DEVELOPMENT OF LIBRARY MANAGEMENT SYSTEM USING MICRO-CDS/ISIS

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Library automation involves aspects of both information retrieval and housekeeping operations. CDS/ISIS, developed by UNESCO, has a number of attractive features which make it suitable for library automation. A prototype circulation control system, developed using CDS/ISIS (Version 2.33), has been reported. Features of three programs written in CDS/ISIS Pascal for circulation control system are described. The design and implementation of sample databases containing book records and user records are detailed. The prototype circulation control system performs satisfactorily with sample databases containing 3,005 book records and 207 user records respectively on a local area network (LAN). A system developed using CDS/ISIS Pascal for online help containing basic guidelines for searching by author, title, borrower and subject is also reported. Considering the specific network features of Version 3.0 of CDS/ISIS, concluded that the prototype system will work satisfactorily on a LAN.

INTRODUCTION

Library automation helps in providing efficient and quick library services; it is economical because it saves human labour, eliminates duplication of jobs, processes the data and performs many other operations of a library. Automation is more helpful in the routine jobs of a library. The size, nature and the specific needs of the library are to be considered first, which will then help to identify the areas to be automated.

The different areas of automation in libraries can be classified into two main groups as:

1. Housekeeping operations, viz., acquisition, circulation control, serials control, etc., and

2. Information retrieval services, viz., cataloguing, indexing, current awareness service (CAS), selective dissemination of information (SDI), retrospective search service, etc.

A suitable system for performing all library operations and services should include the facilities of both text retrieval and database management operations; for example, in a circulation control system information is to be extracted from more than one file, etc., which resembles to typical database management operations, whereas cataloguing, indexing, etc., exemplify typical text retrieval operations. Such systems are called library management systems. These systems are usually created on a relational database management framework which allows to handle more than one related data files which are particularly useful for a number of library housekeeping operations. These systems also provide some text retrieval features with particular reference to wide range of search facilities, etc.

Micro-CDS/ISIS has been designed by UNESCO as a text retrieval package, but it has some features which are comparable to database management systems. Based on the hypothesis that CDS/ISIS can be used to develop a library management system, a set of programs were developed using CDS/ISIS Pascal (Version 2.33). A prototype circulation control system and a system for online help were developed using these programs. This paper describes features of these systems.

MICRO-CDS/ISIS

CDS/ISIS is a menu-driven generalized Information Storage and Retrieval System designed specifically for computerized management of structured non-numerical databases. Although CDS/ISIS deals with text and words, and offers therefore many of the features normally found in text management packages, it does more than just text processing. This is because the text that CDS/ISIS processes is structured into data elements that one defines. CDS/ISIS is now used by about 120 institutions in its mainframe version and more than 5,000 in its mini-micro-version [1]. News related to CDS/ISIS can be found in the form of a regular column in
Field Definition Table (FDT) Data Base: BOOK

<table>
<thead>
<tr>
<th>Tag</th>
<th>Name</th>
<th>Len</th>
<th>Typ</th>
<th>Rep</th>
<th>Delimiters/Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Name of author(s)</td>
<td>200</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Title</td>
<td>300</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Edition</td>
<td>10</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Imprint</td>
<td>100</td>
<td>X</td>
<td></td>
<td>abc</td>
</tr>
<tr>
<td>10</td>
<td>Series</td>
<td>70</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>ISBN</td>
<td>20</td>
<td>X</td>
<td></td>
<td></td>
</tr>
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<td>10</td>
<td>X</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Class number</td>
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<td>X</td>
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<td>4</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Issue status</td>
<td>25</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Location</td>
<td>23</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Borrower number</td>
<td>12</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Borrower name</td>
<td>70</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Borrower department</td>
<td>30</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Date of issue</td>
<td>8</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Date of return</td>
<td>8</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Reservation1</td>
<td>12</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Reservation2</td>
<td>12</td>
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<td></td>
<td></td>
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<td>40</td>
<td>Document number</td>
<td>14</td>
<td>N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: FDT of the Book Database

Field Definition Table (FDT) Data Base: USER

<table>
<thead>
<tr>
<th>Tag</th>
<th>Name</th>
<th>Len</th>
<th>Typ</th>
<th>Rep</th>
<th>Delimiters/Pattern</th>
</tr>
</thead>
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<td>10</td>
<td>Name</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Expiry date</td>
<td>6</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Status</td>
<td>23</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Loan limit</td>
<td>5</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Department</td>
<td>52</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Total items borrowed</td>
<td>5</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Borrower number</td>
<td>12</td>
<td>N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2: FDT of the User Database
many journals. For example, news about CDS/ISIS is published in the UNISIST Newsletter, distributed without charge by UNESCO-PGI [2]. Hopkinson [3] has started a column about CDS/ISIS in the journal Information Development. Besemer [4] has also started a column about CDS/ISIS in the journal IAAALD Quarterly Bulletin.

REVIEW OF LITERATURE

A number of publications on different aspects of Mini-Micro-CDS/ISIS have come out over the last few years. Features of Micro-CDS/ISIS have been published in different sources [2,5,3,6,7,8,9,10]. Muckhich [11] compares different versions of CDS/ISIS. Lang [12] describes installation problems of micro-CDS/ISIS. There are two reports [13,14] on training course on CDS/ISIS. Goyal & Kumar [15] and Ximin [16] describe the conversion of DBF file into Micro-CDS/ISIS whereas Nowak & Trawinski [17] compare the application properties of Micro-CDS/ISIS and dBASE III Plus packages.

INSERM (Institut national de la sante’ et de la recherche medicale) offers a Questel Plus-CDS/ISIS interface for the use of SDI MEDLINE-diskettes under the mini-micro CDS/ISIS software package [18];

ACCESS is a new user-friendly interface, developed by Asian Institute of technology in Bangkok, fully compatible with Mini CDS/ISIS Version 2.3 [19];

European Organization for Nuclear Research (CERN) has developed, through international cooperation, a High Energy Physics (HEP) Preprints Bibliographic Database (PREP) which is indispensable source of current information for HEP. Micro PREP, based on Mini-micro CDS/ISIS, has been developed to facilitate the participation from less developed countries [20]. Gupta [21], Choudhury [22], Torocsik and Fekete [23], Kasper [24], Puntodewo [25], Harirahan and Rao [26], Mittal [27] and Novak [28] describe automated indexing using CDS/ISIS, hyphenated and numeric words indexing using CDS/ISIS, an application of CDS/ISIS in the Science Library of the Bigal Pharmaceutical works. The registration of library users based on CDS/ISIS, the creation of map catalogue using CDS/ISIS, design and the printing of the Union Catalogue of Seminar and Conference Proceedings, creation of subject index to NUCSSI (National Union Catalogue of Scientific Serials in India) database using CDS/ISIS and the use of Micro-CDS/ISIS database as an OPAC.

A number of databases in different subject fields are designed using CDS/ISIS, i.e. a database of a directory of Asian mycorrhizologists [29], Tata Energy Research Institute’s (India) database [30], National Index of Translations database [31] user friendly bibliographic database for cement and building materials [32]. CINTI (Central Institute for Scientific and Technical Information) in Sofia, has developed a database containing English bibliographic and reference information on Bulgarian scientific medical literature, using Mini-micro CDS/ISIS software [33]. Treolar [34] describes a database containing plant information using CDS/ISIS.

DESIDOC software team has developed a library automation package, called SANJAY, using CDS/ISIS, Version 2.3 [35]. The package can be used for normal information retrieval operations like cataloguing, CAS, etc., as well as for house-keeping operations, viz. acquisition and circulation control. The package has been designed to work in a library with medium size collections and users.

DISTINCT FEATURES OF CDS/ISIS

The text that CDS/ISIS processes is structured into data elements that the user defines. However, the unique characteristic of CDS/ISIS is that it is specifically designed to handle fields of variable length. Thus it allows an optimal utilisation of the disk storage and also a complete freedom in defining the maximum length of each field. Another unique feature of CDS/ISIS is that it allows linking of different records of a database. For example, the REF function is a device which allows to gather data which is stored in different records in the database, and appears to the user as if stored in the same record. CDS/ISIS allows data independence, for example, users can build different application programs using data from different databases without having the database structure altered for each application. CDS/ISIS makes provision for data security; users’ access to a database can be restricted by using passwords. CDS/ISIS has the following merits which make it more attractive:

- It is available free of charge;
- It runs on a wide range of micros from IBM PC/XTs upwards;
- Version 2.33 can be mounted on Local Network (LAN), as has been done in the Department of Information Studies, University of Sheffield, using Novell Netware Systems;
- It allows 16 millions records in a database;
- Menu jump keys are provided to select
<table>
<thead>
<tr>
<th>Service ISISENT</th>
<th>Data Entry Services</th>
<th>Menu EXE1</th>
</tr>
</thead>
<tbody>
<tr>
<td>L - Change dialogue language</td>
<td>L - Change dialogue language</td>
<td></td>
</tr>
<tr>
<td>W - Select another worksheet</td>
<td>B - Browse master file</td>
<td></td>
</tr>
<tr>
<td>N - Create new record</td>
<td>T - Display terms dictionary</td>
<td></td>
</tr>
<tr>
<td>E - Edit record (or range)</td>
<td>S - Search formulation</td>
<td></td>
</tr>
<tr>
<td>R - Edit last search results</td>
<td>D - Display search results</td>
<td></td>
</tr>
<tr>
<td>D - Define default values</td>
<td>G - Execute previous search</td>
<td></td>
</tr>
<tr>
<td>P - Recall last record modified</td>
<td>F - Change display format</td>
<td></td>
</tr>
<tr>
<td>C - Clear default values</td>
<td>R - Recall query formulation</td>
<td></td>
</tr>
<tr>
<td>I - Issue of documents</td>
<td>P - Save search results</td>
<td></td>
</tr>
<tr>
<td>T - Return of documents</td>
<td>H - Online help</td>
<td></td>
</tr>
<tr>
<td>V - Reservation of documents</td>
<td>Q - Issue/return query</td>
<td></td>
</tr>
<tr>
<td>X - Exit</td>
<td>X - Exit</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: Modified Data Entry Services Menu

<table>
<thead>
<tr>
<th>Service ISISRET</th>
<th>Information Retrieval Services</th>
<th>Menu EXGEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>L - Change dialogue language</td>
<td>L - Change dialogue language</td>
<td></td>
</tr>
<tr>
<td>B - Browse master file</td>
<td>B - Browse master file</td>
<td></td>
</tr>
<tr>
<td>T - Display terms dictionary</td>
<td>T - Display terms dictionary</td>
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</tr>
<tr>
<td>S - Search formulation</td>
<td>S - Search formulation</td>
<td></td>
</tr>
<tr>
<td>D - Display search results</td>
<td>D - Display search results</td>
<td></td>
</tr>
<tr>
<td>G - Execute previous search</td>
<td>G - Execute previous search</td>
<td></td>
</tr>
<tr>
<td>F - Change display format</td>
<td>F - Change display format</td>
<td></td>
</tr>
<tr>
<td>R - Recall query formulation</td>
<td>R - Recall query formulation</td>
<td></td>
</tr>
<tr>
<td>P - Save search results</td>
<td>P - Save search results</td>
<td></td>
</tr>
<tr>
<td>H - Online help</td>
<td>H - Online help</td>
<td></td>
</tr>
<tr>
<td>Q - Issue/return query</td>
<td>Q - Issue/return query</td>
<td></td>
</tr>
<tr>
<td>X - Exit</td>
<td>X - Exit</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4: Modified Information Retrieval Services Menu
DEVELOPMENT OF LIBRARY MANAGEMENT SYSTEM

- directly the most frequently needed functions;
- When a menu is displayed, it shows the database status information containing name of the currently selected database, display format and worksheet as well as the total number of records available in the database;
- It has multi-lingual facilities;
- It has the Advanced Programming Service which can be used to write a program, using CDS/ISIS Pascal, for specific requirements;
- It has provisions for redesigning the system menus to suit the local needs;
- User-defined display format and print format are available;
- A particular or a range of record(s) can be browsed; term dictionary can be displayed for choosing search terms, etc.

The Prototype Circulation Control System

In a circulation control system, information from two types of records, viz. documents and users, are required. In order to make the circulation control system efficient, prompt access to desired records is necessary. The master file structure in CDS/ISIS facilitates easy access to a given record.

Features of Sample Databases

There are two options for creating databases in the context of circulation control system - two databases can be created, one each for user and document records, or records containing information on users and documents can be kept in one sequence in a database. However, creation of two separate databases seem to be more useful for many reasons, some of which are:

- Owing to the relatively smaller size of both the databases, file handling is relatively easier;
- each database can be used for different purposes without having to be concerned with the other. For example, the 'book database' can be used for different purposes like information retrieval, circulation control, acquisition, etc.; the 'user database' can be used for CAS, SDI, etc., as well as for circulation control.
- the same software for circulation can be used for the central library as for branch or departmental libraries, wherever they exist.

In India this is quite common where users are allowed to borrow items from the university central library, while they can also borrow items from their own departmental library having a separate collection within the building of the department and severed by full-time library staff.

Keeping these points in view, two sample databases, viz. 'book database' and 'user database' have been created, containing 3,005 records and 207 records respectively, in CDS/ISIS. The generalized nature of CDS/ISIS allows databases to be defined for specific requirements. The sample databases were designed in accordance with the provisions laid down in the manual [36]. The fields chosen for both the sample database have been kept simple, while covering the most common features of document and user records. Figures 1 and 2 show fields corresponding to the book and user records respectively. However, the fields can be altered or extended according to a particular need.

A given record in a book database usually contains bibliographic information from field tag 2 through 24 and field tag 40 (Figure 1). Five fields, viz. date of issue, date of return, borrower number, borrower name, and borrower department have been kept to hold data for circulation control in the book record. In the book records, which constitute book database, field tags 2 to 24 and 40 will contain book data, whereas the other fields will remain empty. When a particular book is issued only then the above five fields are automatically filled in by the Issue Program (Section 3.2.1). Similarly, when the given book is returned, these five fields are automatically made empty by the Return Program (Section 3.2.2). Two other fields in the book database, viz. reservation1 and reservation2 contain data only when the given book is reserved by users. Therefore, as in case of the five other fields mentioned above, these two fields remain empty when book records are created. When a book is reserved, these fields are automatically filled in by the Reservation Program (Section 3.2.3).

Thus, user can easily determine, by displaying a given book record, whether it is on loan, to whom, when due, etc. When the given book is not on loan, the fields like date of issue, date of return, borrower number, borrower name, and borrower department will remain empty, and therefore, users can easily make out that it is available for loan.
DEVELOPMENT OF LIBRARY MANAGEMENT SYSTEMS

AUTHOR SEARCH

For searching by GIVEN AUTHOR (e.g., COX, JOHN) follow any of the search expressions given below:
(1) COX$/ (2) COX, JOHN (will retrieve records by JOHN COX)
(3) Use "Display Terms Dictionary" (option T) to select desired terms (move cursor and press '*)

For searching by MORE THAN ONE AUTHORS (e.g., BAILEY, J & KING, P) follow any of the search expressions given below:
(1) BAILEY, J*KING, P/ (2) Use "Display Terms Dictionary" (option T) to select desired terms (move cursor and press '*)

TITLE SEARCH

For searching by GIVEN TITLE (e.g., COMPUTERS AND COMMUNICATIONS) search expressions may be:
(1) comput$*commu$* (will retrieve records containing both the terms)
(2) comput$*commu$*/(4) (will retrieve records containing both the terms in the title)
(3) Use "Display Terms Dictionary (option T)" to select desired terms (move cursor and press '*)

For searching by GIVEN TITLE (e.g., INFORMATION TECHNOLOGY OR COMPUTERS) search expressions may be:
(1) (informa$*techn$)+(computers)/(4) (will retrieve records containing both the terms)
(2) Use "Display Terms Dictionary (option T)"; select terms INFORMATION, and TECHNOLOGY by pressing '*) and the term COMPUTERS by pressing '*)

N for next page or X to exit

Figure 5: Sample Help Screens
PROGRAMS FOR CIRCULATION CONTROL SYSTEM

CDS/ISIS Pascal is a programming language which is a subset of standard Pascal [36]. Three programs were written using CDS/ISIS Pascal for the prototype Circulation Control System. In writing the programs, the speed and accuracy of the resulting circulation control system were given major consideration.

In a library, issuing and returning functions normally take place on different desks. Hence, three different programs, viz. Issue Program, Return program and Reservation Program have been developed. These programs have been written keeping in view the functions involved in issuing, returning and reservation operations. All the three programs written for circulation control system have been introduced in the 'Data Entry Services' menu. Figure 3 shows the modified 'Data Entry Service' menu.

In a circulation control system, records should always provide current information. This can be accomplished by updating a record every time it is edited/ altered. CDS/ISIS allows updating of the master file records while keeping updating of the inverted file pending. CDS/ISIS also allows updating of the inverted file at any desired time interval - daily, weekly, etc. In designing the prototype circulation control system, it has been assumed that the inverted file will be updated daily.

The Issue Program

As soon as the Issue Program is activated, a prompt appears on the screen asking for the Borrower Number. Once the 'Borrower Number' is given, the system performs a number of operations. The system has to take a number of decisions before issuing an item to a borrower. Major functions of the program are :-

- Checks the validity of membership of the particular user; if the user is not a valid member, then the system ends producing the message "You are not a member any more";
- Checks the given user's status (e.g., student, staff, etc.) and simultaneously the user's loan limit;
- Determines the number of items already borrowed by the given borrower; if the borrower has borrowed up to his/her loan limit, the system produces the message

You have already borrowed *(then the number of items he/she has borrowed) documents*; "sorry, cannot borrow any more* and comes to an end.

If the user is a valid member and he/she has not reached loan limit, then the system asks for the Document Number. Here, the number of the document intended to be borrowed is to be given. The system then carries out the following functions:

- Checks the document status; if it is a reference item, it produces the message "sorry, reference document cannot be borrowed" and asks for another document number, if any;
- Checks the reservation fields; if the document is reserved, then it performs the following operations, otherwise it goes to the next step:
- Checks the first reservation field; if the given borrower number is found, then deletes the borrower number; otherwise
- Checks the second reservation field; if the given borrower number is found, then deletes the borrower number;

If the document is reserved and any of the two conditions is satisfied then the system goes to the next step, otherwise it produces a message "This document is reserved by some other borrower", and asks for another Document number;

- Determines the date of return considering loan status (overnight, normal, oneweek, etc.) of the document; for example, if the loan status of a document is 'normal', the system automatically assigns the return date by adding 15 days to the 'issue date' which is adapted from the operating system;
- Updates automatically the particular document record with the given borrower number, borrower name, borrower department, date of issue and date of return;

The above steps continue as long as the borrower intends to borrow documents and has not reached the loan limit. If the borrower does not intend to borrow any more items or reaches his loan limit, the system comes to an end. If the borrower reaches his loan limit, a message is produced: "You have already borrowed (the number
of items he has borrowed) documents; *sorry, cannot borrow any more*. The system updates automatically the particular borrower record with total items borrowed at this stage.

**The Return Program**

As soon as the Return Program is activated, a prompt appears on the screen asking for the Document Number. Once the ‘Document Number’ is given, the system performs the following operations.

- Checks whether the item is reserved by some other borrower; if so, produces the message ‘This item is reserved’, thereby reminding library staff to keep the document separate from other documents being returned;
- Updates automatically the document and borrower records by editing the concerned fields (i.e., borrower number, borrower name, borrower department, date of issue and date of return in the book record, and total items borrowed in the user records).

**The Reservation Program**

As soon as the Reservation Program is activated, the system asks for the Document Number and proceeds as follows:

- Checks the document number;
- Checks the given document’s first reservation field; if it is not empty, then checks the second reservation field;

1. If the record is retrieved and either of the reservation fields of the given document is blank, the system asks for the Borrower Number. Here, the number of the borrower who is going to reserve that particular document is to be given. Then the system updates automatically the particular document record with the given borrower number.

2. If the fields are not empty, then it produces the message ‘This document is already reserved by two users’.

**The Online Help System**

CDS/ISIS does not provide any online help for searching; users, therefore, face difficulties in conducting a proper search. Considering this problem, an online help system has been developed which provides basic guidelines for conducting searches.

The system for ‘Online help’ has been included in CDS/ISIS by introducing an option H (Online help) in the ‘Information Retrieval Services’ menu. Selection of the option H will lead users to the online help facilities. Figure 4 shows the modified ‘Information Retrieval Service’ menu.

Four key areas for search in libraries, viz. author, title, borrower, and subject have been identified. Four help screens have been designed which can be displayed on the screen, users can toggle from one to another by pressing <PgUp > and <PgDn > keys. Each screen contains a few simple search queries followed by necessary guidelines with examples for conducting search. Figure 5 represents two help screens.

**CDS/ISIS ON LOCAL AREA NETWORK**

CDS/ISIS Version 2.33 is not a network version, but it can be mounted on Local Area Network (LAN), as has been done in the Department of Information Studies, University of Sheffield, using Novell Netware Systems. As a result, more than one users can search a database simultaneously through ‘Information Retrieval Services’ menu. However, a given record cannot be opened for editing simultaneously by more than one users.

In a library, users will search for documents according to their particular needs, and they will want to know about ‘issue information’ (for example, whether the documents are available for issuing, or they have already been issued to other member; in the latter case who has borrowed the document, when is it due, and so on) of the documents. For example, if a user wants to borrow a document, he/she will try to know whether the particular document is on loan and if so, whether that document is already reserved or not, etc. In the network using Version 2.33 of CDS/ISIS, it is not possible to know about a document which has been issued/returned on the same day; the system will only show data up to that point when the inverted file was updated last time. The current information can only be obtained by displaying the record on the particular terminal where the document has been issued or returned. This is a problem of the system itself. It has been noticed that in order to get the correct data in all the participating terminals in a network, it is necessary to switch off all but one machines where inverted file is to be updated. In a library, this can only be done at the end of the day. Thus it is not possible for the users to get correct ‘issue informa-
tion', they can get information current up to the previous day, i.e., the last time the inverted file was updated. However, an attempt has been made, as a part of this study, to sort out this problem. The prototype circulation system creates a temporary file where it keeps records of daily transactions. In order to provide users with current information relating to issue status of a document, a program has been developed which can be called by choosing option Q (Issue/return query) from the 'Information Retrieval Services' menu (Figure 4). When a user asks about the issue status of a book by inputing the 'document number' in response to a prompt, the program looks into the temporary file first and if it does not find there, it then searches the main database (Book database); when the document is retrieved, the system displays data containing brief bibliographic details and issue status of the document.

Version 3.0 of CDS/ISIS provides full LAN support, i.e., simultaneous access to a given database by two or more users for both searching and data entry. Thus the problem stated above can be solved by using this version - current information relating to records which have been issued/returned on that particular day can be obtained by displaying the record (searching through keys like author, title, keywords, etc. whose value do not change during issue/return, as happen in case of keys like borrower number, date of issue, date of return, etc.) on any terminal in the network even if the inverted file update is pending. Successful searches can be conducted through keys like borrower number, date of return, etc., only when the inverted file is updated. Inverted file can be updated at the end of the day. Version 3.0 also allows to update the inverted file while other users are searching the database; however, this will slow down the search.

CONCLUSION

The prototype circulation control system performs satisfactorily in LAN environment where Version 2.33 has been mounted. However, no performance evaluation has yet been undertaken. It is believed that the prototype system will be more suitable for Version 3.0 of CDS/ISIS in a LAN; issue and return function can be performed simultaneously on any number of terminals. This will not affect information retrieval operations performed by users/staff. Experience shows that systems for other housekeeping operations, viz. acquisition, serials control, etc., can be developed using CDS/ISIS Pascal and these systems can be incorporated into a chosen menu in CDS/ISIS. Thus, a complete library management system can be developed using Micro-CDS/ISIS which will facilitate automation of both the information retrieval and housekeeping operations in libraries.

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