SANS Data Treatment Software

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The main two steps - primary and secondary ones - of in small angle neutron scattering data processing are performed with the help of SAS and Fitter packages correspondingly.

The SAS [1] program is aimed to process the spectra measured on YuMO spectrometer (channel four of the IBR-2 reactor). The program allows to combine the data referring to the same sample, to calculate the spectrometer resolution function for the given experiment conditions, to carry out data correction on dead times of neutron detectors, and to subtract a background substrate from detector data (in two possible modes: using the neutron beam breaker or without it), to carry out the normalization of the obtained spectrum on standard vanadium scatterer, to subtract background sample data (Fig.1).



Fig. 1: SAS main window

Fitter [2] is a C++ program aimed to fit a chosen theoretical multi-parameter function through a set of data points. The method of fitting is chi-square minimization. Moreover, the robust fitting method can be applied in Fitter. Fitter was designed to be used for a small-angle neutron scattering data analysis. Respective theoretical models are implemented in it. Some commonly used models (Gaussian and polynomials) are also implemented for wider applicability (Fig.2).

SAS is based on the Histogram Template Library (HTL) [3]. It is a C++ class library that provides basic functionality for one-dimensional histograms. As the name suggests, it exploits the template facility of C++ and is designed to be easy to use, compact and performant.

Both SAS and Fitter packages are used RC [4] - a kit of C++ classes that provides functionality for easy to use management of runtime configuration parameters, for storing them in configuration file.

One more package should be mentioned is MaVi [5] (MAtrix VIewer) is s simple visualization program for matrix data (Fig.3). Data is displayed inside the main window as a 2D color field and two orthogonal 1D slices can be chosen in additional windows.



Fig. 2: Fitter main window



Fig. 3: MaVi main window



Fig. 4: Gluplot views

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.

Finally, one useful standalone package – Gluplot [6] - appears during SANS software development. Gluplot is a data plotting package (Fig.4). It was originally intended both as a graphical library and as a 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.

References

- [1] http://www.jinr.ru/programs/jinrlib/sas/indexe.html
- [2] http://www.jinr.ru/programs/jinrlib/fitter/indexe.html
- [3] http://www.jinr.ru/programs/jinrlib/htl/indexe.html
- [4] http://www.jinr.ru/programs/jinrlib/rc/indexe.html
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