# System characteristics of Intrex

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The salient features of Intrex have been reported in prior literature.[1] They are updated here and are included as a preamble to the three companion papers being presented at this conference on several technical features of Intrex.

Intrex is an experimental, pilot-model, machine-oriented library system. As illustrated in Figure 1, the system includes a computer-stored catalog of ten-thousand journal articles in selected fields of materials science and engineering, and the full text of the ten-thousand articles stored on microfiche. The catalog is contained in a general-purpose time-shared computer and is accessed through specially designed alphanumeric consoles, one of which has been implemented to date. The consoles are connected to the central computer through a buffer/controller. The full-text microfiche collection is accessed through the alphanumeric console and the access facility is designed to provide guaranteed, rapid access to any documen in the collection at locations which are remote to th

store. Full text may be viewed, page-by-page, at the user's station by means of a separate storage-tube display, or a permanent copy may be obtained either on 35-mm film or as an $8\frac{1}{2} \times 11$ inch print. The elapsed time from the ordering of a 35-mm film copy to the availability of it at the film station is approximately 90 seconds. The first page of an article appears on the storage-tube display within 7 seconds after an order is placed and each succeeding page can be obtained within 3 seconds.

Our objective in Intrex is to use this experimental library as a means for gaining insights into the design characteristics of large-scale, operational systems of a similar kind. We are in the process of evaluating the merits of the system by making it available to a selected community of users who have a bona fide need for the information contained in the system and to librarians who may wish to use it for reference purposes. It is our intention to alter the characteristics of the system as we learn about its strengths and weaknesses from our user community.

It should be noted that the system illustrated in Figure 1 brings the library to the user; it circumvents his need to go to the library for the information he is seeking. To be acceptable as a working system, however, it must engender satisfaction from the viewpoints of completeness and relevance of the information retrieved; it must be easy to engage; and it must provide quick, reliable service at costs that are realistic.

Intrex is examining several issues with respect to in-depth cataloging and the extent to which in-depth cataloging is needed when guaranteed, rapid access to full text is, and is not, readily available at the user's station. As many as 52 different items of information are being entered for each journal article cataloged. These items are described together with access procedures, in a companion paper by R. S. Marcus et al.[2] Through monitoring of the frequency of requests for
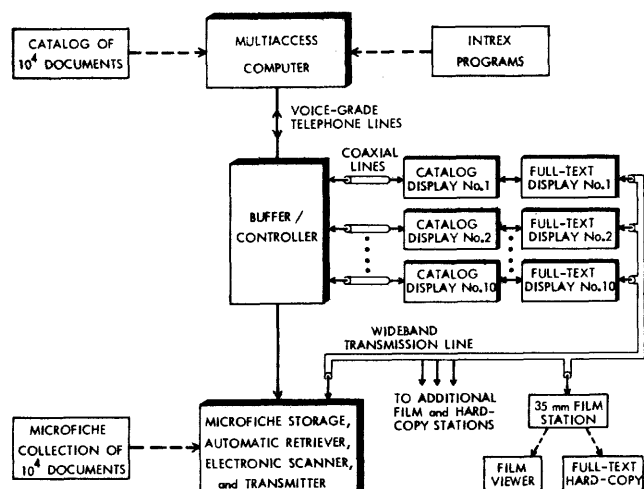


Figure 1—System diagram of Intrex

each item we shall be able to draw conclusions on the relative value of each item.

The possibility exists that easy access to full text may alter the behavior patterns of those using the catalog. Since some of our catolog information is frequently contained on the first page of the document itself (author, author's affiliation, journal name, volume number, page, abstract, and so forth), users have the option of obtaining this information either by retrieving it from the catalog or from the document itself. Our purpose is to investigate the factors which govern user behavior when seeking information of this kind.

For storage of full text we have chosen image storage on microfiche. Computer storage of full text was discarded because of the huge amount of storage required, particularly when gray-level information must be preserved. The use of film ensures preservation of pictorial information, and microfiche is well-suited for journal-article-type literature. We are using COSATI standard microfiche with a reduction ratio of approximately 18 to 1 and sixty frames per microfiche. Since our documents are derived from the published literature, we store text in image form rather than digitally because of the ease with which page text can be converted to a microfilm image.

The full-text storage and scanning unit, called the central station, is time-shared by several receiving stations. In order to minimize the time each microfiche is out-of-storage, each frame on a microfiche is scanned only once by means of a flying-spot scanner. Video signals are transmitted as analog information and to each frame of transmission is added a receiving-station address in digitally encoded form. Single-frame transmission requires storage at the receiving stations; this storage is photographic in the case of the film station and electronic in the case of the storage-tube receiving station.

Our investigations show that at least 2,000 scan lines are required to reproduce the stored images with acceptable legibility.[3] Variations in type sizes and quality of printing among documents dictate this scan-line requirement; in fact, as many as 3,000 lines may be needed where the quality of print is marginal and small type size is present, as in the superscripts and subscripts of mathematical equations. This high-resolution requirement would require an extraordinarily wide-band transmission system if a television type repetition scan were employed. With one-shot scan, as used here, a trade-off can be made between bandwidth and scan time per frame. Approximately a 1-MHz channel with a scan time of 2 seconds has been found compatible with other elements of the text-access system. Details of the text-access and transmission system are contained in the paper being presented at this conference by D. Knudson and S. Teicher.[4]

The alphanumeric-console system through which the catalog is accessed has been developed as an experimental vehicle to determine special attributes which should be included for user convenience in library applications and to investigate techniques which might be employed to minimize cost of such consoles. The salient features of the catalog console system are these: typewriter keyboard input; refreshed CRT-display output; and a buffer/controller, consisting of a 128-track drum storage device and a Varian Data Machines 6201 computer, interposed between the central computer and the display consoles. The buffer/controller is capable of serving a maximum of ten display terminals. In addition to the keyboard, a set of programmed and programmable buttons is being provided in an effort to determine the usefulness of this approach as a user aid.[5]

In the original system design, catalog information and full text are displayed on separate CRT's. This configuration is obviously inconvenient and costly; a single display is a goal of our project. Such a display is described in the paper being presented at this conference by J. K. Roberge and D. R. Haring.[6]

### System utilization

A critical item with respect to utilization of a machine-stored library is the amount of preparation needed to engage the system and to make full use of its power. The bona fide user is interested only in satisfying his need for information as completely and quickly as possible, and with a minimum amount of preliminary effort. Nevertheless certain procedural matters must be mastered even before intelligible responses can be derived from the machine. These include an understanding of the options the user has for making searches and typing procedures for executing these searches, as well as an ability to type and to invoke proper procedures for correcting typing errors. Since many library users are occasional or intermittent users, they may always be in the category of "new" users in the sense that their retentivity of basic operational rules from system engagement to system engagement may be minimal. User aids thus become a crucial item.

Thus far, Intrex has experimented with several types of user aids. A User Guide which describes in detail the various features of the system and how to use them is available both *off-line* in hard-copy form, and *on-line* as a computer printout. In addition, the

Guide is available in summary form in a separate booklet entitled *How to Get Started.* Wall charts describing system operation are also posted directly before the user above his console. Still to be prepared and tested are simple instructions on cards.

The results of our experiments to date indicate that the off-line Guide is the version referred to most frequently; apparently, the time required to print out the various sections of the on-line version is considered to be wasteful. Nevertheless dissatisfaction with the off-line Guide has been expressed. Dissatisfaction seems to result from the large quantity of material it contains, the time required to assimilate the material, and the fact that the phraseology includes a certain amount of technical jargon which is not understood. A further observation is that a summary version of the Guide is helpful, but it must be supplemented by the full-scale version. Finally, response to wall charts as user aids has been disappointing thus far. Further experimentation with their content is needed in order to determine their value as a user aid, if indeed they have value.

To date experiments have been conducted only with a typewriter console as an input-output device. A new dimension to user-aids is added when a graphical terminal becomes available. Since its writing rate is an order of magnitude faster than that of the typewriter, current disinterest in the on-line version of the instructional guide may disappear. Furthermore, since the Intrex graphical console is being designed with a set of programmable switches, these may offer a wholly new approach to on-line instruction when these switches are programmed as user aids.

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