# TECHNICAL COMMUNICATIONS

## REPORTS—LIBRARY PROJECTS AND ACTIVITIES

### Ohio State University Health Sciences Library Uses Automated Bookstack System

The new Health Sciences Library at Ohio State University began serving students in May 1973 with some of the most advanced features in any library in the country. It contains an automated bookstack system to locate and file books, and is the fourth library in the country to have the system (Randtriever, manufactured by Remington Rand Corp.), says Jo Ann Johnson, director of the Health Sciences Library.

"The bookstack system will find and deliver a book via a conveyor belt in about a minute," Miss Johnson said. The chief advantages of the system are that it saves space and is speedy and accurate, she pointed out.

"The book stacks in the new library take up about 15 percent of the total space while in most libraries the stacks take 40 to 60 percent of the space," Miss Johnson said.

Aisles in the stacks are narrow, about 15 inches, and the shelves rise through two stories of the library—twenty-two feet in all, she said. The library has a capacity of 175,000 volumes.

The accuracy of the system will reduce the problem of misfiling. Also, book theft should dwindle because the stacks will be closed to users, she said.

The library is connected with the computerized circulation system of the university library, made up of a main library and twenty-three branch libraries. This circulation system is the first of its type in the country and permits library users to place telephone calls to learn titles and authors and to charge out books.

Other features of the modern library will include a computer-assisted instruction area to be completed later, and connections to MEDLINE, the international computerized information system of medical journals.

Miss Johnson explained that the automated bookstack system works like this: A library staff member sends instructions via a terminal to an electronic device in an aisle. The device travels on vertical and horizontal columns in the aisles. It picks out a small bin of books containing the requested one, then travels to the end of the aisle and places it on a conveyor belt. At the terminal, the staff member selects the requested book from the bin, usually containing about eight volumes, and sends the bin back for refiling.

A glass window permits observation of the system.

### University of California, Berkeley Serials Key Word Index

The University of California, Berkeley, General Library has published a Serials Key Word Index to titles of 45,741 serials. The computer-produced index is the largest of a fairly new variety of key word indexes, covering titles of serials rather than articles. The 360/Assembler programs written by the Library Systems Office include a number of innovations.

Berkeley serial records are stored in MARC format, upper-lower case, capitalized by citation rather than catalog standards. The key word extract program ignores prepositions and conjunctions, etc. (which are not capitalized); treats certain multiword terms (La Paz, United Nations) as single words; prepares a library-standard sorting key (with U.S. filing as UNITED STATES, & filing as AND, and distinction made between two types of hyphenation); and does no stop-list searching or other searching for excluded words.

Key lines are sorted by key word; all other processing is based on an alphabetic file of key words attached to main entries. Thus, vocabulary control (forced interfiling of abbreviations, synonyms, cognates, etc.—not heavily used in this edition) is a fast, simple runtime operation, changing certain key words (on a single

alphabetic pass) and generating "see" references. Exclusion of low-content words is also a fast, simple runtime operation, done in the printing program, allowing excluded-word entries to print if the word occurs first in either title or author, and generating an explanatory note under each excluded key word.

Listings are main-entry, alphabetic under key word groups, with brief holdings, campus location, and call number where available. The key word appears in all capital letters within each entry, and redundant entries are collapsed—that is, if a word appears more than once in an entry, each occurrence is capitalized, but the entry is only listed once under the key word.

The first edition limits entries to 98 characters and holdings to 13 characters; the programs have since been revised to allow up to 193 character entries and up to 45 characters of holdings. Both versions

of the programs retain as much runtime flexibility as possible, while maintaining extremely low running time.

The first edition, including mostly non-document currently-received titles, is photocomposed in a 6-point slab-serif type and published in three paperbound volumes. Copies are available for $60 a set from Systems Office, Main Library, University of California, Berkeley, CA 94720. —*Walt Crawford, University of California, Berkeley*

# PROGRAMMING AND COMPUTERS

## *PLEA, a PL/1 Efficiency Analyzer*

PL/1 users find that the language offers infinite ways to invoke inefficient code. Partial defense is provided by careful manual reading. Another, and very

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                    PLEA EXTRACTION ANALYSIS                        PAGE   2

     STATEMENT TRAP COUNTS FOR    MAIN   PROCEDURE  TESTIME, OFFSET 000368 IN LOAD MODULE.

         STMT    TRAP COUNT    % THIS PRCC  % TOTAL           TOTAL PERCENTAGE GRAPH, * = 1%

            5         3          0.2         0.2
            6        86          6.1         6.1    ******
            7       141          9.6         9.6    **********
            8        69          4.7         4.7    ****
            9         6          0.4         0.4
           10        13          0.8         0.8
           11         4          0.2         0.2
           12        32          2.1         2.1    **
           13        86          5.8         5.8    *****
           14         2          0.1         0.1
           15        21          1.4         1.4    *
           18         4          0.2         0.2
           19         9          0.6         0.6
           20         2          0.1         0.1
           21       163         11.1        11.1    ***********
           22        25          1.7         1.7    *
           23         9          0.6         0.6
           25        14          0.9         0.9
           26         5          0.3         0.3
           27       114          7.8         7.8    ********
           28         7          0.4         0.4
           30         3          0.2         0.2
           33         2          0.1         0.1
           34        10          0.6         0.6
           37         3          0.2         0.2
           38       281         19.4        19.4    ******************
           39         6          0.4         0.4
           40         2          0.1         0.1
           41        17          1.1         1.1    *
           42         5          0.3         0.3
           43         2          0.1         0.1
           44         5          0.3         0.3
           45        17          1.1         1.1    *
           46        54          3.7         3.7    ***
           47        50          3.4         3.4    ***
           48        57          3.9         3.9    ***
           49        17          1.1         1.1    *
           51        28          1.9         1.9    *
           52         4          0.2         0.2
           53        14          1.0         1.0    *
           59        38          2.6         2.6    **
           60        15          1.0         1.0    *

     INTERRUPTS FOR THIS PROC         1456
     NO STATEMENT NUMBER AVAILABLE       0

     THIS PROC CONSUMED 100.0 PERCENT OF THE TOTAL CPU TIME
```

*Fig. 1*

easy-to-use, preventive for runtime excesses is early test compilation using the PLEA (PL/I Extraction Analysis) procedure, available for the PL/1F and Optimizing compilers. PLEA's output is a sampling analysis of the percentage of total GO step time used by each program statement. Output includes histograms for each procedure, with statement numbers on the y axis and percentage time on the x axis (Figure 1). Use of PLEA does not require insertion of special code or timing points in the user's program.

PLEA may also be used to predict the relative efficiency of a variety of PL/1 statement blocks intended to accomplish the same task. PLEA was used to test the proportional time requirements for a series of table search statements for the University of California, San Francisco Library (Figure 2). This test showed large efficiency differentials can be at least as great as 75 to 1 for two different statements performing the same task. The particular worst case statement (FLAG1=ANY(A= B) was omitted from the final run in order

```
/* HOW MUCH TIME DOES IT TAKE TO FIND ARG IN ARRAY & SET FLAG TO 1 */

TESTIME: PROC OPTIONS (MAIN) REORDER;

DCL FLAG1 BIT(1) STATIC INIT ('0'B), FLAG2 FIXED BINARY(15) STATIC INIT(0),
    (TOP, BOT) FIXED BIN(31) STATIC, A(0:9) CHAR(1) STATIC, B CHAR(1) INIT
    ('F') STATIC;

          STRING (A) = 'ABCDEFGHIJ';                      % Total
                .                                          Time     No.Traps
                .
/*TEST1*/ DO J = 0 TO 9 WHILE ( ¬ FLAG1);                 20.4      299
          FLAG1=B=A(J); END;

/*TEST2*/ DO J = 0 TO 9;                                  10.1      151
          IF B = A(J)
               THEN DO; FLAG1 = '1'B; GO TO ENDTEST; END;
               ELSE; END;
          ENDTEST: ...

/*TEST3*/ DO J = 1 TO 10 WHILE (B ¬= A(J-1));             13.4      197
          END; IF J < 11 THEN FLAG1 = '1'B; ELSE;

/*TEST4*/ FLAG2 = INDEX (STRING(A),B);                    8.2       121
          IF FLAG2 > 0 THEN FLAG1 = '1'B; ELSE;

/*TEST5*/ FLAG2 = INDEX ('ABCDEFGHIJ',B);                 0.7       12
          IF FLAG2 > 0 THEN FLAG1 = '1'B; ELSE;

/*TEST6*/ FLAG2 = VERIFY(B, STRING(A)) + 1;               19.4      283

/*TEST7*/ FLAG2 = VERIFY(B, 'ABCDEFGHIJ') + 1;            1.1       17

/*TEST8*/ TOP = 10;BOT = -1; DO WHILE(TOP>BOT+1);         15.6      232
          J = (TOP + BOT) / 2;
          IF B > A(J) THEN BOT = J; ELSE TOP = J; END;
          IF TOP > 10 | B = A(TOP)
             THEN; /*NOT FOUND*/ ELSE FLAG1 = '1'B;
                                                          ____      ____
                                                          88.9      1312
                                       <Test Overhead>     9.4       146
                                             Totals       98.3*     1458
```

(°)—Truncation error.

*Fig. 2. Each test repeated 2000 times with Argument B in Array and 2000 times with Argument B not in Array. Sampling interrupt interval was .00 seconds.*

to get a reasonable sampling of the remaining blocks. A comparative run showed that the optimization overhead was charged to the proper statement groups, but pragmatists will note that the problem setup was biased against the binary search solution.

However, using the trap totals from Tests 2, 3, and 4, the 50 percent Probability Test indicates that the probability of no significant difference between methods 2 and 4 is more than 5 percent; the probability of no significant time difference between methods 2 and 3 is more than 1 percent.

PLEA is available at a program distribution fee of $25 from the SHARE Program Library Agency, Triangle University Computer Center, P.O. Box 12076, Research Triangle Park, NC 27709.

Thanks are due Dr. David Gomberg, University of California, San Francisco Computer Center, for most of the runtime and several of the statements used in the test.—*Justine Roberts, Systems Librarian, UC—San Francisco*

# INPUT

To the Editor:

I am writing to you concerning the article which occurred in the September 1972 issue of *Journal of Library Automation* entitled "The Shared Cataloging System of the Ohio College Library Center."

I also note that this issue of your journal, even though dated September 1972 was not received until July of 1973 by this library, and, indeed, it was a timely arrival for at the present time the Northwest Association of Private Colleges and Universities is investigating the feasibility of seeking service from the OCLC for some of its library requirements. However, in talking with Mr. Kilgour and his associates at ALA this summer it was exceedingly difficult to get a complete cost picture of participation in the OCLC and to this date we have not been able to get a complete cost breakdown obligation.

In this regard, this article was extremely interesting and I requested one of my staff members to do a careful analysis of the cost aspects of the OCLC services. I am attaching this analysis for your interest and perhaps it will be of suitable pertinence for the readership of your journal. Certainly I, and other of my colleagues at this university and in NAPCU would more than be interested in response by Mr. Kilgour and his associates.

*Desmond Taylor*
*Library Director*
*Collins Memorial Library*
*University of Puget Sound*
*Tacoma, Washington*

## AN ANALYSIS

*SUMMARY:*

"Average cost per card for 529,893 catalog cards in finished form and alphabetized for filing was 6.57¢ each . . . the system is easy to use, efficient, reliable, and cost beneficial. An off-line catalog card production system based on a file of MARC II records was activated a year before the on-line system." Requests were batched weekly. Library of Congress card numbers were keypunched onto cards for searching. Seventy percent were found the first search. "Members could specify a recycling period of from one to thirty-six weeks . . . before unfulfilled requests were returned." Lowest price in lots of one-half million Permalife cards was $8.01 per thousand. CPA's checked the system and found that all direct costs were included in 6.57¢ cost. No mention is made of the preexisting cataloging systems—one must assume cataloging each title and typing each card, with no use of either LC catalogs, proof sheets, or xerox. Formatting costs for each card (their assumption of six cards per set) is 2.27¢ each; printing is .33¢ each; thus each card is 2.6¢, and each is 15.6¢ per set. They were unable to devise a procedure to implement a feature written into the program—the ability to delete a line on the LC card; thus they had to erase and type manually upon receipt of a set. Shortest possible response time was ten days; the minimum average was two weeks for items found on the

first try (70 percent). Hardware costs for the off-line system were not given, but they used four different computers in the OSU center for their work.

## CONCLUSION:

On-line allows input by member libraries. Listed monthly lease of hardware is $21,421.00 monthly; (actual costs were $16,317.00 due to various discounts). Each terminal was $175.00 per month. Operators can work at the rate of twelve titles per hour.

| | |
|---|---:|
| Seventy terminals at | |
| $175.00 per month | $12,250.00 |
| Hardware rental | 21,421.00 |
| Twenty thousand sets of | |
| Permalife stock | 961.00 |
| | $34,632.00 |

$34,632.00 divided by 20,000 titles per month—$1.73 per card set.

Personnel layoffs through attrition did not compensate for the burden of the on-line system. Included in the cost was the rental of all hardware, cathode ray tube terminals, and Permalife stock. This was felt justified, because there is no other tangible outlet to the system; when interlibrary loan is included in the results, then costs will go down roughly 10 percent. Not included in the cost of $1.73 per set were:

1. Salaries and wages of center personnel
2. Building rental and other costs
3. Programming costs
4. Keypunching cost for the card input
5. Rental of phone lines for the terminals
6. Cost of MARC tapes.

*Omitted cost/income factor:* Annual dues charge for participation in OCLC.
(Prepared by Daniel Bischel, University of Puget Sound Library)

To the Editor:

As the article about which Mr. Taylor has written to you states, the principal substantive objective of the OCLC system is to increase availability of library resources to users of participating libraries. Products of the present subsystem are an on-line union catalog currently containing over one and a quarter million location listings as well as the catalog of each library from initial time of participation (some libraries are retrospectively converting their shelflists and one has completed the task), and catalog cards in final form alphabetized for filing in specific catalogs in specific libraries. Cataloging done on the system produces the union catalog and catalog cards.

Libraries use the system for searching (Dartmouth has reduced its searching staff from three to one fulltime position and seven to five parttime), for obtaining information, for ordering, for book selection (an expensive work with little expected use is not purchased if a nearby library already possesses it), for locating works for interlibrary loan, and for cataloging (Ohio University has reduced eight positions from its budget while increasing cataloging from 25,000 to 39,000 in a year). About 70 percent of the time, cataloging data is found in the system.

An Ohio library pays for all types of use of the system on the basis of the number of records used for the first time for catalog production that are not records input by the cataloging library; there is no charge if the cataloging library input the record. The estimated cost for the present year for system use by an Ohio library is $2.02 per record used for the first time and not input by the library; this fee pays for the terminals, telephone lines, computer, and all other OCLC expenditures except grant-supported research and development. A library in a region outside of Ohio pays a slightly larger fee because of increased telephone charges. If a region elects to pay its own telephone charges and purchase its own terminals, the charge per first-time use is 87.5¢. The only other payment a library makes is 3.4¢ per catalog card.

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