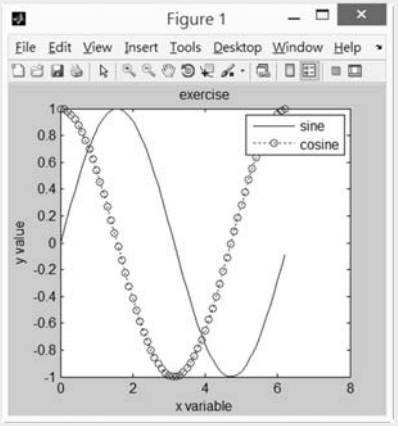
Add Information to Your Plot

extend from last slide...

```
legend('sine','cosine')
xlabel('x variable')
ylabel('y value')
title('exercise')
```



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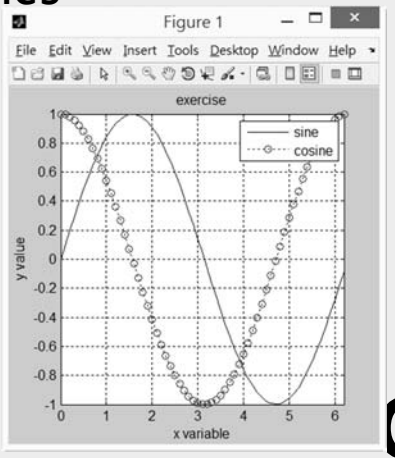
Control Axes Properties

extend from last slide...

```
grid on,
axis([min(x) max(x) -1 1])
```



請開啟並執行materials_L6\DemoPlot01.m

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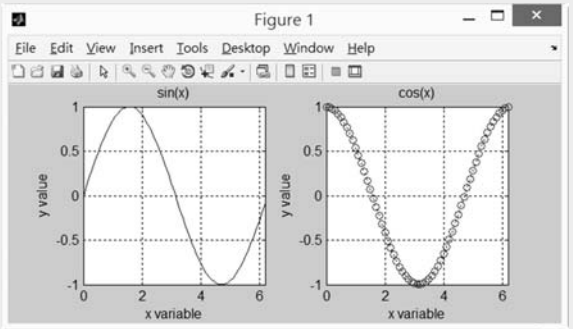
Plot Two Lines Separately

```
x=[0:0.1:2*pi];
figure,
subplot(1,2,1),
plot(x,sin(x))
subplot(1,2,2),
plot(x,cos(x),'ro:')
```



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Plot vs. Line

- Actually, **plot** is a kind of **line**!
- Understand the properties of **line** can help us to fully understand the usage of **plot**.

```
x=[0:0.1:2*pi];
figure,
plot(x,cos(x),'ro:')
figure,
line('xdata',x,'ydata',cos(x),'color','r','marker','o','linestyle',':');
```

Both commands print out the same results!!

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Control Line Properties

<Commad Window>

set(line)

- Parent
- Xdata, Ydata, Zdata
- color
- Linestyle, Linewidth
- Marker, MarkerSize
- MarkerEdgeColor, MarkerFaceColor

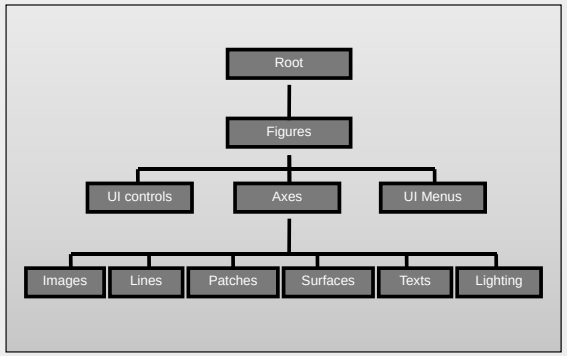
```
Color
EraseMode: [ {normal} | background | xor | none ]
LineStyle: [ {-} | -- | : | -. | none ]
LineWidth
Marker: [ + | o | * | . | x | square | diamond | v | ^ | > | < | pentagram | hexagram | {none} ]
MarkerSize
MarkerEdgeColor: [ none | {auto} ] -or- a ColorSpec.
MarkerFaceColor: [ {none} | auto ] -or- a ColorSpec.
XData
YData
ZData

ButtonDownFcn: string -or- function handle -or- cell array
Children
Clipping: [ {on} | off ]
CreateFcn: string -or- function handle -or- cell array
DeleteFcn: string -or- function handle -or- cell array
BusyAction: [ {queue} | cancel ]
HandleVisibility: [ {on} | callback | off ]
HitTest: [ {on} | off ]
Interruptible: [ {on} | off ]
Parent
Selected: [ on | off ]
SelectionHighlight: [ {on} | off ]
Tag
UIContextMenu
UserData
Visible: [ {on} | off ]
```


Control Line Properties: handle

- **請開啟materials_L6\DemoLine.m**

- set(figure)
- set(axes)
- set(line)



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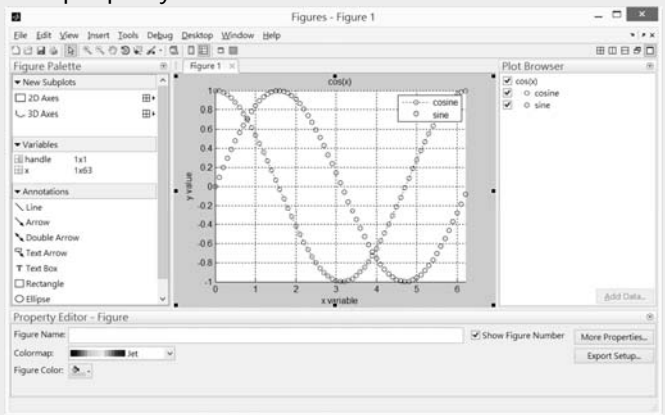
propedit

- Graphical property editor



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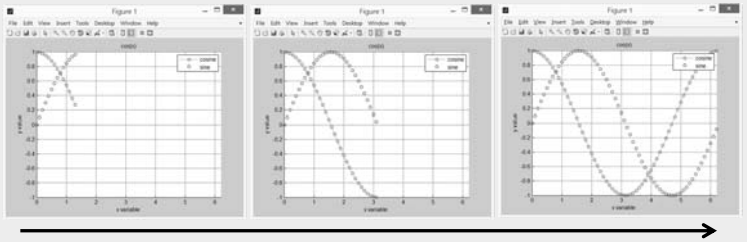
Plot Signal Sequentially

- Rewrite materials_L6\DemoLine.m…
- Please use…
  - For-loop
  - Pause
  - line



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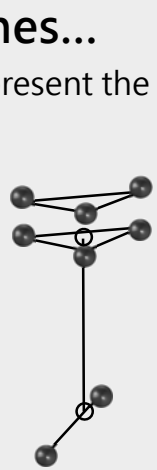
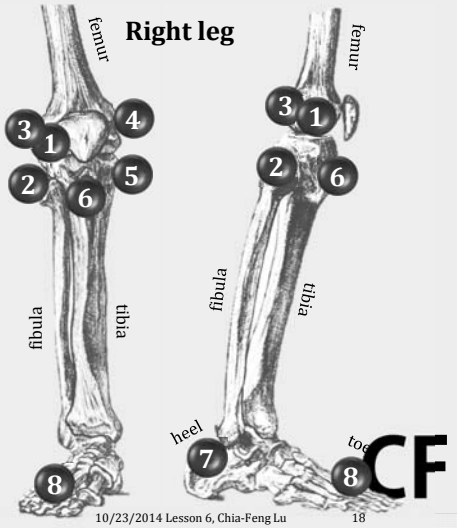
How Many lines…

- do we need to represent the marker locations?





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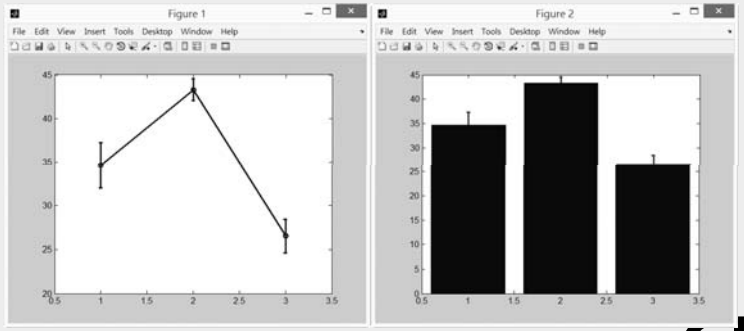
Data variation - errorbar

Useful function

- errorbar
- bar



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影像繪製

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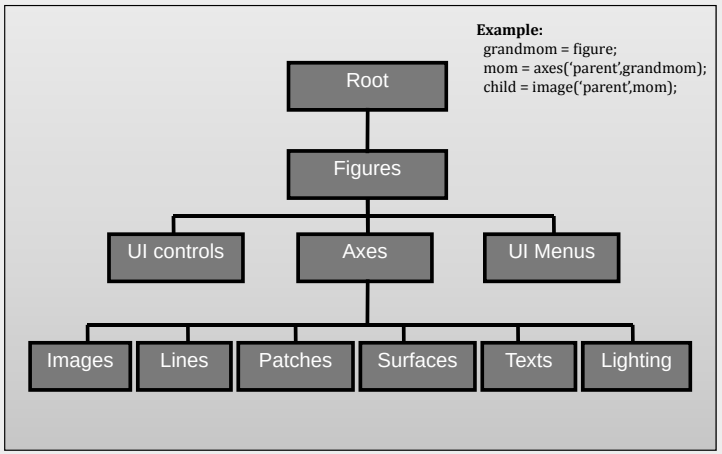
Hierarchical relation plot of objects



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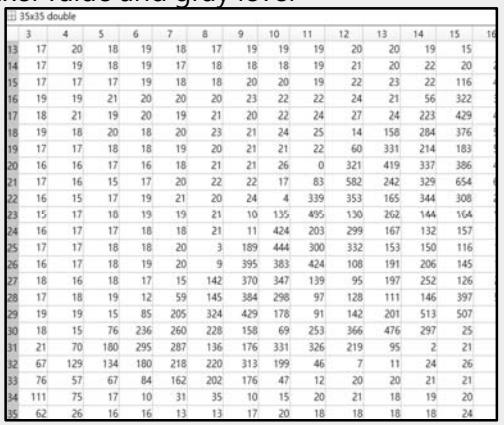
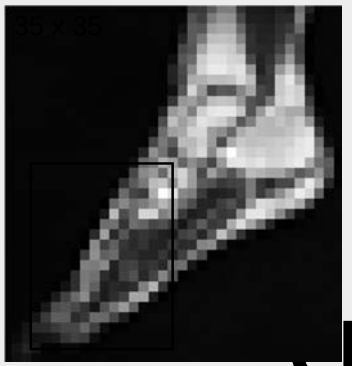
Concept of image

- Pixel value and gray level





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Concept of image

- Pixel number and spatial resolution

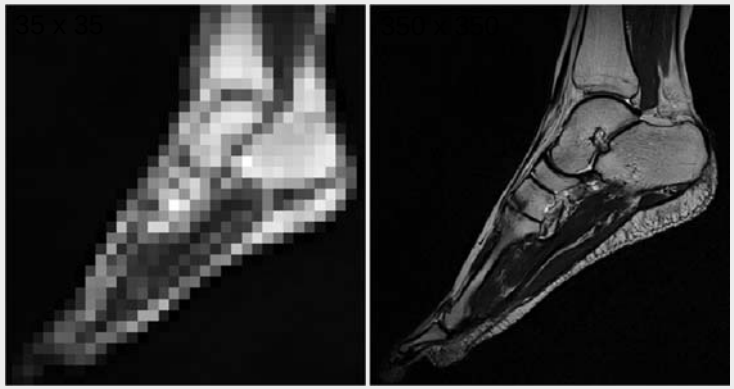

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Image Display Function

- **Imshow**
  - Displays the grayscale image.
- **Image**
  - Display image.
- **Imagesc**
  - Scale data and display as image.

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Try it

load('footimg.mat')

imshow(data)

imshow(data,[])

image(data)

imagesc(data)

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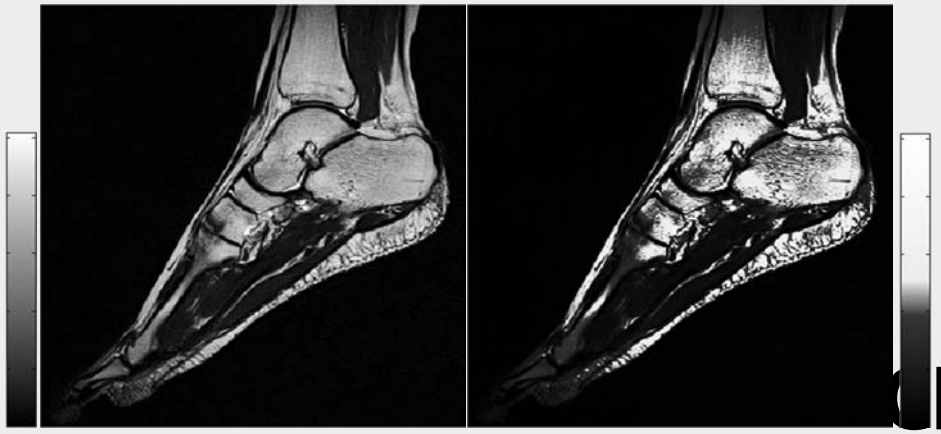
colormap 請開啟並執行materials_L6\ImageColorbar.m



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RGB Color Style

- Each color is composed of 3 numbers as a 1 x 3 vector

RED	GREEN	BLUE	
1	1	1	
0	0	0	
1	0	0	
0	1	0	
0	0	1	
1	1	0	

the value must between 0 and 1!!

- uisetcolor (can help you determine the color vector)

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Index vs. Color

```
          3
        R G B
cmap=[0 0 0;   <=數值1所對應到的顏色成分
      1 0 0;   <=數值2所對應到的顏色成分
      0 1 0;          .
        .  ;  n(n<=255) .
        .  ;          .
        .  ;          .
      1 1 1];  <=數值n所對應到的顏色成分
```

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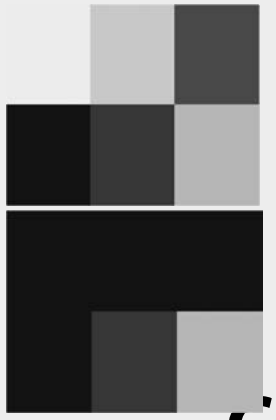
Index vs. Color

- X=[4 5 6; 3 1 2];
  image(X);
  colormap([1 0 0;0 1 0 ; 0 0 1;1 1 0; 0 1 1; 1 0 1])
  axis off

- colormap([1 0 0; 0 1 0; 0 0 1]);



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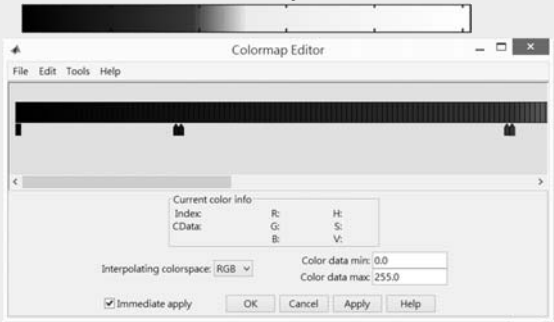
Colormapeditor

32 64 32 128
Black → blue → red → yellow → white



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THE END

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alvin4016@ym.edu.tw