Tutorial 1 MATLAB

COMP 4421: Image Processing

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Introduction

- MATLAB provides a powerful interactive computing environment for numeric computation, visualization, and data analysis.
- Getting started:
  start -> run -> type in matlab <rtn> or press the MATLAB icon
- To exit:
  enter exit <rtn>

ITSC Virtual Barn

You can also use MATLAB through ITSC virtual computer barn. (Select "**Academic Software**".)

http://itsc.ust.hk/services/academic-teaching-support/facilities/virtual-barn/

Virtual Barn

This service allows you to access computer barn software and satellite printers anywhere anytime by connecting to virtual barn desktops -Windows virtual machines running on servers in ITSC data center – from their own devices. Advantages include high availability, power saving, ease of access and lower management costs.

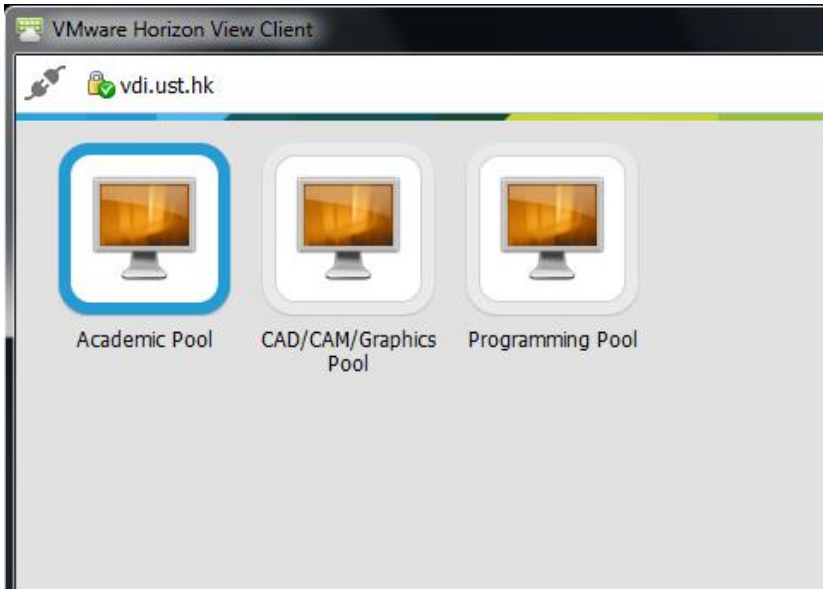
VMWare Horizon View

Since July of 2014, ITSC is adopting VMWare Horizon View as our new Virtual Desktop Infrastructure (VDI). The new solution improves the old one on the followings:

- Shorter login time
- Smoother and faster connections
- Access via multiple platforms and devices such as Mac OS X, Apple iOS and Android, in addition to Windows.

This VDI now provides 3 desktop pools of software for different computing purposes such as academic, CAD/CAM/graphics and programming software. Your personal documents are shared in all pools for easy access. For access, visit the Installation Guide and User Guide to install the client software.

Note that the old all-in-one desktop pool "Virtual Barn Desktops (2013 Spring)" will be de-commissioned by the end of August, 2014 and your personal data cannot be accessed since then. Please migrate the data to the new desktop pools if necessary.



Outline

- Variables, Expressions and Statements
- Reading, Displaying and Saving Images
- Matrix Operations
- Matlab Functions
- Loops and Conditional Statements

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Variables, Expressions and Statements

- Variables
  - A letter followed by any number of numbers, letters and underscores
  - Case sensitive
- Expressions
  - Composed from operators, function calls and variable names
- Statements
  - variable = expression or
    expression

Variables, Expressions and Statements

- a = min(2, 7);
- b = [1 2 3];
- c = [1 2 3; 4 5 6];
- whos %List all the variables in the workspace

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Reading, Displaying and Saving Images

- Read an image: f = imread('*filename*')
  - Image formats can be: tif, jpg, gif, bmp, png or xwd.
  - Some matrix operations can be performed on f to modify the image
- Show an image: imshow(f)
- Save an image: imwrite(f, filename)
- The image processing toolbox (many advanced functions)
  http://www.mathworks.com/products/image/index_b.html

Reading, Displaying and Saving Images

Matlab Code

```
g = imread('Venice.jpg');
figure,imshow(g);
sg=size(g);
f=rgb2gray(g);
sf=size(f);
imwrite(f, 'NewImageGray.jpg');
fg=imread('NewImageGray.jpg');
figure,imshow(fg);
```

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Matrix Operations

- A+2, A*2, A+B, A*B
- X = A\B solves A*X=B
- Transpose: A‘
- Inverse: inv()
- Array Operations: A.+B, A.*B

Matlab Code

```
C=[1 2 3; 4 5 6];
D=[1 1 1; 2 2 2];
x=[1 1 1]';
C*x
x'*x
x*x'
C*D'
E=[1 2; 3 4]^2
E=[1 2; 3 4].^2
```

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Common Built-in Commands and Functions

- 'help *function_name*'
- 'who' and 'whos'
- 'clear *variable_name*'
- 'size', 'length'
- 'tic' and 'toc'
- 'max', 'min', 'cos', 'sin'
- Special variable 'ans'
- 'ctrl-c'

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Loops and Conditional Statements

- if *condition*
  statements
  else
  statements
  end
- for *variable=expression*
  statements
  end
- while *condition*
  statements
  end

- Relational operators
  $<$, $<=$, $==$, $>=$, $>$, $\sim=$
- Logical operators
  $\&$, $|$, $\sim$

Loops and Conditional Statements

```
for i=1:5
      disp(i)
end
```

Result:

1
2
3
4
5

```
x = 5;
while x>2
      disp(x)
      x = x - 1;
end
```

Result:

5
4
3

```
x = 10;
if x <10
      disp 'Hello';
else
      disp 'Fine';
end
```

Result:

'Fine'