12.010 Computational Methods of Scientific Programming
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Lecturers

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Summary of Introduction to Matlab

- Looked at the basic features of Matlab:
  - Getting help
  - Variable definitions and usage
  - Math operators
  - Control statements: Syntax is available through the online help
  - M-files: Script and function types
    - Variable number of input and output arguments

Today's Lecture

- Continue examining Matlab operations
- path and addpath commands
- Variables and constants
- IO using fopen, scanf etc.
- Formats
- Dialog boxes

Path controls

- Matlab uses a path structure to tell it where to look for M-files
- In simple cases, all the m-file needed are in the directory from which Matlab runs but in more complex cases this is not possible
- The path command lists the current path
- The addpath command adds a new directory to the path (the current directory is always seached first)
- The pwd command can be used in the addpath command e.g., addpath(pwd)
- M-files can contain multiple functions but additional functions in M-file are available only to the main function of the M-file.
- In complex systems of analysis, where functions are put in M-files should be carefully considered.

Variables and constants

- In Matlab variables are passed into functions by address unless the values are changed, in which case they are copied in to the function workspace.
- Although most variables are stored as double precision in Matlab, they can be referred to as different types e.g., complex, logical.
- To create non-double precession array, the data type can be specificed in the ones, zeros functions e.g. IA=zeros(20,'int8')
- `whos` shows the type of variable
- `all`, `any`, `find` implement logical expressions in array indexing. (See `ops` for more details)
- `logical` can be used to select elements from an array

IO: fopen, scanf, printf

- `fopen` opens a file and returns a file ID number (FID): Syntax is
  `[fid,message]=`
  `fopen('filename','permissions')`
- If the open is not successful, fid returns as -1
- Lec02_01_file.m gives a simple example of reading and plotting a data file. Data files used here are MIT GPS data processing. Example allows a number different features in Matlab to be explored.
- This M-file also shows the use of logical and plotting functions in Matlab.

FORMATS for scan and print

- The format structure in Matlab is very similar to C (and unix programs such as awk)
- Mostly these are used for outputting values
- Basic types (see details in Matlab On-line help)
- %f, %e, %g — floating point numbers
- %d — integer values
- %s — String characters
- \n —newline (needed often at ends of format)
- \r — carriage return

Dialog boxes

- We can make the File selection even better in the example using a dialog box.
- The Matlab M-file Lec02_02_db.m shows an example of how we might do this.
- This example shows ways to get file names from a directory listing.
- At this point we try these features on MIT Server
- In the next two lectures, you will develop a Matlab program to manipulate data of this type.

Summary of Today's class

- Continued examining Matlab operations
- path and addpath commands
- Variables and constants
- IO using fopen, scanf etc.
- Formats
- Dialog boxes
- Much of the lecture is spent actually using these features in the M-files that are included with the lecture.