# Development of Utility System of Charged Particle Nuclear Reaction Data on Unified Interface

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**Abstract**

We have developed a utility system, WinNRDF, for a nuclear charged particle reaction data of NRDF (Nuclear Reaction Data File) on a unified interface of Windows95, 98/NT. By using the system, we can easily search the experimental data of a charged particle reaction in NRDF and also see the graphic data on GUI (Graphical User Interface). Furthermore, we develop a mechanism of making a new index of keywords in order to include the time developing character of the NRDF database.

## 1. Introduction

For about twenty years, NRDF (Nuclear Reaction Data File) has been accumulated by JCPRG (Japan Charged Particle Reaction Group). NRDF contains the experimental data of the nuclear charged particle reaction in Japan. The number of accumulated data files is several ten thousands, which may be almost all data in Japan. However, the utility system for searching data is very poor, which was made more than ten years ago on the main frame of the computer center in Hokkaido University [1]. For example, we must know the grammar and the codes of NRDF and input thier commands on CUI (Character User Interface) in order to search even a simple data (Fig. 1). The obtained date itself can not be understood by a person who is not a specialist of JCPRG (Fig. 2). Furthermore, it is almost impossible to modify the old system to accept new applications because of the old architecture. On the other hand, recently, PC (Personal Computer) has been widely spread all over the world. The EXFOR (EXchange FORmat) database which is an international standard is determined to support it on the PC (Windows) interface and WWW (World Wide Web). Then, it is meaningful to develop the utility system of NRDF on the Windows interface and WWW.

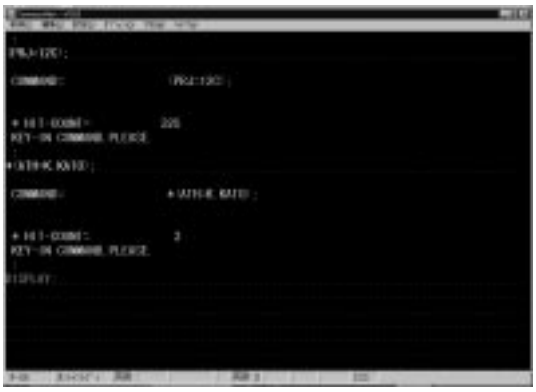

Fig. 1 Searching window of NRDF on CUI

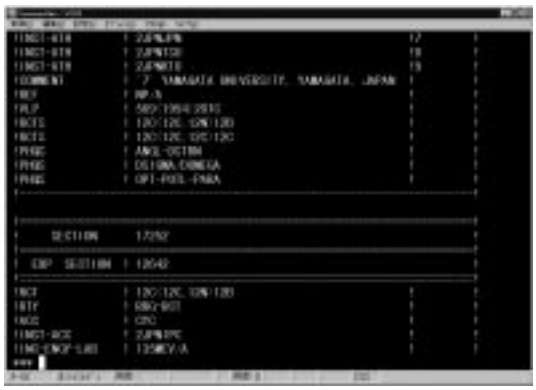

Fig. 2 Data of NRDF

On such a situation, we have three projects of the development of new data searching and utility systems for NRDF; i) A data search and utility system with Windows interface on the local PC (present paper). ii) A data search system on the network circumstance such as WWW (http://nucl.sci.hokudai.ac.jp/cgi-bin/nrdffind). iii) A data search and utility system by Intelligent Pad (IP) architecture [2] (see a paper by Ohbayasi *et al*. in this proceeding). In this paper, first, we describe an overview of the present system, WinNRDF, for the local PC with Windows interface in brief. Next, we explain the practical uses of WinNRDF. Third, we discuss the time developing architecture of NRDF on this system. Finally, summary and future problems are given.

## 2. Overview of WinNRDF

We describe an overview of WinNRDF for a local PC with the Windows interface in brief. The details of each window will be explained in the next section. The programming language of the present system is C++ one of the Borland C++ Builder. Because we also want to apply the system to the EXFOR database whose format on PC was already given in a Borland DBASE format, we select the Borland's one in order to do an easy connection to it. In Fig. 3, we show the overview of the system. The main window to input or select keywords is the upper middle part of the desktop. The left bottom is a data file select window. The right bottom is a graphic window in order to show the graphic data such as nuclear reaction cross-sections. These windows are programmed by the C++ language and the searching data file of NRDF is obtained by using an index file that is essentially the same one of the WWW system (http://nucl.sci.hokudai.ac.jp/cgi-bin/nrdffind). It should be mentioned that the replacement of the SQL language in the searching system or using a DBMS is easy. However, we can not include all the architecture of NRDF by such systems, though it is sufficient for the EXFOR database of a simple data structure.

Fig. 3 Overview of WinNRDF

## 3. How to use WinNRDF?

In this section, we explain how to use WinNRDF. We input some codes (keywords) to the input boxes in the searching window (Fig. 4). If we do not know code (keywords) in NRDF, we can use a dictionary from the popup menu of the input boxes. In Fig. 4, we show the popup menu for references. In the case of pushing the "Search" button, we can see the list of the so called D-number in NRDF (Fig. 5) which is an identification number of the data file basically corresponding to an article. If we select one of the D-numbers and push the "Open File" button in the list window (Fig. 5), then we get the data file (Fig. 6) with the D-numbers, which is corresponding to that of the old system in Fig. 2.

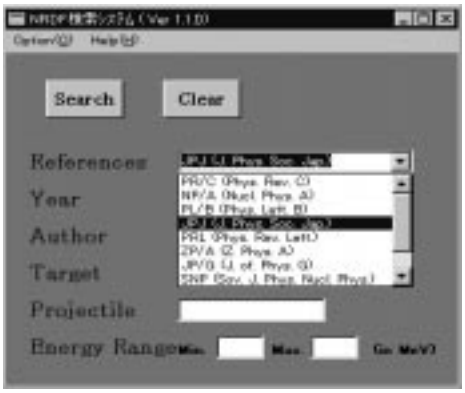


Fig. 4 Searching window

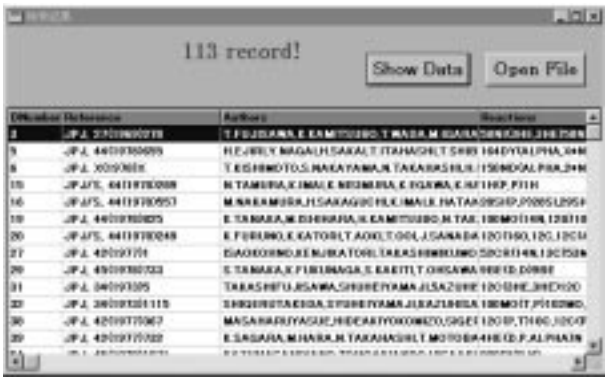


Fig.5 List window

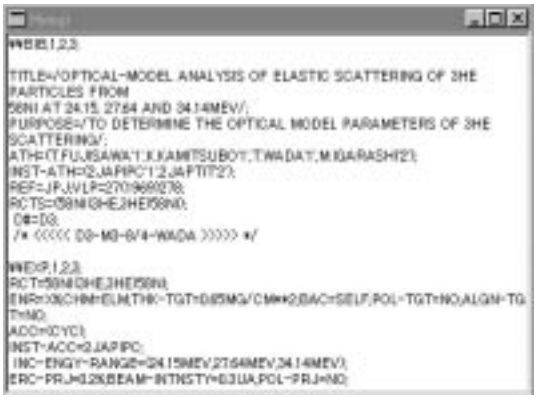

Fig. 6 Data file editor

In the old system, we can see a graph in a character pattern. However, it is not graphical at all now. Then, we should have a graphic window in the present system. The NRDF architecture has a kind of a tree structure. The data section in the data file of a D-number corresponds to a figure or a table in an article. In the old system, we must know the grammar of NRDF to treat such a data structure. In the present system, we do not need a knowledge of such a grammar. If we push the "Show Data" button in the list window (Fig. 5), a data select window openes as Fig. 7. When we select a data section corresponding to a figure, we can see the data itself in the lower part of the data select window. Furthermore, if you want to see the graph and push the graph button, a graphic window is also opened as Fig. 8. This graphic window has a scaling mechanism and a parallel moving mechanism. If users want to other excellent graphic software, he can use the graphic data itself which is saved as a new file.


Fig. 7 Data select window

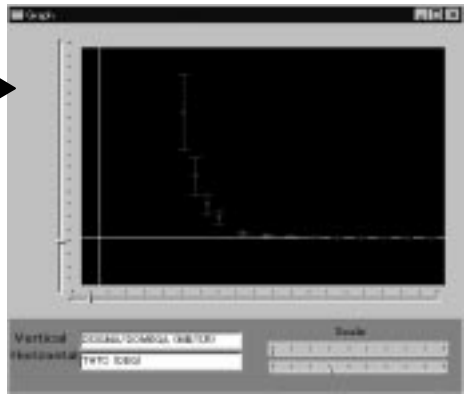

Fig. 8 Graphic window

## 4. Mechanism of searching new keyword

In this section, we show how to make a new window including a new keyword which is not contained in the original searching window. The original NRDF database has more than a hundred of keywords (items). The number of those will increase because keywords which are meaningful for researchers will change in the future and new concepts will be also given in some articles. The data structure of NRDF is made in considering the time dependence and the user's dependence of the meaningful keywords in articles. Then, if we make a database with the original data structure of NRDF, we have to do that we can also search new keywords of NRDF. In order to have such a mechanism, we make a window of making a new index file (Fig. 9). This window appears when we select "Make New Index" in the menu bar (Fig. 10). In the new window (Fig. 9), we input the keyword and select a code of NRDF, and push the left "Make Index" button. Then, the original window will change that of including the new keyword as seen in Fig. 11. The present example of Fig. 9-11 is that of the accelerator.


Fig. 9 Making a new file window

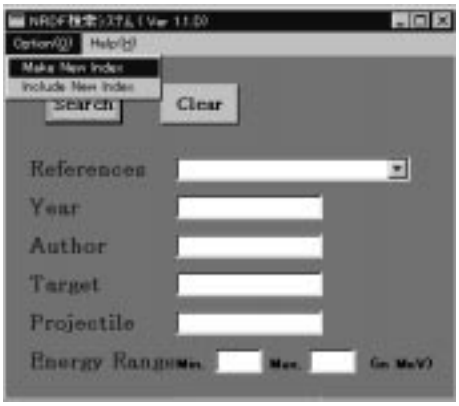


Fig. 10 Original searching window

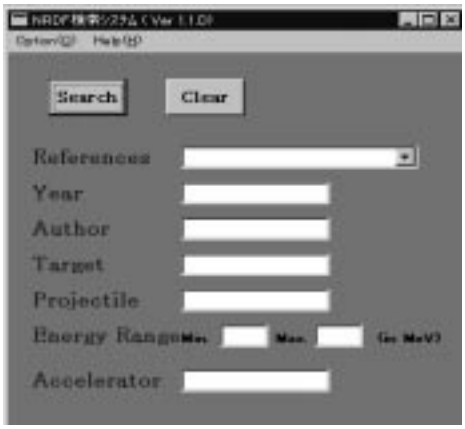


Fig. 11 New searching window

## 5. Summary and future problem

In this paper, we have described a new utility system, WinNRDF, for a nuclear charged particle reaction data of NRDF (Nuclear Reaction Data File) on a unified interface of Windows95, 98/NT. By using the system, we can easily search the experimental data of charged particle reactions in NRDF and see the graphic data on GUI. Furthermore, we developed a mechanism of making a new index of keywords by which we include the time developing character of the NRDF database. In the near future, we will want to apply the same interface to the EXFOR database. We show a preliminary version of WinEXFOR in Fig. 12.

Fig. 12 Overview of WinEXFOR (preliminary)

**Acknowledgment**

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**References**

[1] M. Togashi and H. Tanaka, Jour. Inf. Sci. **Vol.4**, No.5(1982), 213.

[2] Y. Tanaka, Inf. and Sof. Tec. **38** (1996), 201.