INTRODUCTORY CONCEPTS

Tuesday, Jan. 20th, 2009

PREFACE

ASSUMED – Little to no experience with Unix and/or scientific computing

GOAL – Establish a foundation to start working in a UNIX environment immediately, and provide the tools and knowledge to quickly gain proficiency.

PHILOSOPHY – Provide breadth to (hopefully) illustrate the big picture and interconnection of the different topics covered. Provide the necessary depth in topics most relevant.
PRELIMINARIES

Instructor:
- Matt Masarik, mmasarik@atmos.colostate.edu

Website:
- http://www.atmos.colostate.edu/gradprog/programming

Class Structure:
- 3:00-3:50    - Lecture 1
- 3:50-4:00    - Break
- 4:00-4:50    - Lecture 2
- 4:50-5:00    - Summary/Questions
- 5:00-5:30    - Office hours [optional]

SYLLABUS

WEEK 1
- Lec 1: Introduction to Unix
- Lec 2: Programming Basics

WEEK 2
- General computing topics – hardware, precision, languages, scripting, programming tools (compiler, text editors, etc.), boolean logic

WEEK 3
- Introduction to CS – background, problem solving model, functions, algorithm design, good programming practices, debugging

WEEK 4
- Networks & related topics – background, hierarchy, tunneling, vpn, ssh, ftp, scp, http, html/css, security
LAST OF THE DETAILS…

- Syllabus vs. Syllabus
- Matlab, C
- A word about speakers
- Student background
- Student requests

BASIC PROGRAMMING

- Data Structures
  - constant
  - scalar
  - array
  - exotic
- Core Statements/Expressions
  - declaration/assignment
  - branches
  - loops
- Operators (relational/logical)
DATA STRUCTURES

Scalar Variables
  • integer: 3
  • float, double: 3.9999
  • character: ‘a’
  • boolean: True, 1

  • string: “jan202009”

DATA STRUCTURES

Constants
  • By definition do not (should not) change during execution of the program.
  • Example: Fortran – PARAMETER, any data type (int, float, char).
  • Example: Matlab – only predefined, pi = 3.14…
  • Matlab and the declaration global
DATA STRUCTURES

Arrays
• multi-dimensional
• can be composed of any of the scalar variable types
• comment on dimensions (Matlab vs. Fortran)

DATA STRUCTURES

Pointers
• a variable that holds the ‘address’ of another variable (any type). It ‘points’ to the location of a variable.
• can be ‘dereferenced’, giving the value of the variable it points to
• won’t discuss much
DATA STRUCTURES

Exotic
• see example: Linked List of Observation objects

RELATIONAL OPERATORS

• Less than
• Less than or equal
• Greater than
• Greater than or equal
• Equal
• Not equal
LOGICAL OPERATORS

- and
- or
- not
- exclusive or (xor)

STATEMENTS / EXPRESSIONS

[See Matlab examples]

Assignment (declaration_INITIALIZATION)

Branches
- if
- case (not here)

Loops
- for
- while
- do while (not here)