



AVS/Express and Vislt Training

NERSC Users meeting June 2006 - PPPL

Cristina Siegerist NERSC/LBNL Visualization group June 13, 2006





AVS/Express and Vislt Training Overview



- **Network Editor**
- **Importing Data**
- Libraries
- **V** language
- **Module writing**

Vislt

- Introduction
- **Databases** •
 - **Plots**
- **Operators**

Conclusions and what was left out

How to contact us:

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What is AVS/Express?

- An object oriented visualization development tool
- Graphical development interface
- Modular, with many built in library modules
- Open and extensible, using V-language and/or C, C++, FORTRAN Api.
- Serial, not distributed.







AVS/Express in NERSC

- 250 licenses
- DaVinci (7.0, 7.1), Seaborg(6.3)
- module load avs-express
- %express
- Licenses can be checked out from the license server http://www.nersc.gov/nusers/services/licenses/





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Type of application

- Single-window
- Multi-window
- Application

and dimensions. Choose the default: Single-window, 3D.



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Selecting single window app and 3d you will see: 3D Display 3D Viewer instance Built-in Library modules







Main Library: Data IO Filters Mappers Geometries Field Mappers Viewers





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Left mouse to drag and drop instances of modules onto the canvas. Choose "Rd_HDF5_Field" from the Data IO library.

The viewer will show the corresponding gui. From the browser select "./tutorial1.h5"









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Network Editor



Viewing controls: mouse over the icons tells you what they are





Viewing controls continued





Reading Data

- Supported Formats
- The Express Field
- Importing Data into AVS/Express
- Writing Custom Readers





Reading Data

Some Readers (Main, Data IO library)

Read_Field, Read_UCD, Rd_netCDF_Fld, Rd_HDF5_Field, Read_PLOT3D, Read_DXF, Rd_Txt_Colums, Rd_Txt_Grid, Rd_Bin_Sequence, Read_Volums, Read_Polygon, Read_Triangle...









The Express Field

Field Types:

- Structured (or irregular)
- Rectilinear
- Uniform

Connectivity is implicit, can define a header file to use Read_Field

Unstructured



Connectivity must be defined.





The Structured Field



Structured Field: nspace ndims dims coordinates node data: scalar, vector, etc.





The Read_Field Module

AVS field file This is a header file for a structured field **Header file** for a ndim = 3structured dim1 = 40dim2 = 32field dim3 = 32nspace = 3veclen = 5data = floatfield = irregular needs label = density x-momentum y-momentum z-momentum stagnation to be there variable 1 file=./blntfinq.bin filetype=binary skip=28 variable 2 file=./blntfinq.bin filetype=binary skip=163868 variable 3 file=./blntfinq.bin filetype=binary skip=327708 variable 4 file=.blntfinq.bin filetype=binary skip=491548 variable 5 file=./blntfinq.bin filetype=binary skip=655388 coord 1 file=./ blntfinx.bin filetype=binary skip=12 coord 2 file=./ blntfinx.bin filetype=binary skip=163852 coord 3 file=./blntfinx.bin filetype=binary skip=327692



Uniform

Field

The Read_Field Module

AVS field file # this is a header file for a uniform field # # ndim = 3 dim1 = 64 dim2 = 64 dim3 = 64 nspace = 3 veclen = 1 data = byte field = uniform

variable 1 file=./hydrogen.dat filetype=binary skip=3

Note: FORTRAN unformatted data can be read in by using for example: variable 1 file=for0004.dat filetype=unformatted skip=32 stride=1





The Unstructured Field

Cell types:



see the AVS/Express manual





Unstructured Field

• Can be assembled in Express by reading the connectivity array, by writing it in HDF5 format, or by using a custom reader.





Importing Data into Uniform Fields

- Rd_Text_Grid: reads in grid-oriented text, often the result of exporting a spreadsheet
- Rd_Text_Sequence: reads in a sequence of numbers from an ascii file into a uniform field.
- Rd_Bin_Sequence: Reads in a sequence of numbers from a binary file into a uniform field.



Uniform fields





Importing Data into Tables

 Rd_Text_Columns: reads an ASCII file containing any number of separated columns into a "table". It can be converted to the Uniform Field or Scattered (particles) Field types.





- I Reading an hdf5 array into a 2D uniform mesh.
- II Reading a 3D HDF5 file, making an isosurface, changing the transparency.
- III Visualizing a vector field, making streamlines.





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Delete the application: left click on SingleWinApp choose **Delete Application** from the main File menu.







From MAIN/Data IO drag and drop Rd_HDF5_Field

Read tutorial_3d.h5 from the GUI







Unstructured data: mesh made with prisms and several node data variables, both scalar and vector.





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Find isosurface (Main/Mappers). Left mouse button on an output port and connect to the corresponding input port of another module. Delete a connection: right click on the connection and select delete.



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Tip: under the Object menu button there is a "Find in All Libraries..." option. Search for *surf* and all the modules surf related will appear. Show will show the module in the library.







Example Application: Change the isosurface value from the isosurface module GUI.





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Example Application II



Changing the transparency: ctrl-left click on the surface to select the object. external faces will replace Top. Select **Editors/Object** from the main menu.



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ctrl-left click on the background to select the Top object. Select Editors/Modules from the main menu.





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We will visualize a Vector Field:

From the Rd_HDF5_Field GUI read the

B, magnetic field vector





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Example Application III



Select Accesories/Utilities/Viz_Macros/Vector (double left click to open)















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Example Application III



Delete the vectors from the viewer and connect the streamlines.

Select plane as the start point



V language

AVS/Express applications can be saved as .v files and loaded later.



To save an application: select your SingleWindowApp (left click) and save from the File menu as a .v file

You can load it later with "File/Load Application"

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<u>File</u> <u>E</u> dit <u>O</u> bjec	t <u>P</u> roject
New Application	Start
Load Application	
Save Application	
Delete Application	
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🔁 Read Field	
🔁 Read UCD	
Applications	





AVS/Express Module Writing

It's a long tutorial by itself. If people are interested I can prepare material and post it in our web site.





- Vislt is a point-and-click 3D scientific visualization application that supports most of the common visualization techniques (isocontouring, volume rendering) on structured and unstructured grids.
- For detailed information on Vislt, please refer to http://www.llnl.gov/visi





- Main Features:
 - it's free and open source and most importantly, it offers a distributed mode. You can connect a client from your desktop and run a backend in the computer where you produced the data.
 - Visit employs a parallel architecture in order to handle extremely large data sets interactively.







 On DaVinci, use the modules facility % module load visit % visit

IMPORTANT NOTES

- 1- To run the parallel backend the path to visit has to be in your environment. Add this line to your .cshrc setenv PATH /usr/common/graphics/visit/visit-1.5.2/bin/:\$PATH
- 2 Sometimes when the Vislt GUI starts, the opening of windows stalls. If this is the case use:
- %visit -nowindowmetrics
- 3 If you are running in client remote server mode, the version number of the client and the server must to be the same.
- 4- Make sure the backend can connect to your client (check with the systems' admin).





File Controls Options Windows Help File Ctrl+F Advanced file options Help Advanced file options File information Ctrl+F File information Ctrl+R File information Ctrl+R Simulations Ctrl+S Save window Ctrl+S Set Save options Ctrl+S	Select "Select file" from the File menu.
Save movie Export database Print window Set Print options Ctrl+P Restore session Save session Draw Exit	Load "tutorial_3d.vtk"
Plots Operators PlotAtts OpAtts Variables Apply operators and selection to all plots	Note: this is the same data that we just used for Express but I extracted only the B, magnitude and the B, vector variables
	to VTK format





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Open the file.

The Plots menu will be enabled.

Once you select a plot, the operators over that plot will be enabled.







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Vislt tutorial



Select PlotAtts Pseudocolor.

Change the opacity and apply.

Vector plot attributes

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Plots Operators	PlotAtts OpAtts selection to all plots 	Select Plot Vector B	Maintain limits R view data A e/Show Delete or - ExternalSurface(B) ternalSurface(B)	Line style Y Line width Y Vector color Magnitude Default Limits Use Original Data Y Min 0
 Curve Filled Bounda Histogram Label Mesh Pseudocolor Scatter Scatter Streamline Streamline Subset Surface Tensor Truecolor Vector Vector Volume Science 	▶ TY ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶	Draw the plot From the PlotAtts menu select Vector and change the parameters	PlotAtts OpAtts Image: Solution of the second se	Imax 1

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Vislt tutorial

Making Streamlines:

Make sure you deselect the toggle button "Apply operators and selection to all plots"

Select Plots, Streamline, B

From PlotAtts, Streamline change the source type to plane and the step length.

Conclusions

- AVS/Express: commercial, serial, very flexible, not so easy to use, good API for custom development.
 – left out: module development
- Vislt: open source, parallel, easy to use, python interface for batch operation, plugin development is possible.
 - left out: vtk data format, parallel operation, plugin development.

