Improvements in the Coupling of SDI System Output with Document Delivery Systems

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A brief review is given of approaches used to couple SDI system output to the supporting document delivery systems. A coupling system is described which has been implemented for the nine campuses of the University of California to automatically annotate citations retrieved from a central SDI service with location and call number information. Many of the computer-printed citations sent to each UC user are annotated to show the one or more library locations and call numbers for those serial titles on that user's campus. In the event that a cited title is not held on a user's campus, the citations are annotated to identify the nearest UC library that has that title. The location-code segment of the SDI system has been in operation since mid-1974 for over 1500 profiles, and five data bases, and for users on nine UC campuses. This is the first instance of this kind of coupling on a operational basis for a large, multifile, geographically dispersed multilibrary system.

INTRODUCTION

The developers and operators of almost all computer-based SDI systems have generally kept a clear separation between the SDI systems and the document delivery systems. In most instances, the SDI system was intended only to furnish the user with citations to relevant publications; it was generally felt that it was somebody else's responsibility to get the publications into the hands of the patron. There have been rather distinct boundaries and interfaces between these SDI and document delivery systems, and this has been disadvantageous to patrons of the SDI services. The discontinuity between these systems need not be so pronounced, and this report discusses some ways to more closely couple the two systems for the benefit of the SDI patron.

To date, where SDI systems have been coupled with document delivery systems, it has been done in the following general ways:

Hard copy SDI
- Inclusions in the citation of a call number for a single-library system, or a report accession number for a major report distribution center
- Design of output citations to be turn-around order documents for a single source supplier

Examples of the first approach are: (1) the early experiments at IBM to distribute complete copies of the cited reports instead of the citations; (2) systems with manual intervention to send a photocopy of an abstract or title page in lieu of the computer-printed citation; (3) microfiche distribution systems such as that operated by NTIS with individual interest profiles that automatically distribute microfiche copies of the selected publications in lieu of citations.

In the second approach, the tape supplier includes in the source citation an annotation to identify some single source of supply for the publication. Examples of this approach are: (1) in-house report files; (2) CAIN data base with NAL call numbers; (3) ERIC and NTIS data bases with ED or PB numbers for ordering from their corresponding on-demand report production facilities.

Examples of the third approach are: (1) the turn-around citation cards that were used in some of the earliest SDI systems and continue to be used today; (2) the citation printouts from several SDI service bureaus such as ISI or ABI that can be sent back to the service bureau as order slips for the cited publications.

No examples have been found, other than the approach described later in this report, of a coupling system in operation anywhere for a geographically dispersed, multilibrary document delivery system supporting multiple data bases and a large number of users.

The University of California currently operates a major SDI service primarily for the benefit of UC faculty, staff, and students. This service, operated by the Center for Information Services, is a university-wide activity that is located on the UCLA campus.[1] As of April 1975 it was providing SDI service with over 3500 search requests (profile/data base combinations) running on over 1500 profiles for nearly 1300 unique users served by almost 200 profile analysts at 43 locations. The system is running with the ERIC, *CA Condensates*, *BIOSIS Previews*, SSCI, and CAIN data bases. Most of the UC users are located on the nine UC campuses, although a few are located at some off-campus locations.

The UC campus library systems vary in their degree of centralization, but typically several branch libraries exist on each campus. As an extreme case, the Berkeley campus has over 20 affiliated branch libraries as part of the campus library system, plus an additional 20 or more unaffiliated libraries. In all, the total UC library system resources potentially available by policy to any UC person represent over 100 separate library collections and locations.

The general objective of the system described in this report was to more effectively couple our central SDI system with our significant but widely distributed library resources. We concentrated our attention on an SDI system, but all the arguments and methods could be applied equally well to retrospective search systems in cases where there are identifiable clusters of users in groups large enough to make the location file building effort worthwhile.

Our general approach was to annotate the output citations with library location and call number information for each user's location. The most obvious reasons for providing this information with each printed citation are:

1. Each individual patron (or a designated representative such as a research assistant) is saved a considerable amount of time and effort in determining where a copy of a cited publication can be obtained, and obtaining the call number of the publication so that it can be physically retrieved and examined.
2. Because of the form of entry of the citation, or lack of familiarity with the practices of the supporting libraries, some patrons may not be able to locate some publications (particularly foreign language titles) that are actually held in their libraries. Our approach minimizes such problems.
3. By calling several campus library locations to the attention of the patron, better use can be made of available local resources.
4. The recipient's attention might be called to other

supporting libraries that had not been previously known to the patron.
5. The system can provide some help to the user or to the campus interlibrary loan operation in the event that a cited publication is not held by a library on the user's campus.
6. The system can lead to a better utilization and awareness of the total university-wide library resources.
7. Continuing studies of each library's collection adequacy and the extent of support and performance of the document delivery systems will be greatly simplified by the inclusion of this location and call number information on the citation printouts.

Preliminary indications are that a significant amount of time is being saved for users by eliminating the need for them to make a visit to various library catalogs to determine the location and call number of cited titles of interest.

APPROACH

Several external constraints influenced our approach to this problem. First, we wanted to restrict our attention initially to UC users, primarily because of the effort that would be required to build the location/call number machine files for locations other than the nine UC campuses. However, these files for off-campus locations could be added at a later date. Secondly, there was no printed or computer-based UC-wide union list of serials with up-to-date holdings and call number information which could be used to make a programmed match with the list of titles covered by each of the tape services. Hence, separate individual campus lists had to be used for file building purposes, with manual lookups and keyboarding. Third, the coupling system had to be patched into a major computer system that already was in operation, in such a way that it would not disrupt present services.

Our intent was to show an SDI recipient where each cited publication was held on that user's campus. If the publication was held in several libraries on that campus, then the library name and the call number associated with each library would be printed out with the citation. The idea here was to leave to the user the choice of which campus library to patronize, since there might be a personal preference because of library location, facilities, or other factors.

Each UC patron is associated in the system with a campus code. Reference is made to this code at the time that output hit citations are assembled and printed by the system. For a given campus code, tables are stored in the computer system which give the names of the major publications covered by each bibliographic data base, the name of the holding libraries, and the call number for a given publication in each of the holding libraries on each campus. This location and call number information is then printed to accompany the relevant citation.

An example of an annotated printout is shown in Figure 1. In some cases as many as nine different library locations were given for a title on the same campus. The location information seldom requires more than a single line of computer printout for each citation. In this way, a UCLA patron, for example, might receive a printed citation to an article in a journal, along with the names of the four UCLA libraries that receive that publication, and the call numbers used by each of them for that publication. In cases where the call number was the same at some or all of the holding libraries, this information could be consolidated. In the event that we ascertained that a cited title was not available on the user's campus, we then found another UC library that had that title, and entered an appropriate notation into the machine file to be printed for that title-campus combination. An example of such an off-campus reference is shown in Figure 1. When a title was found to be unavailable on a given campus, we searched other UC campus holdings in the search sequence that would normally be followed by that campus' interlibrary loan staffs (i.e., look first at the closest UC neighbor, or the UC campus with which there is daily courier service). Thus the computer-printed reference to any off-campus UC location will likely point to the same place to which the campus interlibrary loan office would have pointed, but we have done the lookup once and stored it for all future use, thus reducing the need for the repeated efforts by the loan staffs.

No interlibrary loan work was done in advance here to store notation about availability at non-UC libraries, but that could be done later if desired.

When an incoming tape is processed by the SDI system, the output citations selected for each profile are subsequently passed against the title/location/call-number file as part of the output printing run. Each of the journal title or CODEN statements in the selected citations is then matched against the entries in this file. For this to work properly, our file had to include the journal title or CODEN expressions as they are used by each particular data base. This was not difficult for the *CA Condensates* and *BIOSIS Previews* tapes which used the CODEN as a data element, but it required separate machine records with title or abbreviated title entries for the other data bases.

For the ERIC CIJE data base, location/call number records were prepared for every one of the over 700 serial titles reported as being covered by that service.

All the more than 1000 titles listed as being covered by SSCI were encoded and put into our machine files.

At the time this work was done, a complete list of serials covered by the CAIN data base was not available, so instead we used a list published by the National Agricultural Library of 1000 of the most frequently cited NAL serials.[2] All these 1000 titles were entered into our machine files.

The *CA Condensates* data base, covering over 12,000 titles, was too much for us to handle with the initial system, so we compromised and put in over 1000 of the most productive titles from this data base. Rank order data for serial title citation frequency in *CA Condensates* is available and was used as a starting point to pick up the 1000 most frequently cited serials that we estimate will account for about 50% of the citations in that data base.[3,4] In addition, all the titles listed in the *ISI Journal Citation Reports* as being most frequently cited serials also were put into our machine files when they were on the serials lists associated with the data bases running on our system.[5-7]

Unpublished rank order information was also used with the *BIOSIS Previews* data base to enter information for about 800 titles that contributed 30 or more articles per year to *Biological Abstracts* for the period 1969–1971. This is a small fraction of BIOSIS total coverage of over 11,000 serial titles, but those 800 titles in our file probably contribute about 50% of the BA citations. Both BIOSIS and CA rank order lists were checked against the serial lists of the other service and incorporated in our joint files.

At the completion of our file building effort, a total of 3280 titles had been put into the machine file along with library location and call number information for each campus, amounting to about 30,000 separate title–location entry statements. Library locations were represented in the file and in the printouts by NUC library codes when available, and NUC-like codes otherwise. Holdings of over 60 separate library branches are presently represented in our machine file.

OPERATION

The location information coupling system has been in regular production use since early 1975 and has been received

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000364 CHEMICAL ABSTRACTS VOL.83 - ISSUE 05   (ACS COPYRIGHT)          PAGE   2
LOCCODE TESTING

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LOC: CU-BIOC,BIOL,CHEM,MAIN,MATH,PHYS  (Q11.N26).
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-----------------------------------------------------------------------
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LOC: AVAILABLE AT UCSF.
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      CA083050381870.  9-HYDROXYELLIPTICINE.  BACTERIOSTATIC AND
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OOCYTE; MEIOSIS OOCYTE ORGANOMERCURIAL.
LOC: CU-BIOC,BIOL,CHEM,MAIN,MATH,PHYS  (Q11.N26).
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      CA083050383020.  ENZYMIC ACTIVITY OF RAT'S SMALL INTESTINE
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RADIATION ALPHA POLONIUM LUNG.
LOC: CU-BIOL,PHYS,PUBL,AGRI,CHEM,BICC,EART,FORE,OPTO  (Q1.S33).
SELECTED BY 'SELECT IF' #1.
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Figure 1. Sample SDI printout showing location/call number annotations.

with thanks by many library staff members and SDI recipients. The major difficulties noted to date are an increase of about 15–20% in computer time required for the output printing program, and a need for some file maintenance effort to keep up to date with serial cancellations made at various UC libraries. A central reporting point has been established by CIS to receive and act on error reports about library holdings from the users and library staffs. Present plans are to keep this coupling system in operation for UC users.

AREAS FOR IMPROVEMENT OR EXPANSION

The operation of this type of system would be greatly facilitated if the data base suppliers all used the same means of serial title identification in their records (e.g., CODEN, ISSN). We hope that this will eventually happen; however, that aspect is beyond our direct control.

Things that we would like to do locally to improve the system are: (1) expand the files to add more titles; (2) expand the system to handle major collections of non-UC users, such as large groups of subscribers at non-UC campuses; (3) develop a data analysis program to analyze the output print tapes for collection development purposes to see what titles have been selected for printout and are potentially of interest to UC users but are not held on the user's campus or any of the other UC

campuses; (4) replace these special location files with the active serials part of the master machine data base for the entire UC union list of serials.

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Computer-Based Modeling in the Teaching of Steady-State Enzyme Kinetics

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Equations are derived for the steady-state treatment of enzyme reactions with one type of inhibitor, consisting of one reaction cycle or two connected cycles. Computerized simulation programs are described which are designed to acquaint the student thoroughly with the behavior of enzyme systems. The user has freedom in the choice of parameters for the system, including up to three product-producing rate constants for the two-cycle system.

INTRODUCTION

Steady-state enzyme kinetics has been known since the original derivations of Michaelis and Menten.[1] The theory was refined later by Haldane.[2] However, some early thoughts on steady-state kinetics go back to studies by Henri.[3] In presentations of steady-state kinetics the educator generally follows rather closely the derivations of Michaelis and Menten, referring to a one-site enzyme with one substrate. The various types of inhibitions are subsequently added, and such treatments frequently terminate presentations in steady-state kinetics. We shall start our presentation with a cyclic scheme of four steps. Although this derivation is somewhat more difficult than that of the simple Michaelis–Menten scheme, the various types of inhibition can quickly be derived as limiting conditions among the various constants in the cyclic scheme. Such a derivation is intellectually much more satisfactory than one starting with a very simple derivation.

To introduce the concepts of steady-state kinetics more effectively, three lessons in Computer-Aided-Instruction were written which may be used by any student with access to a cathode-ray terminal, which allows addressing of coordinate locations. We used the Hazeltine 2000 video terminal. The first lesson introduces basic concepts of steady-state kinetics, the second lesson introduces those of inhibition, and the third one allows simulation of bell-shaped curves and permits input of parameter values by the student.

A special system was designed to produce easily bell-shaped curves of enzyme activity. The system consists of two cycles of four steps each, containing three different enzyme–substrate complexes, all of which may decompose into the same product. A simulation program was written, allowing the student considerable flexibility in the choice of the value of various parameters. This way he should obtain a good understanding of the relationship between changes in various parameters of the system and resulting curves, which may relate to results on specific enzyme systems. Only two types of plots are available, either with substrate concentration as abscissa or with inhibitor concentration as abscissa. The other concentration is then used as the "fixed" parameter allowing one to submit three different values, thus producing a group of three curves.

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I. UNDERLYING THEORY FOR "PLANAR" SCHEMES

Most textbooks on biochemistry now present the original derivations of Michaelis and Menten, sometimes modified in one way or another. Such derivations are treated in a rather thorough manner in a monograph by Reiner.[4] They will not be repeated here, although they are actually utilized in two of the three lessons in Computer-Aided-Instruction. The concepts and equations are directly introduced in these lessons, as will be discussed in the next section.

A comparatively elegant derivation of the simple enzyme system with the various types of inhibitions may be presented by using the cyclic scheme shown in Figure 1 with the additional assumption that $k_0 = 0$. In the presented scheme, E denotes enzyme, I the inhibitor, and S the substrate. Only ES, the binary enzyme–substrate complex, is initially considered to generate product. All even-subscripted rate constants k_i (as well as k_9 and k_0) are monomolecular; all other are bimolecular "constants". With $C_E^0 << C_I^0, S_S^0$, there is also the general assumption

$$k_3 C_I^0, k_7 C_I^0, k_4, k_8 >> k_2, k_9 \quad (1)$$

The adjustment between EI and E does not need to be considered as it is controlled by the fast steps with the inhibitor because of the scheme's cyclic nature. (However, k_2 in the Michaelis constant could become k_6, if $k_6 >> k_2$; also more complex intermediate cases may take place.)

For the general case one needs the equations

$$C_E^0 = [E] + [EI] + [ES] + [EIS] \quad (2)$$

$$C_I^0 = [I] + [EI] + [EIS] \quad (3)$$

$$C_S^0 = [S] + [ES] + [EIS] \quad (4)$$

[EIS]: E binds I and S; no preferred order is implied in this representation. The last two terms in eq 3 and 4 are negligibly