Visualization Techniques for Monitoring Simulations

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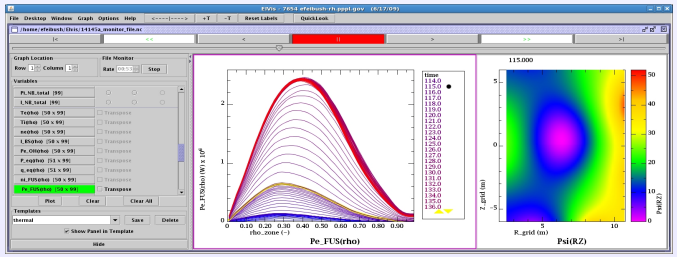
Visualization Client



Visualizing Time Indexed Data in a Single Graph

A color gradient legend, from blue to red, is applied to *f*(x,t) curves of Pe_FUS(rho). The color sequence conveys the time ordering in one static graph. The yellow triangles in the legend box control scrolling the list of time indices.
The client periodically checks for new data and automatically adds it to the graphs.

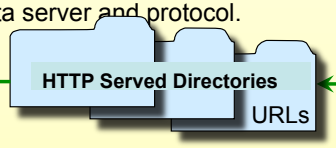
Automated Data Monitoring Scientific Graphics Display

f(x,y,t) data for Psi(R,Z) is downloaded and visualized in the client program. Having the data locally improves interactive exploration.

HTTP Web Server

Scientists can monitor long running programs from anywhere on the Internet.

Leverage use of HTTP server and web directories to send data to client instead of developing custom data server and protocol.



Client checks URL for new data. Adjusts polling rate to simulation's update rate throughout the run.

Simulations

Monitoring Variables with Graph Templates

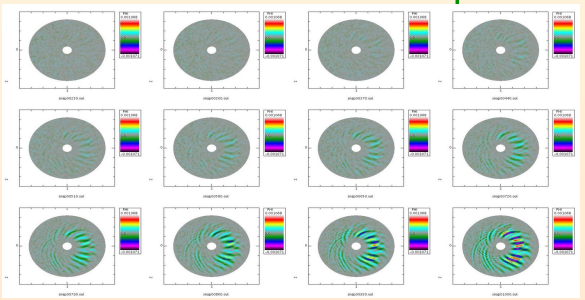
Simulation programs on cluster or super-computer write monitor data to netCDF files. Variables are defined with an "unlimited" dimension in time.
Append data to variables at each time step.
API in client reads netCDF file stored at URL.

Any program that writes a structured netCDF file can be automatically monitored by client.

Template file is paired with netCDF file to specify variables to plot. Load new run with established presentation. Compare multiple runs in client.

netCDF File	Template File
Variables	Graph descriptions
Attributes	Presentation style
Units	Annotation

Monitor Data

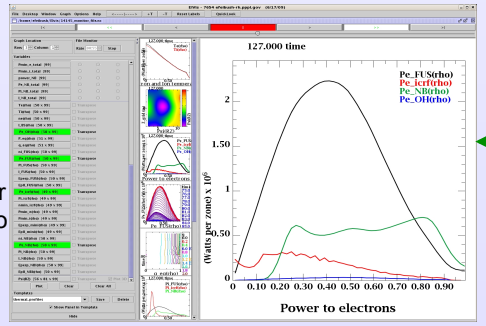


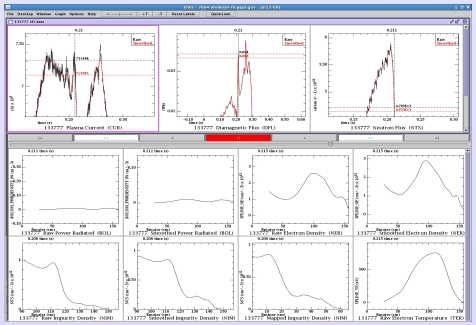
Monitoring with Sequence of Image Files

Gyrokinetic Toroidal code produces data too large to download so an image is rendered for each time step.
Client downloads images sequentially to display animation and checks for new images when last image is displayed.
Images are rescaled to global range at end of run.
A portable movie maker program combines images into a movie file and avoids copying the images to another platform.

Filmstrip Layout

Scientists need to organize an increasing number of graphs. Thumbnails are shown in scrollable column. Variables highlighted for selected graph. Easy to learn layout based on digital photo and slide program paradigm.





Integrated Animation

f(x) data in the top row is interactively examined with digital readout by dragging the cursor along time axis. Animation is simultaneously advanced to closest time step in second & third rows. This feature was requested by plasma physics scientists.

Implementation

Client software written in Java for portability of single version. Runs as trusted applet in browser or as Java application to access more memory. Visualizations can be saved to PostScript or PDF files for publication quality output.

http://w3.pppl.gov/elvis