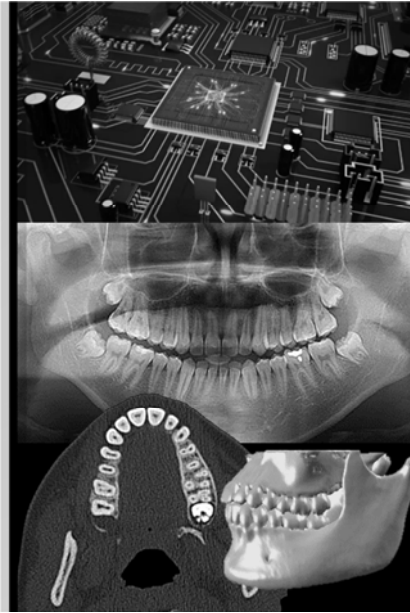


計算機概論 *for Dentist* IMAGE PROCESSING USING YOUR COMPUTER (INTRODUCTION OF MATLAB PROGRAMMING)

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下半學期課表更新

課程教學影片與講義
http://www.ym.edu.tw/~cflu/CFLu_course_DoDCompArch.html

	Topics
Class 10	Image processing using your computer (Introduction of MATLAB programming)
Class 11	Reading dental DICOM image (Usage of dicomread and variable assignment)
Class 12	Image contrast and zoom-in (Matrix index and operation)
Class 13	Target/lesion detection (Image thresholding and ROI)
Class 14	Building up your first application I (Graphic User interface - guide)
Class 15	Building up your first application II (Graphic User interface - guide)
Class 16 (6/3)	Processing 3D dental images (3D cone beam CT - cross sectional tomography)
Class 17	Carving teeth models (3D model and 3D printing)
Class 18	Final exam

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影像讀取、處理、3D模型



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課堂實際操作

- 請於下次上課前，安裝Matlab程式語言
 - 資統中心校園授權軟體
 - <http://software.web.ym.edu.tw/files/11-1266-1.php>
- 請於每次上課攜帶安裝Matlab之筆電
 - 隨堂操作練習
 - 如無個人筆電，建議最多2~3人共用一台

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MATLAB簡介

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MATLAB

- 於1970~1980年代被開發的高階程式語言，歷經37個版號的擴充。
- 容易學習、廣大的工具箱，應用層面、領域相當廣泛。
- 能整合其他程式語言、應用程式的各種函示
 - C、C++、Fortran、Java、COM以及Microsoft Excel

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MATLAB的實用性-豐富的TOOLBOX

- 高級計算機、解方程式
 - 工程計算、方程式求解
- 資料檔案整理
 - 批次整理檔案、更改檔名
- 圖表繪製
 - 統計圖表、二維與三維訊號及影像繪製、互動介面
- 影像、訊號與資料處理、資料輸出
 - 醫學影像、三維空間資料分析、生理訊號、有限元素法、Excel表格、pdf報表
- 統計分析
 - 描述性統計、t-test、卡方檢定、N-way ANOVA、多重比較、ICC

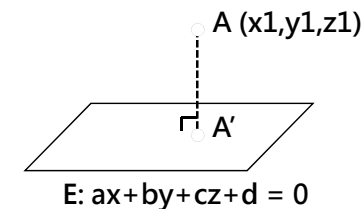
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SOLVE A' (THE PROJECTION POINT OF A ON E)

- The line L pass through point A and is perpendicular to surface E:
 - $X = x_1 + at$;
 - $Y = y_1 + bt$;
 - $Z = z_1 + ct$;
- Replace x, y, and z of surface E by the (X,Y,Z) and solve t
 - $a(x_1 + at) + b(y_1 + bt) + c(z_1 + ct) + d = 0$
- Substitute t into L to get the projection point A'



請開啟並執行CAmaterial_L10\demo_SymbolicCal.m

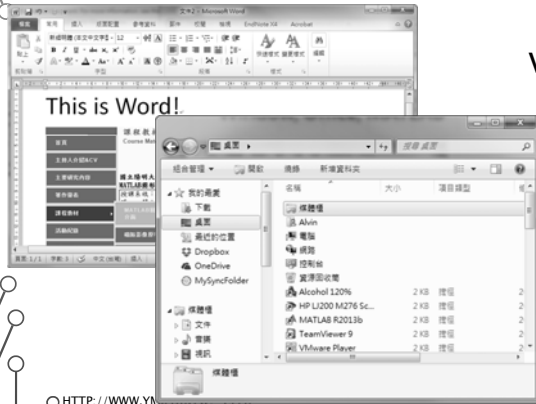
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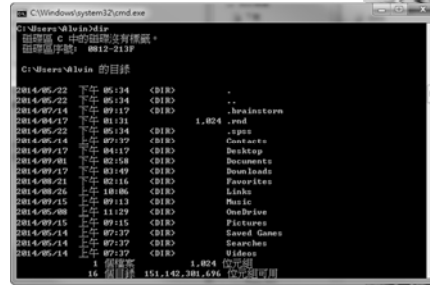
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GRAPHIC USER INTERFACE (GUI)

Window, Office, MATLAB

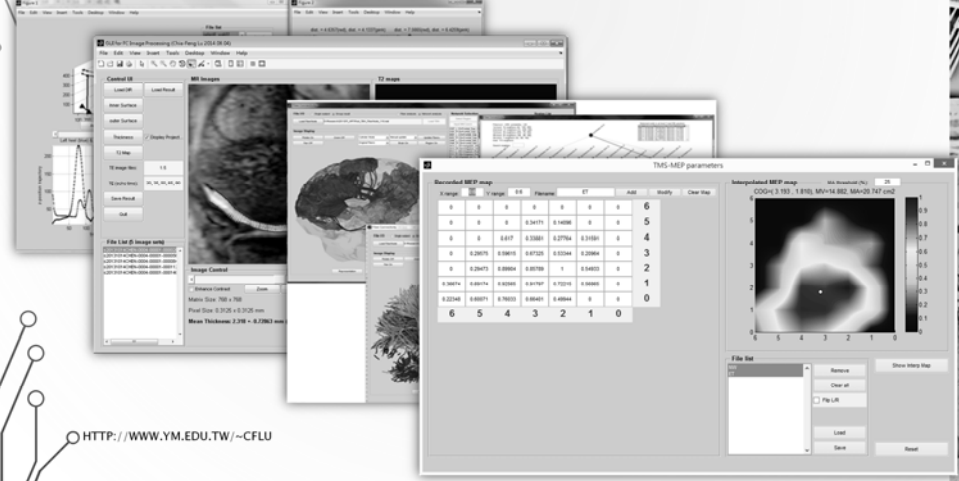


V.S. Command line (DOS)



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DEMONSTRATION OF GUIs



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DEMONSTRATION OF GUI

- Self-built Examples
 - Motion analysis (VICON motion capture during walking) <http://youtu.be/4KTi3-LsvM8>
 - MR femoral cartilage thickness <http://youtu.be/Dp6QCpz8CzY>
 - DICOM processing platform (ROI-based histogram analysis) <https://youtu.be/wqbac9ZP7Lk>
 - Basketball localizer https://youtu.be/R_qUi1eYESQ
 - Motor cortical map (TMS motor threshold)
 - Fiber tracking (DTI tractography and network analysis)
- Published toolbox/GUIs
 - SPM for brain imaging (fMRI, PET)
 - Brainstorm for EEG
 - EEGLab for EEG
 - Homer2 for fNIRS

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MATLAB環境與基本語法

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請先下載本週上課資料

- 下載網址 http://www.ym.edu.tw/~cflu/CFLu_course_DoDCompArch.html
- 下載第10週 [上課資料] [CAmaterials_L10.zip](#)

[HTTP://WWW.YM.EDU.TW/~CFLU](http://www.ym.edu.tw/~cflu)

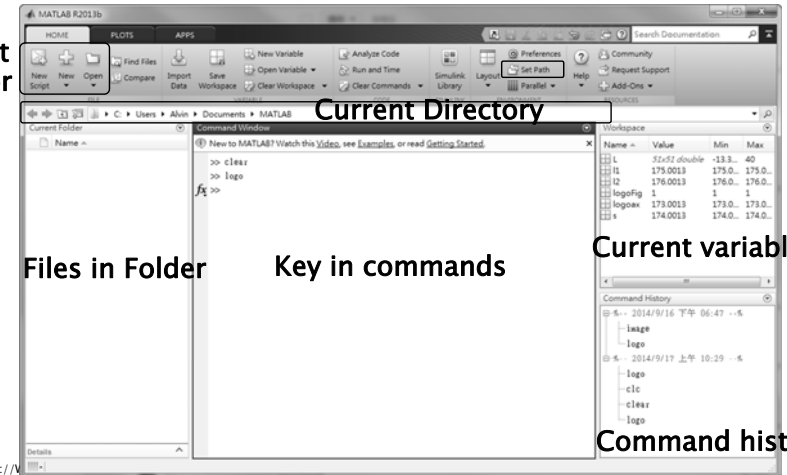
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MATLAB ENVIRONMENT

Script Editor

Set Path



Files in Folder

Key in commands

Current variables

Command history

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COMMAND WINDOW

- 高級工程計算機
- 檢索查詢功能 help
- 錯誤訊息 error messages

```
Command Window
>> sqrt(sin(pi/5)^2+cos(pi/5)^2)
ans =
    1
fx >>
```

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ERROR/WARNING IN COMMAND WINDOW

- Error messages

```
Command Window
>> b=a+1
Undefined function or variable 'a'.
```

```
Command Window
>> test
Undefined function or variable 'a'.
```

```
Error in test (line 9)
b=a+1;
fx >>
```

- Out of memory !

```
Command Window
>> A=rand(100000,100000);
Error using rand
Out of memory. Type HELP MEMORY for your options.
```

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WORKSPACE

- 顯示目前存放在記憶體中的變數
- 可用於檢索資料類型與內容

Workspace	
Name	Value
A	1000x1000 dou...
img	512x512 double

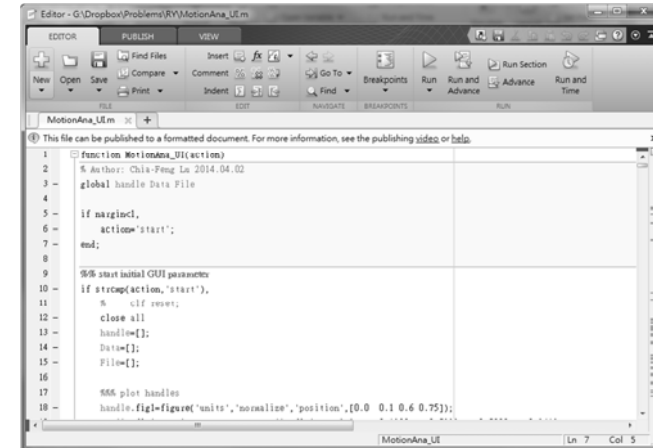
img					
512x512 double					
	1	2	3	4	5
1	0.6607	0.6728	0.2610	0.1390	0.1
2	0.5871	0.4608	0.6671	0.4567	0.4
3	0.5741	0.6288	0.4875	0.2037	0.9
4	0.5556	0.8943	0.9521	0.9907	0.4
5	0.7597	0.1833	0.0581	0.2335	0.8
6	0.1221	0.6698	0.1185	0.9970	0.5
7	0.5354	0.1053	0.0724	0.6760	0.8
8	0.2568	0.1148	0.9994	0.5454	0.6

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SCRIPT EDITOR



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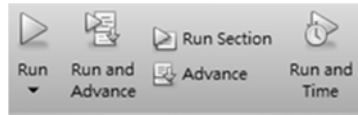
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SCRIPT EDITOR - EDITOR

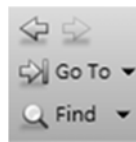
```

1 function MotionAna_UI(action)
2 % Author: Chia-Feng Lu 2014.04.02
3 global handle Data File
4
5 if nargin<1,
6     action='start';
7 end;
8
9 %% start initial GUI parameter
10 if strcmp(action,'start'),
11     % clf reset;
12     close all
    
```

% notation mark



(F5)



Undo & redo

Go to line

Find and replace

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HELP IN COMMAND WINDOW

- help function name

```

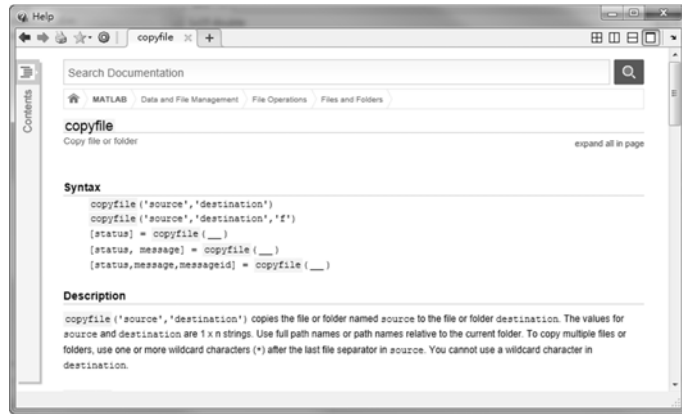
Command Window
>> help copyfile
copyfile Copy file or directory.
[SUCCESS,MESSAGE,MESSAGEID] = copyfile(SOURCE,DESTINATION,MODE) copies
the file or directory SOURCE to the new file or directory DESTINATION.
Both SOURCE and DESTINATION may be either an absolute pathname or a
pathname relative to the current directory. When the MODE is set to
'f', copyfile copies SOURCE to DESTINATION, even when DESTINATION is
read-only. The DESTINATION's writable attribute state is preserved.
[SUCCESS,MESSAGE,MESSAGEID] = copyfile(SOURCE) attempts to copy SOURCE
to the current directory.
    
```

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OPEN HELP BROWSER – PRESS F1



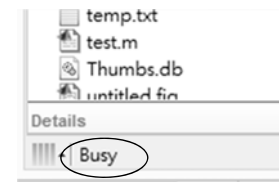
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STATUS OF MATLAB

- "Busy", How long? Will it stop ?



The left-lower corner of MATLAB command window.

- Estimation of processing time ([Run and Time], tic-toc).
- Interrupt the process by [Ctrl+c]

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以Matlab開啟CAmaterial_L10\DentalModel.fig
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THE END

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