

Scientific Visualization in Nuclear Physics

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Gluplot [1] is a data plotting package. It was originally intended both as graphical library and as standalone program which would allow scientists and students to visualize data. (The "GLU" in **gluplot** means that it is OpenGL/GLU/glut based.) **Gluplot** handles both curves (2D) and surfaces (3D). For 2D plots, there are many plot styles, including lines, points, lines with points, error bars and impulses. Surfaces are plotted as a color map on the x-y plane. **Gluplot** supplies both linear and logarithmic axes. Moreover, any other axis distortion is available using **gluplot** library. Axis scale and also many other settings are changeable by **gluplot** command-line options or by menu items and hot-keys after it runs. After all, **gluplot** supports high quality plot output to PostScript (PS), Encapsulated PostScript (EPS) and Portable Document Format (PDF) files.

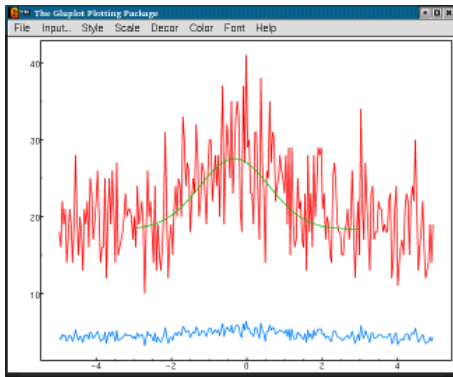


Figure 1: Main Gluplot window

This is the clone of famous gnuplot plotting utility, but there are some new features.

First of all, **gluplot** is OpenGL/GLU/glut based, as seen from its name. Thus, it produces high quality plots due to OpenGL facilities. **Gluplot** also uses GL2PS library included in its distribution to produce output to PostScript (PS), Encapsulated PostScript (EPS) or Portable Document Format (PDF) files.

Second and the most pleasant **gluplot** feature is the possibility to use it as a library of C++ classes and in this way it is more flexible than standalone utility.

Third, **gluplot** provides excellent gnuplot-like auto-scaling for its axes. Moreover, it supplies any user-defined axis distortions, including linear and logarithmic ones, of course.

Finally, **gluplot** is able to perform true scatter plots due to triangulation. By default, any surface without mesh is triangulated by **gluplot**, and thus, user can forget about it.

Applications for nuclear physics

Visualization of freezeout-surface

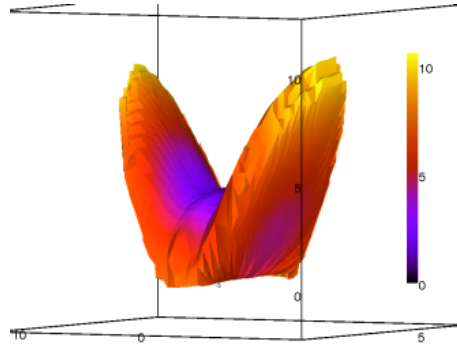


Figure 2: freezeout-surface

This application (see fig.2) extends **gluplot** functionality: it calculates bounding surface area and bounded volume. It provides also visualization of freezeout-surface evolution in time.

Visualization of particles distribution in NICA/MPD detector

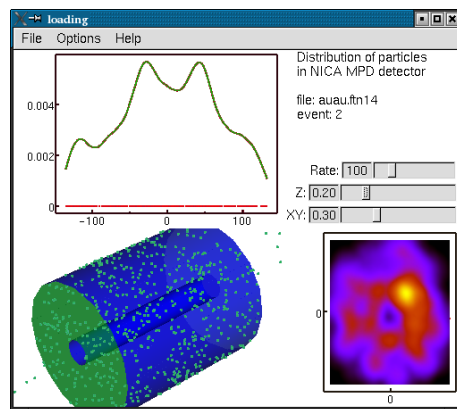


Figure 3: Particles distribution in NICA/MPD detector

Application for visualization of particle distribution in NICA/MPD detector is shown in fig.3. Ex-

cept 3D dynamic visualization it uses 2 `gluPlot` windows for particle distributions along detector axis and on its sides.

Visualization of nuclear models

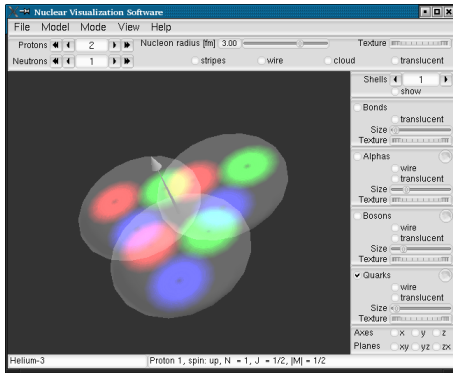


Figure 4: Visualization of nuclear models

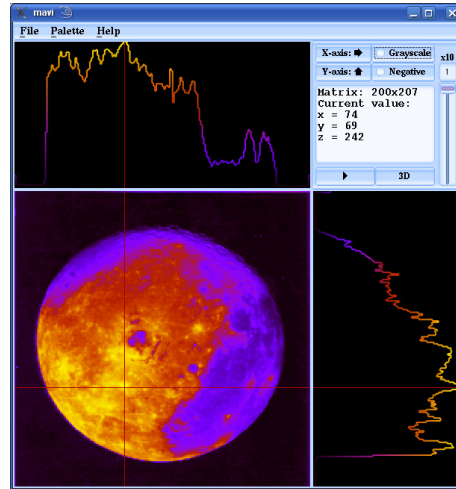
Application for visualization of nuclear models is shown in fig.4.

MaVi development

MaVi (MAtrix VIewer) [2] is a simple visualization program for matrix data. Data is displayed inside the main window as 2D color field and two orthogonal 1D slices can be chosen in additional windows. MaVi allows one to pick up and explore the

individual elements of the matrix. It can be used for on-line or off-line analysis in the control or data acquisition systems.

New version provides unified interface for dynamic beam monitoring.



References

- [1] <http://www.jinr.ru/programs/jinrlib/gluplot/indexe.html>, <http://www.fltk.org/links.php?V346>
- [2] <http://www.jinr.ru/programs/jinrlib/mavi/index.html>, <http://www.fltk.org/links.php?V231>