

§25. New System of Differential Cross Section Databases

Pichl, L. (International Christian Univ.),
Kato, D., Murakami, I., Kato, T. (Nat. Inst. Fusion Sci.)

The numerical databases maintained at the NIFS Data Center are able to accommodate only single-variable numerical data [1]. Since the system is based on the ORACLE database management software, and outsourced to a professional company, its extension into multi-dimensional numerical data sets, such as the differential cross sections, would imply a substantial cost. Although the 1D data tables allow for various indexing, e.g. in the form of integer quantum numbers, it would not be practical to use the additional cross-section variables in the form of indices for the sake of data integration.

Instead, we have developed the first differential cross-section database in the Coordination Research Center as a free-software open-source solution. The main features of the online database system are shown in Fig. 1.

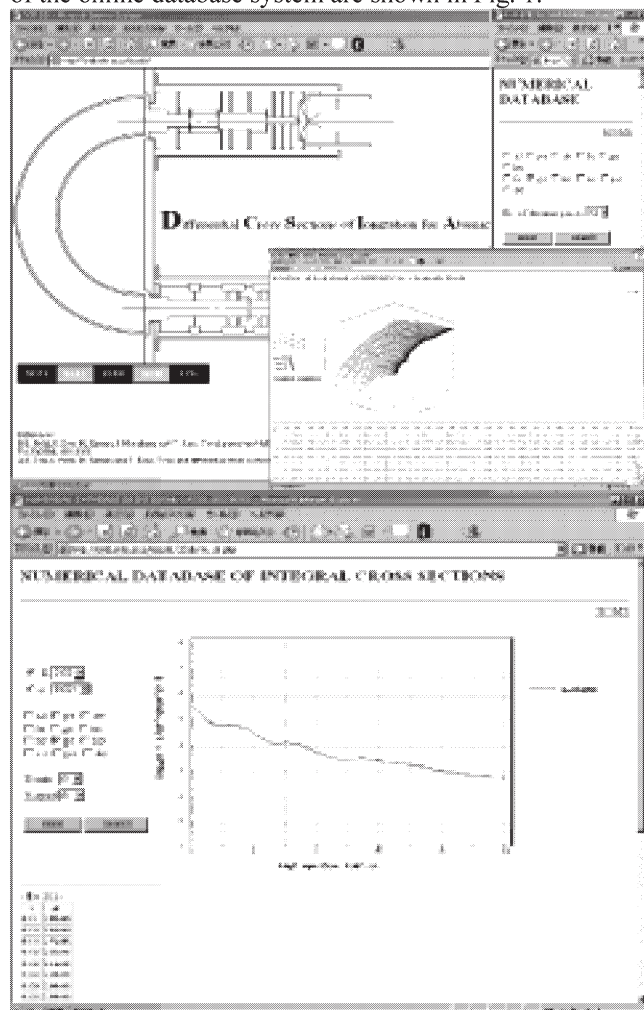


Fig. 1. Online database of differential cross sections at NIFS (<http://crdb.nifs.ac.jp/dcsdb/>) The upper panel shows the main page and a 3D plot GUI in the inset. The lower panel shows the GUI for 2D section plots.

The physical data contain energy-differential cross-sections of ionization of atomic hydrogen by proton impact, resolved with respect to the energy of impacting proton, energy of the ionized electron, and angular momentum quantum numbers, which were computed in our previous NIFS-based project [2]. The main features of the software system are: (1) seamless integration of all data in a hypercube and easy generation of 2D sections, and (2) graphical user interface (GUI) for 2D section plots and 3D data graphs, including multiple data sets in one graph. The 3D GUI also allows for selecting the range of data and manipulating the graph's viewpoint. All figures are generated on the fly, reducing the size of the database. The system is implemented on Fedora Core 3 SE Linux server (Apache server, PostgreSQL database, PHP logic layer).

In order to facilitate the design and deployment of new databases, we have also developed a prototype online database builder module, which allows for creation of database tables, online data input, data search and 2D plot generation. The interface is shown in Fig. 2.

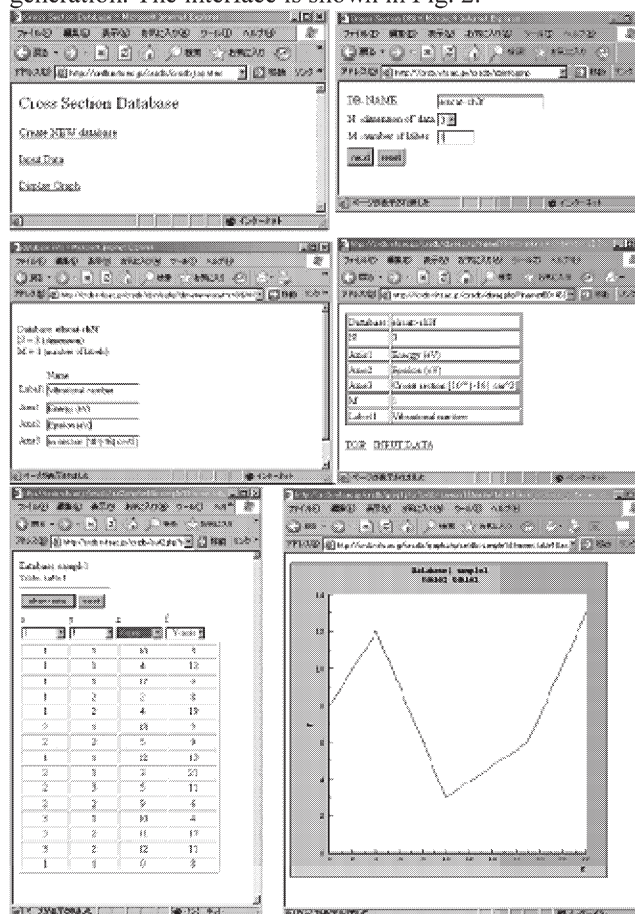


Fig. 2. Elements of the online database builder prototype.

Further research will include the integration of both modules.

References

- [1] <http://dbshino.nifs.ac.jp/>
- [2] Pichl, L. et al., JPCRD **33** (2004) 1031.