CSE 1570
Introduction to Computing for Psychology

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http://www.cse.yorku.ca/course/1570

Outline

- Course content
- Why study the materials?
- Course objective
- Textbooks
- Class format
- Marking scheme
- How to access MATLAB
- Course web site and policies
- Brief introduction to computer and programming language

Course Content

MATLAB

- Powerful computer programming language
- User-friendly programming environment
- Good at
  - Math computation
  - Data analysis and modeling
  - Visualization and graphics
  - Simulation
  - …

Psychtoolbox (if time and tech support allow**)**

- A collection of programs that facilitate the use of MATLAB for psychological experiments

MATLAB

Short for MATrix LABoratory

Commercial product of *The MathWorks*

Originally designed for solving ***linear algebra*** problems using ***matrices***

Has since been expanded and now has built-in functions for

- data analysis, signal processing, optimization, and other types of scientific computations.
- data visualization
  - Contains functions for 2-D and 3-D graphics and animation.

Why Study MATLAB?

Easy to use, and powerful

- No need to declare the data type of a variable before using it (unlike Java, C, C++, Visual Basic)
- A very rich set of powerful ***built-in functions*** makes complex problems easy to solve
- High-level commands can realize things that would take many lines of program to realize in other languages
- User interface is friendly
  - Comprehensive help facility
  - Use interactively or as programming language

Built-in Function Example

Task: find the roots of a polynomial

- Polynomial: $f(x)=4x^2+10x-8$
- A root of f(x) is a value of x for which f(x)=0

Code of MATLAB:

```
roots([4 10 -8])
```

which will generate:

```
ans =

   -3.1375
    0.6375
```

Why Study MATLAB?

Useful for designing psychology experiments. Allows:

- Stimulus generation
- Response collection
- Data analysis
- Data plotting

A more general programming language

- Specialized software, such as *ePrime* and *Psyscope*, may not allow you to implement unconventional experiment designs

Has become popular among experimental pschologiest

Course Objective

By the end of the course, you are expected to

- Know the basic concepts of computer programming
- Use the MATLAB environment for fast calculation, data generation, data plotting and analysis.
- Write modest-sized programs in MATLAB
- Implement programs for simple psychological experiments:
  - presenting stimuli
  - gathering response

Text and Reference books

Textbook:

- David A. Rosenbaum, ***MATLAB for Behavioral Scientists***, Taylor & Francis Group, 2007.

Reference book:

- Amos Gilat, *MATLAB: An Introduction with Applications*, 3rd Edition, Wiley, 2007.

Online materials

- See "*Resources*" on course web site

Topics

Interacting with MATLAB

Variables and mathematical operations

Control structures of program (selection, iteration, etc)

File I/O, recording user responses, etc

Functions

Data types: cell and structure

Plotting

- Creating 2-D and 3-D graphics
- Simple animation

Psychtoolbox (if time and tech support allows)

Math Concepts Used

Basic linear algebra operations

- Matrix addition, subtraction, multiplication, transpose.

Basic knowledge of trigonometry

Basic Statistics Concepts

- mean, median, standard deviation, correlation coefficients, histogram.

Class Format

Tuesdays 11:30 – 13:00

- Lecture
- Location: **SLH B**

Thursdays 11:30 – 13:00

- Lecture and exercise
- Location : AP Labs (**TEL 2114 & 2116)**

Marking Scheme

- Assignments (25%)
  - 6 assignments
- Midterm (30%)
  - Tentative time: March 1 class time
- Final (45%)
  - TBA

How to Access to MATLAB

Use MATLAB **on Campus**

- CSE Undergraduate Lab (CSE 1002)
  - You need a ***PRISM Lab account*** to use the machines in this lab.
- AP Labs (TEL 2114, 2116, 2118, 2027, 2132)
  - You need a ***FAS (File Access Service) account***
- Computing Commons Labs (WSC, ACE 017)
  - You need a ***FAS account***

How to Access to MATLAB

Use MATLAB **at Home**

- Through York's WebFAS
  1. Go to WebFAS main page:
     - http://webfas.yorku.ca
  2. Click on the LOGIN button at the top-right area.
  3. Login with ***your FAS account*** name and password
  4. A list of applications appears on your browser
  5. Click on "matlabr2010a" to launch MATLAB
- If it is your first time to log into WebFAS from your remote computer,
  - after step 3, you will be prompted to install a client (Citrix Online Plug-in)
  - Follow the on-screen instructions to complete the installation.

Why Need a Prism Lab Account

You need a CSE PRISM Lab account to

- User the computers in CSE 1002
- Download CSE1570 lecture notes and assignments from the course web site
- Submit your assignments online
- Check your marks online

How to Create a Prism Lab Account

Prism Lab Account Activation

- You have to be registered for a CSE15xx course
- Go to https://webapp.cse.yorku.ca/activ8/
- Follow the on-screen instructions

Information about PRISM Lab

- Lab schedule, account activation, etc.:
- http://www.cse.yorku.ca/glade/

Why Need a FAS Account

You need a FAS account to

- Use the computers in AP Labs and Computing Commons
- Use WebFAS service (to use MATLAB at home)

How to Create a FAS Account

All York students are entitled a FAS account

Information about FAS – File Access Service

- http://www.yorku.ca/computing/students/accounts/fas.html

FAS Account Activation (if you haven't done so)

- Go to FAS page above
- Find and click on "**Manage My Services**"

Free MATLAB Alternative

Octave

- Download at *http://www.octave.org*
- A language mostly compatible with Matlab
- Command line interface

Xoctave

- Download at *http://xoctave.webs.com*
- A GUI interface on top of Octave

Course Web Site

http://www.cse.yorku.ca/course/1570

You can find:

- Lecture notes (will be posted after each lecture)
- Assignments (when available)
- Links to only resources
- Information on how to access MATLAB
- Course policies
- FAQs
- …

Policies

See the course web site for policies on

- How to submit an assignment
- Academic dishonesty
- What if fail to submit an assignment or fail to attend tests

Instructor and TAs

Instructor: Aijun An

- Email: aan@cse.yorku.ca
- Office: CSE 2048
- Office Hour: Tue & Thur 4:10pm-5:10pm

Teaching Assistants

- Mehdi Kargar (kargar@cse.yorku.ca)
- Jessie Zhao (jessie@cse.yorku.ca

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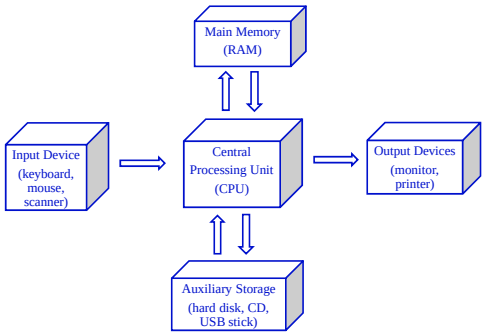
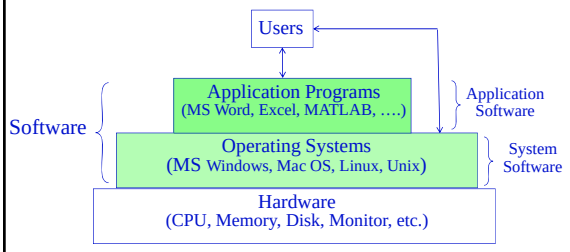
Computer Hardware Architecture



Computer Software Structure



Computer Program

A sequence of instructions written to perform a specified task for a computer

Two forms of a program:

- Executable program
  - Binary code (consists of 0s and 1s).
  - Can be directly executed by the computer
- Source code
  - Written in a *programming language* (human understandable)
  - Need to be either converted into an executable program by a *compiler* or may be executed with the aid of an *interpreter*.

Programming Language

An artificial language designed to write computer programs

Can be classified along multiple axes:

- Compiled or interpreted
  - Programs written in a *compiled* language need to be compiled into an executable form by a *compiler* and later executed.
    - The executable program runs faster.
    - Example: C, C++, Fortran
  - Programs written in an *interpreted* language can be executed immediately with the aid of an *interpreter*
    - Program runs slower
    - Example: Perl, MATLAB

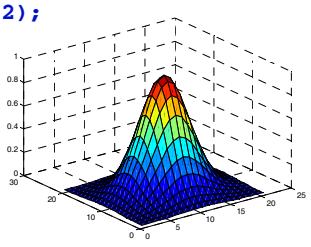
Programming Language (cont'd)

- Procedural or object-oriented
  - Procedural:
    - Program consists of a set of functions or procedures
    - Example: C, Visual Basic, MATLAB, ….
  - Object-oriented:
    - Program consists of classes and objects
    - Example: Java, C++, Python, ….

MATLAB is an interpreted, procedural programming language.

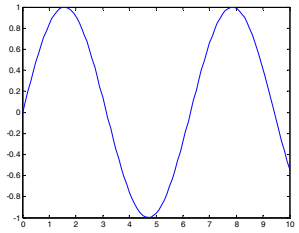
Sample Programs

```
a=-2:0.2:2;
[x,y]=meshgrid(a,a);
z=exp(-x.^2-y.^2);
surf(z)
```



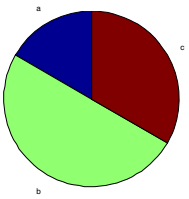
Sample Programs

```
x=0:.1:10;
y=sin(x);
plot(x,y)
```



Sample Programs

```
data=[2 6 4];
text={'a','b','c'};
pie(data,text)
```



Things to Do before Next Class

Activate your PRISM lab account

Activate your FAS account (if you haven't)

Launch MATLAB from a computer on campus

Launch MATLAB from home computer or labtop via WebFAS

Next Class

Topic: Interacting with MATLAB

Location: TEL 2114 & 2116