ILIRCS-- INTERACTIVE LIBRARY RESOURCES CIRCULATION SYSTEM

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Abstract

This paper introduces a software designed for an interactive library resources circulation system. It is implemented on a VAX/VMS 11-785 minicomputer using VAX DBMS INGRES. The system caters for 4 types of library materials: books, journals, manuals and magazines. The system has 4 modules: circulation, reservation, query and maintenance.

Loans, returns, renewals and retrievals are handled using automated circulation procedures. Overdue reminders and reservations on all the 4 types of library materials can be made through electronic mail. The whole system is designed in a menu-driven approach.

Keywords: database applications, information retrieval, library circulation system

1. INTRODUCTION

There are some library software systems available for large-scale libraries in the market. For instance, MINISIS [IRE75] on HP3000, ATLAS [GRA76] on Vax8800, URICA [AWA78] on Microdata and VTLS [HP75] on HP3000. We introduce a small-scale library circulation system, called ILIRCS (Interactive Library Resources Circulation System). It has been designed and implemented on the Vax/VMS 11-785 minicomputer using a relational DBMS [DATE86] INGRES interfacing with PASCAL [RT83], [RT84]. This software focuses on interactive electronic mail facility and office automation. It provides automated circulation functions of loans, returns, and renewals for the open section of a library on 4 types of library materials, books, magazines, journals and manuals.

Besides the circulation functions, the software also provides automated reservation and query services [NWS72]. A maintenance function has also been included to make the package independent and complete.

The overall purpose of the software is to improve:

(1) Productivity of human resources
(2) Efficiency through the reduction of manual procedures and faster retrieval of information.
(3) Reliability & accuracy of information through proper maintenance.

Specifically, the goals to be accomplished are:

(1) Automating circulation procedures i.e. loans, returns, renewals, collections of reserved materials.
(2) Reducing late returns of loans by sending reminders
(3) Allowing users to make reservations via electronic mail
(4) Providing users with easy query facilities
(5) Ensuring reliable information of library materials and their status, and of member details and status.

The following assumptions are relevant in the design of the system:

(1) Users have limited access to the database through a VAX account for purposes of query and reservation.
(2) Loans, renewals, returns and collections of reserved book / manual / journal must be done personally.
(3) Each member has a library membership card with a unique user identification number.
(4) Members of the library check their mail in their VAX accounts regularly.
(5) Only one copy of per issue of magazine or journal is purchased by the library.
(6) Multiple copies of a book or manual title can be purchased.

International Symposium on Database Systems for Advanced Applications
Seoul, Korea, April, 1989

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Also the policies incorporated into the system are:

(1) Overdue loans are not allowed to be renewed.
(2) Not more than 3 reservations are allowed per book/manual/journal.
(3) If a person doesn't claim a reserved book/manual/journal by 7 days, the book /manual/journal will be given to the next person on the reservation list.
(4) Blacklist codes are issued for each loan record.
(5) Fines are charged for late returns of the book/manual/journal/magazine on loan.
(6) Four categories of reminders
   -- 1st reminder for materials overdue for less than or equal to 7 days
   -- 2nd reminder for materials overdue for more than 1 week and less than or equal to 2 weeks
   -- 3rd reminder for materials overdue for more than 2 weeks
   -- general reminder for loan materials due in a week
(7) A release notice is sent to the first member on the reservation list of a book /manual/journal once it is available.

2. SYSTEM DESIGN

The overall logical dataflow diagram [GaSa79] consists of 3 main modules. (see Fig 1)

(1) Service to members
(2) Statistical reports
(3) Maintenance

The module "Service to members" can be subdivided into 5 smaller modules:

(1) query module
(2) reservation module
(3) loans and collection of reservations module
(4) returns and renewals module
(5) reminders and release notices module

2.1 Query Module

This module serves to answer member's queries via their VAX account. It handles queries on all four types of library materials, books, magazines, journals & manuals. (see Fig 2)

For the book query, the member can get the details and status of books under 3 categories:

1) Books written by author
2) Books under a subject
3) Books published by a certain publisher.

For each of the 3 categories, a list of authors or subjects or publishers are displayed respectively so that the member can pick out the desired author, subject or publisher. The book title under the category chosen is displayed. The details and status of a book can also be obtained.

The details of the book can be known through the query includes the title, authors, publisher, publication year and edition. The status of the book tells how many copies of the book exist on the shelf, the number of copies that are borrowed out and the number of members reserving the book. A list of the name of members and whether they are students, outsiders or staff, holding the book & reserving the book are next displayed.

The manual query, the members can get details and status of the manual by 2 categories:

(a) get manuals by publisher
(b) get manuals by machine.

The journal query and magazine query are similar in nature. Both the journal and magazine queries gets journals/magazine respectively by subject only since this is the only useful way in which journals and magazines can be retrieved.

2.2 Reservation Module

This module handles the following functions:

(1) Reservations of books, manuals and journals. Magazines are not allowed to be reserved.
(2) Displaying all of the reservations on a book, manual, or journal.
(3) Displaying all of a member's reservations for books, manuals or journals.

The above functions require the availability of a VAX terminal and account. Reservations on books, journals and manuals can only be placed provided:

(1) the book, journal, manual does not exist on the shelf, meaning that all copies have been borrowed out.
(2) the member has not placed a reservation for it already. In other words, he is not allowed to duplicate a reservation.
(3) the number of reservations made so far is less than three at any one time, i.e. only a maximum of three reservations can be made on a book, manual or journal.

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The function checking all reservations on a book, manual, or journal gives a list of all members, a maximum of three, who are reserving the particular title. It also tells if the member reserving it is a staff, student, or outsider.

The third function allows a member to check all of his reservations on a particular book, manual, or journal. He simply identifies himself by his userid. This allows a member to check if he has already made a reservation, and if so, which titles.

2.3 Loans & collection of reservations Module

This module handles two types of loans:
(1) borrowing from open shelf or (2) collecting reserved material that is now available.

For both types of loan, when a member borrows a book, manual, journal, or manual, the librarian uses the member's userid to check if the member's status is still valid (not suspended or expired). If it is still valid, the member's account is checked to see if he has exceeded his borrowing limit. A member is only allowed a certain number of loans, and according to the type of material, he is allowed a certain period of loan. The period of loan and number of loans allowed can be changed in the maintenance menu.

The due date for the loan will then be assigned and recorded in the loan material.

2.4 Returns and renewals Module

This module handles the returning of loans and renewals of loans. For each loan that is returned, if the loan is overdue, the overdue age of the loan is calculated and fines are charged in three stages. Holidays within the loan period are not considered.

If the total amount of fine exceeds the maximum fine, then the maximum fine is charged instead and the amount of fine charged is recorded in the loan record.

The fine rates are not fixed but can be changed when required in the maintenance module.

When a loan is returned, the system checks to see if the returned loan has been reserved by other members. If the loan is reserved by other members, no renewal of the loan is allowed. The book, journal, manual, or magazine is then set aside and taken note of so that a release notice can be sent to the next member on the reservation list.

2.5 Reminders and release notices Module

This module serves to send 2 types of reminders:
(1) a reminder for loans due in a week's time
(2) reminder for overdue loans:
(a) 1st reminder notice for loans less than or equal to one week overdue
(b) 2nd reminder notice for loans > 1 week old and less than or equal to 2 weeks
(c) 3rd reminder notice for loans > 2 weeks

Release notices are sent to notify the members that the book they have reserved are available and awaiting their collection.

Both the reminders and release notices are sent through the VAX mail facility. If a member has more than one loan that falls under a certain category of reminders, such loans will be grouped together into one reminder notice. Similarly for release notices.

2.6 Maintenance Module

This maintenance module handles the maintenance of the system. The various functions are:
(1) Changing of parameters which are used in other modules.
(2) Cleaning the loans file
(3) Updating of the book file
(4) Updating of the journal file
(5) Updating of the manual file
(6) Updating of the magazine file
(7) Updating of the membership file

Changing of parameters is of two types:
(a) System parameters such as the three fine rates, the number of days associated with each fine rate, and the password for entering the library circulation subsystem.
(b) Member parameters such as the book loan period, number of books allowed, manual loan period, journal loan period, magazine loan period of staff, students, and outsiders.

Updating of membership file includes:
(a) Changing the particulars of members such as the address, and the telephone number.
(b) Adding new members to the library.
(c) Updating the status of members to expire for those whose membership has expired.

Updating of book, journal, manual, and magazine files includes the following functions:
(a) Changing the details such as publisher address, author name and subject.
(b) Adding new books or manuals, or journals or magazines.

(c) Adding additional copies to existing titles.

(d) Handling losses of books, manuals, magazines and journals.

3. IMPLEMENTATION

Implementation involves the development of application programs, conversion and loading of database and testing of the system for completeness and accuracy.

Due to time and manpower constraints, we could only implement the following subsystems:

3.1 Query Services

Anybody who has access to a VAX account can retrieve information on books, magazines, manuals or journals, their details and status. Relevant information will be displayed on the terminal screen.

3.2 Reservation Services

Reservations can be made and checked by library members who have access to a VAX account. A release notice is sent to members via electronic mail once the book, magazine, manual, or journal becomes available.

3.3 Circulation Control

Loans, collection of reservations, returns and renewals must be done personally at the library counter. Fines are charged and renewals disallowed for late return of loans. Reminders are sent to members via electronic mail both when the due-date of the loan approaches and when the loan is overdue.

3.4 Maintenance

This caters for adding new member, book, journal, magazine and manual details into the relevant files, updating of details that have been wrongly entered and noting membership expiry or loss of books, manuals, magazines, and journals. Such functions are necessary to keep files neat and information up to date.

Production of statistical reports has not been implemented, not because we view it to be of little importance but because of time constraints.

4. SECURITY CONSIDERATIONS

The security of any system can never be neglected. As such, the following security measures have been implemented:

(a) Data Verification: As data are keyed into the computer from a source document, the data are displayed on the screen for visual verification. In addition, a check is done internally on certain fields for reasonableness and format. Any errors are indicated by appropriate error messages and the user will be prompted to make the necessary changes.

(b) Confirmation Checks: When making vital changes to the database, such as in the handling of lost books in the maintenance program, confirmations are required from the user. This serves to double check before updating the database.

(c) Validity Checks: Validating checks are done on the user id’s, book id’s, manual id’s, journal id’s, magazine id’s and bibliographic numbers of books, manuals, journals, and magazines when they are entered in response to such prompts. Such checks ensure that they exist and are still valid.

(d) Password Authorization: To get access to the Library Circulation System, the user has to enter a password. When the user enters the correct password, he will gain access to the system.

In addition to the above security measures that we have implemented, the VAX computer system and the system maintenance staff are providing the following securities:

(a) Password Authorization: This password authorization refers to that which is required on entering the VAX system. (This is different from the one we have implemented in that the one we implemented gets you into the Library Circulation System.) Authorized users are issued a unique username and password. These passwords are periodically re-issued and old ones are removed from the file of valid users in order to ensure reliability. Thus, there are 2 levels of password authorization before one can enter the Library Circulation System.

(b) Log: This is a security technique used to keep track of all users who have accessed the system. Every time an access or modification is made to the system, an entry which includes the date, time, userid, program name, location and access type is generated in the log. Periodically, the log is examined for suspicious activity.

(c) File Backup: A disk dump of the database is currently made once a week so that in the event of any disaster, the database can be reloaded.

Although the above preventive and security measures are implemented, there is still a need to improve on the security system. We hereby propose that the following security measures be observed and preferably implemented too.
(a) **File Backup**: The file backup that is currently done on a weekly basis should and must be extended to one done on a daily basis as this will recover more data in the case of any failure.

(b) **Physical security against theft and other natural disasters.**

5. **SCREEN DESIGN**

The software is menu-driven and the different operations available are:

1. desk operations (circulation functions such as loans, returns, renewals & collection of reservations). (see Fig 3)
2. making of query or reservations. (see Fig 4)
3. handling maintenance functions. (see Fig 5)

5.1 **DESK OPERATIONS**

For the loans option, the system displays the borrowing status of a member on entering his identification number. (see Fig 6) On entering the accession number of the loan material, the title of the loan material is displayed for confirmation and after the confirmation, the date borrowed and the due date are displayed on the screen.

5.2 **QUERY**

The query option allows queries on books, journals, manuals and magazines. The book query menu (see Fig 7) allows retrieval by author, subject and publisher.

To get all books under a subject, a list of available subjects is displayed. The user enters the subject code of the desired subject and the list of books under the particular subject is displayed (see Fig 8). The details and status of a book can also be obtained (see Fig 9).

5.3 **RESERVATION**

The reservation menu allows the user to place a reservation, to check the reservations on any book, journal or manual and to check all of his reservations (see fig 10).

To place a reservation on a book, the details of the desired book is displayed for confirmation before placing any reservation (see Fig 11). After confirmation, the reservation will be placed and recorded.

5.4 **MAINTENANCE**

The maintenance menu (see Fig 5) offers a variety of maintenance operations. Updating the book file allows changing of details, adding new book titles to the catalog, handling losses and adding of additional copies to an existing title.

6. **CONCLUSION**

This library software package is adequate for automating a library resources circulation system. It provides information retrieval on 4 types of library materials: books, journals, manuals and magazines. The library database is created and managed by the database management system INGRES on Vax 11-785. Functions such as loans, returns, renewals and reminders are handled interactively through electronic mail.

The achievement of the electronic mail approach includes:

1. to increase productivity of human resources
2. to improve efficiency of library resources circulation
3. to provide office automation on interactive query process

6. **REFERENCES**

Fig 1 OVERALL DFD.

Fig 2 STRUCTURED CHART FOR QUERY MODULE.