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3.42 Development of a Search System of NRDF on WWW

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We develop a data search system and a data entry system for the Nuclear Reaction Data File (NRDF), which is one of the charged-particle reaction database compiled by Japan Charged Particle Reaction Group (JCPRG). Using a WWW browser, we can easily search, retrieve and utilize the data of NRDF.

1 Introduction

For twenty-five years, Japan Charged Particle Reaction Group (JCPRG) has been accumulated charged-particle nuclear reaction data mainly form the papers concerned with domestic experimental facilities and authors [1]. The accumulated data are compiled to the original database of nuclear data, NRDF (Nuclear Reaction Data File). The data format of NRDF has flexibility for a variety of data type of nuclear reactions. Hence, the data contains not only the bibliographical data and the experimental results but also almost all of information about the experiment. Therefore, NRDF can be a kind of "scientific" database, which has an ability to utilize the data for both scientific and practical use (e.g. for a medical use). Data of NRDF are also transported to the data of the EXFOR (EXchange FORmat) for a sake of our international contribution in nuclear data [2].

In the beginning of NRDF compilation, the data was opened on a mainframe, hence the user was restricted to the member who had an account on the mainframe [3]. Moreover, the retrieved data was the NRDF data cord itself, then the user has to know the meanings of words in the cord and the structure of NRDF data format. On such the situation, from 1996, we experimentally started a WWW data retrieval system on our web server [4]. Using this system, we can easily retrieve the NRDF data on a WWW browser, same as a usual data search page. However, it still remained some difficulties in utilization of the retrieved data. First, the view of

retrieved data was the NRDF cord itself, then we also has to know the meanings of the words and the structure. Second, the numerical data of experiments were graphically displayed, but the attributes of x- and y-axes were not shown explicitly.

In this work, we develop a new WWW data search system in order to overcome the difficulties as mentioned above. On the new developed system, we need not know any words of NRDF data cord and the structure of data format. The numerical data of experiments is graphically visualized with information of the attributes of x- and y-axes. Now, our activities of development of utility systems extend for several ways: WinNRDF [5] and WinNRDF2 [6], which are another data retrieval systems works with/without the network, CONTIP [7,8,9], which is a new types of data utility system using IntelligentPad [10]. And more, we start to develop a data entry system on WWW.

2 Data Search System

The new data search system is opened on the following address:

http://nrdf.meme.hokudai.ac.jp/tools/nrdf_search.html

Features of this system are: (1) easy operations using "friendly" inter face of a WWW browser, (2) graphically data visualization with information about the experiment and x- and y-axes, (3) simpleness in the development of the system, and (4) platform-free for users.

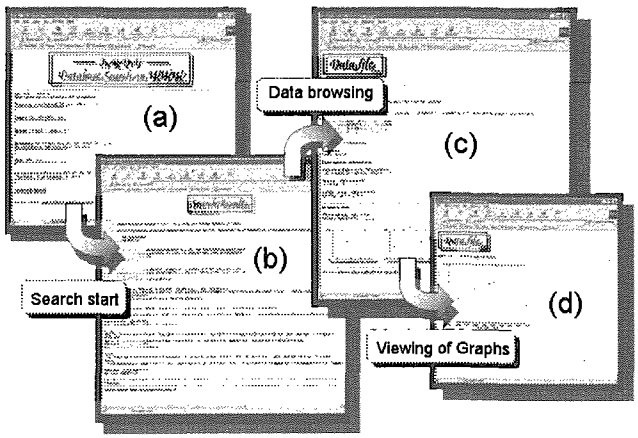

Figure 1: Sequence of data search on the new WWW search system.

A sequence of data retrieve is on following steps (see Fig. 1). First, to list up data to be retrieved, we input search keywords in the first data-search page as marked (a). Search results are listed up in the search-result page as marked (b). We can choose the data to be retrieved with some information, the title of the article, the authors, the reference and the reaction types of the experiments. The retrieved data is precisely shown in the data-browsing page as marked (c). The information of the experiment is shown, and thumbnail-pictures of graphs are displayed in the bottom of the page. We can see each graph data precisely in the graph-display page as marked (d).

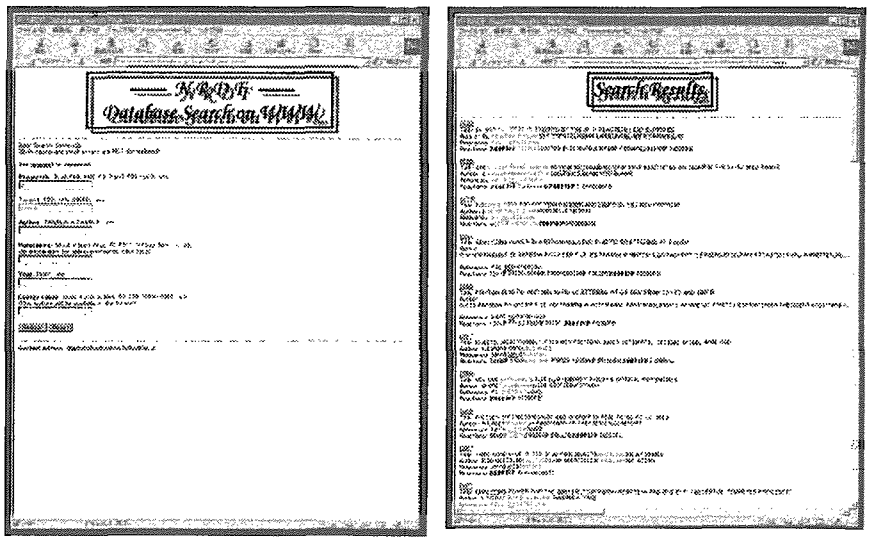

Figure 2: (a) First data-search page of the system, and (b) the result.

Here, we show functions and features of this system in each page. We start a data search with some search keywords with the first data-search page shown in Fig. 2. Similarly to almost all other WWW data search systems, this data-search page works as keyword-matching search system. We input some search keywords of a projectile, a target, an author, a reference article and the published year of the reference, (in Fig. 2a). The search results are listed up in the search-results page, and search keywords are emphasized by bold-face font, see Fig. 2b. We can choose a data to be retrieved in the list with information, say, the title, the authors, the reference and its volume, and reaction types of the experiments.

The data-browsing page has some remarkable features (see Fig. 3). The most improved function is that we can easily to see the title, the authors, and the relation between the figures

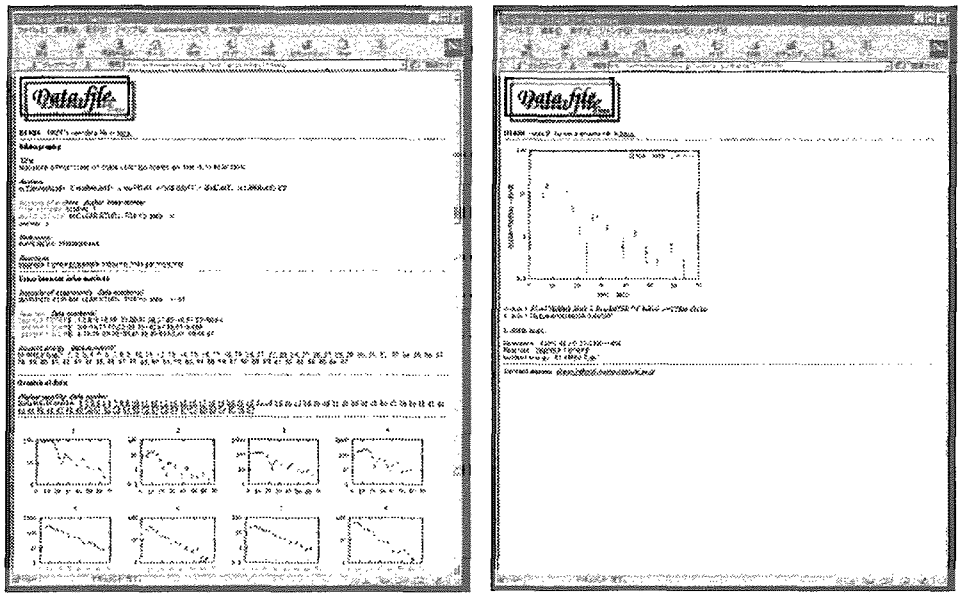

Figure 3: (a) The data-browsing page, and (b) graph-display page.

and the information of the experiments. Each word in the NRDF cord is translated with appropriate NRDF-words dictionary file. Hence we can obtain information of the experiment as if we read the original article, shown in Fig. 3a. The original NRDF formatted cord is also available in the upper part of the page where the link for the original cord is set up. To overlook all of figures of the numerical data of the experiments, the data-browsing page has a function to create "thumbnail-pictures" of the figures. Each thumbnail has a link for a graph-display page, see Fig. 3b. The graph-display page shows the figure of the numerical data and the information of the experiment, reaction type, incident energy, and the reference. The numerical data itself can be obtained in the upper part of the page, same as the data-browsing page.

The present data search system is constructed by using Perl script. Perl script is suitable to develop this kind of system and has a portability to other servers, which support a CGI of the Perl script.

3 Trial of Data Entry System

At present stage, we have been accumulating charged-particle nuclear reaction data form published papers and compilation has been done by reading the papers. However, such a process of

the compilation may cause some mistakes due to misreading of the compiler. Therefore, we just start to develop a WWW data entry system on our Web server.

Here, we introduce a "trial" data entry system. First of all, the title, the authors and the purpose of the experiment are to be input as a free text, shown in Fig. 4a. Next, to avoid careless mistakes, the reference and the institute of the experiments are chosen from each pull-down menu, since these words are to be translated into the NRDF cord. Finally, we count the number of graphs to be compiled and input it.

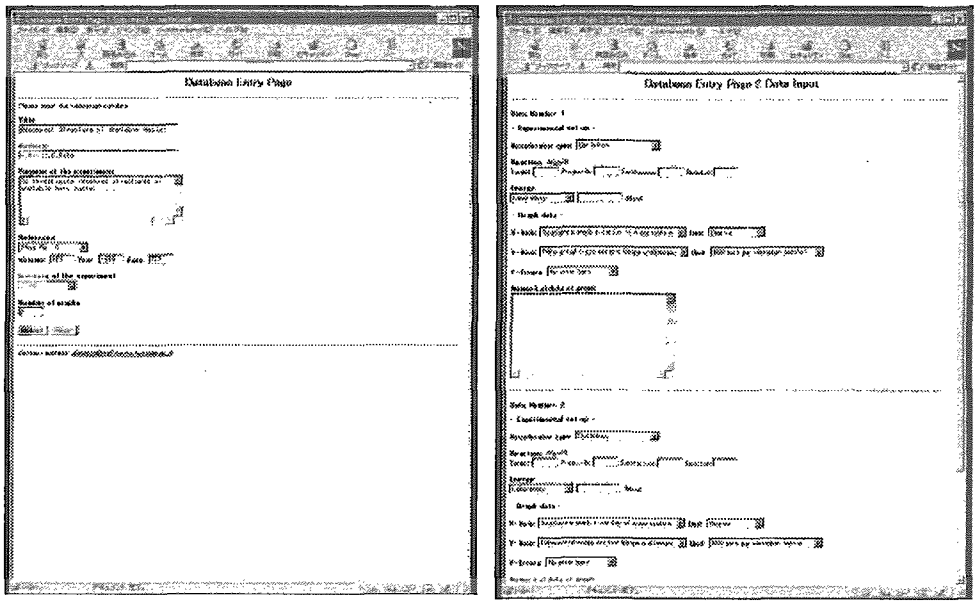

Figure 4: (a) The bibliographical data input page, and (b) graph-data input page.

According to the input number of graphs, the graph-data input page will be provided, as shown in Fig. 4b. In this page, we input the information of the experiment, i.e. an accelerator type, a reaction type, an incident energy, attributes of x- and y-axes, and numerical values of the graph, using pull-down menus and free text-boxes.

The NRDF formatted cord is automatically generated, and the input data is linked to the data-browsing page, hence we can see and confirm the input data with graphical views.

4 Conclusions

We developed a WWW data-search system. Almost all difficulties and inconveniences of old system, i.e. on the the mainframe-system and the old WWW search system, are avoided. And now we develop a data-entry system, which enables us to input nuclear reaction data without any knowledge of the NRDF cord. Both systems are constructed by using the Perl script, hence the systems can work on any servers, which supports a CGI of the Perl script. We propose that the combination of these two systems provides an "individual nuclear data management system" for us. That is because, once we input the data with the data-entry system, we can store the data as a NRDF cord, and the data can always be retrieved using the data-search system on the local server, independently of the original NRDF data server. Moreover, the data is not restricted to the experimental data, the theoretical calculated data can also be stored on the local server. Therefore, nuclear physicists can utilize nuclear reaction data both on the local and original NRDF servers, according to a purpose of a investigation. This concept can be realized in more sophisticated way on CONTIP as shown in Refs. [7,8,9].

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