The advent of computers in the information field has made possible not only the creation of such data bases but also efficient and fast access to world sources of scientific and technical information for purposes of current awareness service as well as retrospective literature search.

A beginning has been made recently in India to develop computer-based SDI service. An experimental project using CAN/SDI software and with CA CONDENSATES data base is being carried out at IIT Madras. This project is being supported by UNESCO/UNISIST, Paris. The successful outcome of the project will enable systematic organisation of computer-based SDI service, using several of the available machine-readable bibliographic data bases for the benefit of a large number of users of scientific and technical information.
information scientists, and librarians with the existence and use of machine-readable bibliographic data bases.

The Seminar was held in the Homi Bhabha Auditorium of the Tata Institute of Fundamental Research, Bombay. It was sponsored by the Department of Science and Technology and organised by BARC, DRTC and INSDOC.

About 300 scientists, technologists, information scientists and librarians working in various R&D establishments, academic institutions, government departments and industries, attended the seminar. Participants were also invited to witness the ESRIN/RECON On-line Demonstration which was held during 20-25 September, 1976.

2.1 CONDUCT OF THE SEMINAR

During the Seminar, six invited papers were presented in the two sessions and discussed as per the details given below:

Technical Session (Morning):

Chairman - Prof. A. Neelameghan

Papers presented:

1. Modern Trends in Information Processing - by S. Parthasarathy (INSDOC, New Delhi)

Technical Session (Afternoon):

Chairman - Dr V. A. Kamath

Papers presented:

1. MEDLINE - by A. Neelameghan (DRTC, Bangalore)
2. The CHEM/SDI Project - by A.S. Raizada (INSDOC, New Delhi)

The last paper of the morning session was entitled "International Nuclear Information System (INIS): Accessibility and Utility of its Bibliographic Data Base", by Shri N. M. Malwad. He mentioned that the INIS is the most authoritative and comprehensive information system in the field of nuclear science and technology. Its bibliographic data base follows a number of international standards for its content and structure, making it compatible and acceptable by national information centres in the world to provide a wide range of information services. INIS bibliographic data base can conveniently be incorporated into any existing national or international information network. He described the potentialities of the INIS bibliographic data base with regard to its accessibility and utility.

The afternoon session of the seminar started with the paper entitled "MEDLINE", by Prof. A. Neelameghan (DRTC, Bangalore). He started his presentation with a brief description of the features of MEDLINE (MEDLARS-ON-LINE) System and then dealt with examples illustrating three points that might be of interest in the context of the ESRIN/RECON demonstration which was going to be held on 20th September, and our more general processing. The rapid developments in the fields of computer technology, telecommunication, including satellite communication, reprography, photocomposition, etc. are now gradually making an impact on information processing. It is estimated that there are now about 200 computerised data bases available. Some of the centres providing on-line information services are LOCKHEED DIALOG, Systems Development Corporation, National Library of Medicine, and ESRIN, Frascati. He further mentioned that considerable work is going on to develop adequate telecommunication networks for data transmission. TYSMSHARE, ARPANET, CYCLADES and EURONET are some of the networks.

Shri T.S. Rajagopalan, in his paper entitled "Machine-Readable Bibliographic Data Bases", presented a general account of these data bases and their use in information service. He pointed out that the machine-readable bibliographic data bases have some additional advantages over their corresponding printed versions. Much before the release of printed version of abstracting and indexing services, their magnetic tapes are available for mailing. This means that users can have access to information more speedily with the machine-readable data bases. It is also stated that in some data base services, the retrieval efficiency is sought to be improved by means of greater depth of indexing than in the printed version. He mentioned that because of high costs of data bases and computer processing, our country cannot afford duplication of efforts in terms of multiple organisations processing the same data bases. In our country, he said, much depends upon the progress that would be made in the fields of telecommunication and computer hardware.
concern regarding access to remote data bases. The examples which he gave related to (i) MEDLINE service via satellite communication; (ii) Problem of MEDLARS/MEDLINE service to widely dispersed user populations in developing countries; and (iii) International arrangements for MEDLARS/ MEDLINE services.

Shri A.S. Raizada presented a paper on the CHEM/SDI project in India. He dealt with the SDI (Selective Dissemination of Information) concept. He mentioned that CHEM/SDI is a pilot project of UNESCO/UNISIST for computerised SDI in South Asia. This project has been taken under NISSAT programme with the financial support of the Department of Science and Technology and is jointly operated by INSDOC, New Delhi and IIT, Madras. CHEM/SDI is a current information retrieval service. It uses CAC (Chemical Abstracts Condensates) magnetic tapes. The CHEM/SDI selects current information from journals, reports, books, patents and conferences that are incorporated in the latest issue of CAC tapes. The selection and matching is accomplished by a fully computerised process matching individual profile against current CAC tape. He also dealt in detail with various sequence phases which should be executed to provide CHEM/SDI service.

The last paper in the afternoon session was "Machine-Readable Bibliographic Data Bases with special reference to the experience of India in participating in AGRIS System" by P.C. Bose which was presented, in the author's absence, by Shri S.P. Phadnis of IARI. In his paper Shri Bose mentioned that agriculture is fairly well documented in literature sources. Survey of world agricultural documentation services, published by FAO in 1973 has categorised 124 title services (29 computerised) and 230 abstracting services (45 computerised) published in 41 countries and 21 languages. Their annual output covered 632,000 title citations and 1,137,000 abstracts. Among the important indexing services with world-wide coverage is the "Bibliography of Agriculture", compiled in the United States Department of Agriculture (USDA), National Agriculture Library (NAL), since 1942 and published from a cataloguing and indexing (CAIN) computer tape. Among the abstracting journals, "Biological Abstracts" and "Chemical Abstracts" and their associated current awareness title indexes and the publications of the Commonwealth Agricultural Bureaux (CAB) are the important sources. He also described the International Information System for Agricultural Sciences and Technology (AGRIS) covering input methods and the output services available in two forms:

- a printed monthly bibliography called AGRINDEX
- an output magnetic tape, the format of which can be adapted to meet the needs of individuals, research programmes and national and regional information centres. The magnetic tape can also provide services such as SDI, retrospective search and on-line retrieval.

He also dealt with AGRIS operations in India.

3. SYSTEMS FOR ACCESS TO BIBLIOGRAPHIC DATA BASES

3.1 OFF-LINE OR BATCH PROCESSING SYSTEM

In this system, the search topic is translated into search strategy, usually in the form of Boolean algebraic expressions using logical expression AND, OR, NOT. The search strategy is put into machine-readable form and is then matched against the machine-readable file of indexed citations. Searches are carried out when computer time is available, and a number of searches are "batched" and run simultaneously.

3.1.1 Limitations of Batch Processing System

1. There is no direct interconnection between the user (i.e., the person with the information need) and the system. Therefore, the user cannot conduct his own searches. The searching work is done by the information specialist who acts as an intermediary between the user and the system. The search strategy is prepared by the intermediary who acts as a search analyst. This type of searching may have certain advantages, but it has one fundamental disadvantage, namely, the danger of analyst misinterpreting a requester's information need or the user himself sometimes may not be able to express his need verbally with sufficient accuracy to effect a successful search.

2. As the searcher has essentially only one chance to conduct a successful search, the analyst has to think, in advance, of alternative approaches and must incorporate them into his strategy. If the results of search are disappointing, he can obviously try again, but this will usually mean a further delay while waiting for the availability of machine-time once more.

3. A batch processing system almost inevitably involves time delays. In many systems, the response time is several days to weeks. Therefore, it becomes difficult for a user to obtain an immediate ("real time") response to his request.

3.2 ON-LINE SYSTEM

An on-line system differs from an off-line system in that the searcher, via some type of terminal, has immediate access to the data base and can interrogate it directly, structuring his strategy at the terminal, receiving responses from the system, and modifying the strategy on the basis of responses received. The entire search
can be conducted in a matter of minutes, and the output (of citations, abstracts, or possibly full text) displayed on a console or typed out at a machine-controlled typewriter which is part of the user terminal. For a search retrieving very many citations, the searcher once he is satisfied with his strategy and has received some specimen printouts or displays on-line, can request that the full search results can be carried out off-line and sent to him at a later time. The main advantages of on-line system are:

- Browsing in this system is possible.
- Search strategy can be developed at the counter and the user can experiment with various approaches.
- User is able to obtain the results immediately and he himself conducts the search at the terminal without the help of intermediary.

3.4 ON-LINE SEARCHING

Searching in an on-line system is an interactive process. In this system, searcher can try various terms, term groups, or term combinations and immediately find how many citations match the exploratory strategy. Searcher can then broaden or narrow the scope of the search by adding descriptors, or he can try a completely different search approach. He can browse in the data base to determine the type of documents retrieved by a particular strategy. When he finds a relevant item, he can view all the descriptors assigned to it. Possibly, he will find further terms that can be incorporated into his search formulation.

4. ESRO/ELDO SPACE DOCUMENTATION SERVICE

A joint ESRO/ELDO Space Documentation Services (SDS) was created in 1964 with the aim of providing scientific and technical documentation to government establishments, universities and industries in European Community member states.

In 1969, after negotiations with NASA, SDS envisaged adopting in Europe the RECON (REMOTE CONSOLE) on-line retrieval system, developed in the USA for NASA by the Lockheed Missile and Space Co., Pal Alto (California).

The first on-line terminal was installed in Paris in July 1969 and a version of the RECON/DIALOG programme was adapted under contract with Lockheed to be used on the IBM 370/155 at ESOC (The European Space Operation Centre of ESRO) in Darmstadt, W. Germany.

4.1 HIGHLIGHTS OF ESA SPACE DOCUMENTATION SERVICE

1964: SDS created by European Space Research Organisation and European Space Vehicle Launcher Development Organisation to provide information services to scientists and engineers in Member States.

1969: RECON on-line interactive information retrieval system installed.

1970: First remote leased line terminal outside ESRO/ELDO establishments. First Transatlantic cable demonstration of RECON system.

1972: First Transatlantic satellite demonstration of RECON system.

1973: SDS transferred to Frascati, Rome, Italy. IBM 360/50 computer installed at Frascati dedicated to RECON system.

1975: ESRO became the European Space Agency. Users able to access SDS file via dial-up terminals. IBM Computer upgraded to 360/65.

4.2 RECON NETWORK IN EUROPE

RECON is a remote access, on-line interactive retrieval system which permits the user to retrieve instantaneously information held in ESRIN, Frascati. Terminals are now located in France, Netherlands, the United Kingdom, The Federal Republic of Germany, Spain, Sweden and Denmark. Recently, a terminal has been set up at Rabat, Morocco. This network covers 10,000 km and has 76 terminal nodes all over Europe (See Appendix I).

4.3 DATA BASES

The ESRIN Centre has at present 12 data bases and provides access to over 7.5 million references drawn from them. The monthly addition comes to some 100,000 references. Some of the data bases covered are NASA, CA CONDENSATES, INSPEC, COMPENDEX, Nuclear Science Abstracts, NTIS, METADEX, World Aluminum Abstracts, the Environment Abstracts and Science Citation Index. This vast store of information was available for search in India during the demonstration from 20th September to 25th September 1976 (See Appendix II).

4.4 THE RECON SYSTEM

The RECON system is an information retrieval system defined by the following characteristics:

- is of concept-coordination type;
- works in the interactive, on-line mode; and
- has a remote processing capability.

4.41 Concept-Coordination - means that the documents are described by a set of keywords (descriptors) defining by their association the contents
of document unit. They are retrieved by logic associations of descriptors, by means of the usual Boolean operators OR, AND, AND NOT.

4.42 Interactive - means that the system response time for each elementary enquiry is of the order of magnitude of that of the human operator so that a real interaction has to occur at the man/machine interface.

The system user, by means of a very simple language, is able to visualize on a TV screen a fraction of a dictionary, select pertinent descriptors, combine them by Boolean operators and display a document surrogate on the same screen when required, in a real conversational routine.

4.43 Remote-Processing - means that the user can have access to the system by means of visualization terminals which can also be located far from the central computer. The link between the central computer and the remote stations (terminals) is realized normally by means of four wire telephone lines, at a signal rate of 2400 bits/sec. Each remote terminal is equipped with a small (1K byte) buffer memory, a keyboard, a TV screen and a 30-character-per-second teletype.

4.44 The RECON Language - The language which is used with the RECON system at the user/terminal interface is very simple. The various commands can be grouped as follows:

1) Master Commands (MCS): These commands can be executed only if entered at a terminal having the so-called "master status". Normally, there is only one master terminal in the network and the MCS are used to supervise the system.

2) General Commands (GCS): The GCS are used to preset the system for a search, to perform tutorial or explanatory routine or to exchange messages between terminals. There are, in particular, five GCS:

   a) Begin and End Search Commands,
   b) Switch Files,
   c) Set History,
   d) Tutorial Commands, and
   e) Message Capability.


4) Operation Commands for Search Strategy Development (OC/S) - The following commands, namely, SELECT, INTERSECT, COMBINE, KEEP and LIMIT perform the actual search strategy that translates the user's question into the System Language.

5) The Operation Commands for Document Reference Access (OC/D) - The document references are accessible by using both the DISPLAY DOCUMENT and PRINT commands in five formats:

   Format 1: Only the accession numbers. 80 accession numbers can be displayed.

   Format 2: The complete format with accession number, title, micro-abstract, authors, corporate source, bibliographical data and descriptors. Documents in this format are displayed one by one on the TV screen.

   Format 3: Dump format, containing all the information of format 2.

   Format 4: Only accession number, title and micro-abstract. 4 documents are displayed in one screen image.

   Format 5: Similar to format 2, but without descriptors.

5. ESRIN/RECON ON-LINE DEMONSTRATION IN INDIA

Development of telecommunication facilities has made long-distance on-line information retrieval possible. The network concept is also thereby gaining currency throughout the world. In order to demonstrate the possibility of introducing on-line interactive information retrieval systems using telecommunication facilities in the developing countries, UNESCO/UNISIST sponsored in India a project viz., "ESRIN/RECON On-line Demonstration Project-Linking to World Sources of Information". The ESRIN Centre in Frascati, near Rome, which has about a dozen data bases and access to some 7.5 million references in science and technology drawn from the data bases was made accessible in the demonstration project.1 The demonstration was held in the Tata Institute of Fundamental Research, Bombay, during 20-25 September, 1976. It was organised by the Department of Science and Technology, Government of India, in collaboration with the P&T Department, the Overseas Communications Service, the Tata Institute of Fundamental Research, BARC and INSDOC. The project was inaugurated by the Union Minister of State for Information and Broadcasting, Shri V. C. Shukla. During the demonstration, the data bases in ESRIN were searched from a terminal at TIFR, Bombay. The retrieved references were seen on a screen and had as printouts, if required.

Welcoming the elite gathering of technocrats, Dr A. Ramachandran, Secretary, Department of Science and Technology, said that the demonstration project was a collective venture of several scientific departments and agencies such as TIFR, BARC, INSDOC, the P&T Department and the Overseas Communications Service.

Dr Ramachandran further said that the National Committee on Science and Technology had
specifically identified information as a vital national resource and stressed the need for organising scientific and technical information as an important programme in the Fifth Plan. He pointed out that the main function of the National Information System for Science and Technology (NISSAT) would be to speed up the flow of information. NISSAT would also nurture the growth of information analysis centres as well as the straightforward data bases and documentation services for the benefit of the planners, entrepreneurs and decision-makers.

Shri Shukla, while inaugurating the project, pointed out that the main object of the demonstration at TIFR was to demonstrate to our scientists the application of modern telecommunication technology to enable them to have instant access to vast stores of information held in data bases located at global distances.

While thanking UNESCO and ESA for their cooperation in India's efforts, Shri Shukla said that the country was very anxious to keep pace with modern developments in science and technology and would make great sacrifice for that purpose.

Mr L.E. Samarasinghe of UNESCO, said that developing countries need scientific and technical information systems of their own, laying emphasis on the type of knowledge most needed for social and economic development.

Mr W.A. Martin of ESRIN said that the information service of the European Space Agency comprises three important parts - (1) large computers with a huge store of references, (2) extremely advanced series of programmes, and (3) extensively developed network which offers a number of operational options. He hoped that India would be able to secure information from the European Space Agency.

Dr V.A. Kamath, Head, Library & Information Services, BARC, coordinated the efforts involved in this project, culminating in grand success. At the end of the session, he proposed a vote of thanks.

REFERENCES


APPENDIX 1

Geographical distribution of present RECON network
## APPENDIX 2

### RECON BIBLIOGRAPHIC FILE SUMMARY

<table>
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<tr>
<th>FILE NO</th>
<th>FILE NAME</th>
<th>SUPPLIER</th>
<th>ABSTRACT JOURNAL</th>
<th>SUBJECT COVERAGE</th>
<th>TIME SPAN</th>
<th>NO REFS DEC 1975</th>
<th>NO REFS YEARLY</th>
<th>UPDATE</th>
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<td>National Aeronautics and Space Administration, USA</td>
<td>Scientific and technical Aerospace Reports (STAR); International Aerospace Abstracts (IAA)</td>
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<td>Metals Abstracts</td>
<td>Applied; theoretical metallurgy; properties of metals/ alloys</td>
<td>1969-</td>
<td>187,000</td>
<td>30,000</td>
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PORTION OF A PRINT OUT FOR A QUERY ON FLOATING POINT PROCESSORS

SEARCH HISTORY

ITEMS DESCRIPTION
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2  596 ENERGY RANGE
3  232 ENGINEERING
4   0 1*2*3
5   13 1*3
6   4  E5,E6 MARK GENERATORS
7   3  E6,E7 TESLA TRANSFORMERS
8   1 BLUMLEIN CIRCUITS
9   4  E5,E6 CAPACITOR BANKS
10  5  E6,E7 SPARK GAPS
11  1  E6,E7 TRIGGERED SPARKGAPS
12  3  E6,E7,E8 PULSE CHARGING
13  4  E10,E14 INDUCTIVE SWITCHING
14  8  E5,E6,E7 EXPLODING WIRES
15   4   6-14
16   0  7=8
17  125 4.56+78+9+10+11+12+13+14
18   0  9=14
19   0  4=1=14
20   0  8
21  682 FLOATING
22 10216 POINT
23  556 PROCESSORS
24   3 21*22*23

SEARCH TIME 7.55 PRINT COUNT 3 DESCS.: 3

PRINT 24/4/1-3 USER 193 PAGE 1 (ITEM 1 OF 3)

76c04028 Inspe 859249 itcob
Vector floating-point data format
Higuie, L.C.
Massachusetts Maritime Acad., Buzzards Bay, MA, USA
CC: C8420, C9800, C8120 wcaat, xaaaaa, wcaaa
SH: data structures, programming TRT: THEORETICAL
PT: data format, reducing memory cost, special purpose processors, pipeline processors, a programming language, array processor, vector floating point

ABSTRACT: Memory has always been a major factor in determining the cost of a computer system. Many schemes have been proposed for reducing memory cost without degrading system performance or increasing system cost or complexity significantly. This paper presents a particular data type that may have been used occasionally by programmers who have had to simulate floating-point hardware by software. This new data type is useful in large scientific problems and may be able to serve as a replacement for floating point data type on special purpose processors. Its hardware implementation on orthogonal and pipeline processors is discussed in detail and the implications of these implementations for a programming language (API) (Iverson's language) are examined, 6 Refs.