OIT Seminar

Introduction to

PV-WAVE CL ™

Dean Jerding

dfj@cc.gatech.edu

Overview

- Command language for Visual Data Analysis
  - similar to FORTRAN but higher level
- Features
  - data access, reduction, analysis
  - 2D and 3D graphics
  - animation
  - image processing
  - creation and query of tables
  - application development
- Applications
  - thermodynamics
  - fluid dynamics
  - finite element analysis
  - real-time data acquisition
  - imaging
  - astrophysics
  - earth resources

Usage Levels

- Command level
  - CL interactive shell environment
  - compiled and executed immediately
  - save journal files of sessions
- Procedure level
  - groups of commands callable from other routines
  - callable from C, FORTRAN programs
- Application level
  - stand-alone applications written in CL
  - point-and-click interfaces

Environment Set-up

- **Invoking CL interactive environment**
  - **type `wave` at the shell prompt**
  - **type `exit` or `quit` to end session**
- **Path to PV-WAVE related files**
  - ***/usr/local/pvi/wave***
- **Environment variables**
  - **currently set-up automatically**
- **Procedure and function libraries**
  - **Standard Library**
    - -- ***/usr/local/pvi/wave/lib/std***
  - **User Contributed Library**
    - -- ***/usr/local/pvi/wave/lib/user***

Documentation

- **On-line help in the interactive environment**
  - **on-line help system**
    - **-- type `help` at the prompt**
  - **help about current session**
    - **-- type `info [,expr...]` at the prompt**
- **Manuals (available in SciVis Lab)**
  - **PV-WAVE Command Language Overview**
  - **PV-WAVE Command Language User's Guide**
  - **PV-WAVE Command Language Reference**
  - **PV-WAVE CL Sample Applications and Guide to Demonstration Software**

Command Syntax

- commands are not case sensitive
- a `$` is used as the line continuation character
- a `+` is used to concatenate strings
  - must be used when strings are broken by a linebreak
- strings are enclosed by double (`"`) or single (`'`) quotes
- a `!` preceding a string indicates a system variable
- a `/` preceding a string indicates a keyword set to 1

Interactive Environment

- **Recalling commands**
  - **press up arrow to cycle through command history**
- **Saving and restoring variables**
  - **type** `save, /all, filename = '`*filename*`'`
  - **to restore, type** `restore, '`*filename*`'`
- **Journal files**
  - **type** `journal, '`*filename*`'`
  - **to end journal, type** `journal`
  - **replay commands by typing** `@`*filename*
- **Other files**
  - **command files**
    - -- ***.pro*** **extension**
    - -- **execute using** `@`
  - **procedures and functions**
    - -- ***.pro*** **or** ***.cpr*** **extension**
    - -- **callable automatically**
  - **main programs**
    - -- **compile, execute using** `.run`

CL Overview

- Data types
  - byte, integer, long integer, floating point, double precision, complex, string, structure
- Standard arithmetic, relational, boolean, and string operators
- Assignment and control statements similar to FORTRAN and C
- Procedures and functions
- Formatted and unformatted I/O

High-level CL Features

- Data manipulation
  - basic statistics
    - `-- avg, correlate, sigma, stdev`
  - array information
    - `-- determ, histogram, max, min, total`
  - array manipulation
    - `-- rebin, reform, reverse, rotate, shift, smooth, transpose`
  - search
    - `-- where`
  - sort
    - `-- sort`
  - table functions
    - `-- build_table, query_table, unique`

- Mathematical functions
  - absolute value
    - `-- abs`
  - cross product
    - `-- crossp`
  - derivatives
    - `-- deriv`

High-level CL Features (Cont.)

- determinant
  - -- `determ`
- eigenvalues and vectors
  - -- `tred2`
- Fast Fourier Transform
  - -- `fft`
- linear equation solvers
  - -- `lubksb, ludcmp, mprove, svbksb, tridag`
- curve-fitting
  - -- `curvefit, gaussfit, polyfit, polyfitw`

- Graphics routines
  - 2D line and scatter plots
    - -- `plot, oplot`
  - polar plots
    - -- `plot` with `polar` keyword
  - log plots
    - -- `plot_io, plot_oi, plot_oo`
  - contour plots
    - -- `contour`

High-level CL Features (Cont.)

- wire mesh plots
  - -- `surface`
- calendar axis plots
- multiple axis plots
  - -- `axis`
- interactive graphics
  - -- `cursor, tvcrs, defroi, profiles`
- shading surfaces
  - -- `polyshade, shade_surf`
- animation
  - -- `movie`
- advanced rendering
  - -- `render, cone, cylnder, sphere, mesh, volume`

- Image routines
  - color tables
    - -- `adjct, c_edit, color_edit, loadct, palette`
  - histogram equalization
    - -- `hist_equal_ct, hist_equal`

High-level CL Features (Cont.)

- displaying images
  - -- `tv`
- scaling and displaying images
  - -- `tvscl`
- morphologic building blocks
  - -- `dilate, erode`
- shrinking, expanding
  - -- `congrid, rebin`
- convolving two vectors
  - -- `convol`
- creating filters
  - -- `digital_filter, hanning, leefilt, median`
- warping
  - -- `polywarp`
- edge enhancement
  - -- `roberts, sobel`

- **Output**
  - X windows, SunView
  - hardcopy
    - -- printers, plotters, PostScript, PICT, etc.