

Integrated Inventory Information System

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The nature of oceanographic data and the management of inventory level information are described in Integrated Inventory Information System (IIIS). It is shown how a ROSCOP (Report on Observations/Samples collected during Oceanographic Programme) based inventory type database structure can be evolved to meet the end users' requirements and to provide a generalised inventory information service. IIIS has three sub-systems station, parameter and documentation. It is supported with retrieval system to handle simple and complex user's enquiry. It also supports the graphic facilities. The system is portable and can be implemented on any micro or mini computer system.

1. Introduction

Significant and technologically complex developments are taking place in the world today. Among them, one such phenomenon is 'database' or 'Information system' (a subset of the larger computer technology). Thus, there exists a gap between database experts and users. To fill this gap, there is a need to develop user friendly systems which could be used by end users without much knowledge of the computer system.

Information has become an essential ingredient in decision making. The need for improved information systems, in recent years, has become critical by the rapid growth in size and complexity of knowledge of data. Computers, with capability to store, select, retrieve and manipulate, numeric and alphanumeric data, are most appropriate tools for providing information timely.

National Institute of Oceanography (NIO) has been collecting oceanographic data with the aim of making extensive basic research, in oceanography. The Indian National Oceanographic Data Centre (INODC) presently stands as a unique national facility for oceanography data services. The centre has the responsibility to acquire entire spectrum of oceanographic data in a suitable form to research scholars, industries, governmental departments and other users. Oceanography is a multidisciplinary science and hence a common and controlled approach is adopted to structure data in integrated manner, so that consolidation of information on various aspects become easy.

2. Source Of Data

A standard form for the Report of Observations and Sample Collection during Oceanographic Programme (ROSCOP) is being used worldwide by National Oceanographic Data Centres (NODC) and international agencies concerned with

marine sciences. ROSCOP is considered as an important mechanism in support of the International Oceanographic Data Exchange. Based on ROSCOP coding system, an attempt is made to develop a computer oriented Integrated Inventory Information System (IIIS).

NIO has conducted more than 200 cruises in the last 11 years. Data was collected from more than 7,000 locations (stations) in the sea/ocean during these programmes. At each location (station) data was collected on 4 to 15 parameters of different oceanographic disciplines and at each station, observations were collected maximum at 34 standard depths. ROSCOP forms are filled on board during the oceanographic research programmes and these forms are main source of information for this System.

Expenditure on oceanographic research is very high. Significant part of expenditure arises from the cost of taking measurements at sea. The cost is of the order of Rs. 0.75 to 2.0 lakhs/day to operate an ocean going research ship. Despite the large amount of money and efforts in such data collection, the density in time and space of the available data from the oceans in general remains low. Further, skilled scientific teams and their equipment are a scarce resource, and thus it is important that what ever data available should be made accessible to as many users as possible. Data is valuable not only to the primary users responsible for its original collection, but also a wide range of secondary users.

Thus creation of a centralized national oceanographic data storage facility, not only improves the availability of data to end-users but also ensures that the data is protected for long term use.

3. Evolution of IIIS

All the important oceanographic parameters have been identified and classified. Data elements, sets, field, record have been

identified and their inter relationships determined. Data organisation has been done in a number of linked networks, which permits various complex logical relationships between data elements. There are three major components (sub-system).

3.1 Station Subsystem

3.2 Parameter Subsystem

3.3 Documentation Subsystem

3.1 Station Subsystem:—System comprises of group of related records which provides information regarding location of station, in terms of Latitude and Longitude where data was collected. System includes various fields like INODC Station and Cruise Numbers; Cruise Codes, Ship Name, Originators Reference Number and also includes time, period and depth details. These records are unique to any one station.

3.2 Parameter Subsystem—system comprises of records containing various parameters alongwith representative code. ROSCOP coding system has adopted a three alphanumeric digits coding system. The first character represents the subject disciplines like eg. B—Biology, H—Hydrology, G—Geology, M—Meteorology etc. Next two numeric digits represent the serial code of parameter in that discipline eg. B01—Primary Productivity etc.

Each parameter is assigned with ROSCOP code as above and security code (for dissemination) and is stored in parameter subsystem. All the parameters are linked with relation and are grouped together discipline wise. Each record (Parameter) acts as an index and permits access to the entire data set belonging to that parameter through ROSCOP code key index.

3.3 Documentation Subsystem—The system consists of documentation records including instrumentation, platform, method of data collection, calibration etc. All these records have unique relation among each other.

Records within station subsystem and parameter subsystem are related by many-relationships since each record is linked with many parameters and vice versa, whereas a parameter subsystem and documentation subsystem have a one-to-one relationship.

The information from all these subsystems can be pooled together through a merge mechanism and can be used for preparing reports like cruise, station, parameter catalogues and instrument documentation etc. Parameter plot w.r.t. time/period; depth; area etc. can be plotted by pooling information from station and parameter subsystems as shown in Fig. 2.

Software modules are written in FORTRAN-77 and are linked at different levels (as shown in fig.2). Such hierarchical linkage of modules helped in involving IIS. Some of such modules and their functions are given below.

MERGED— Merges data files of station subsystem and parameter subsystem.

CATALOG— Intermediate program for the preparation of cruise summary.

CRUCAT— Prepares parameter summaries and also finds the range of different data fields for cruise catalogue.

RCRCAT— Retrieves cruise catalogue in formatted way and replaces the ROSCOP codes by their acronyms.

RSTCAT— Retrieves the station catalogue in formatted way and replaces the ROSCOP codes by their acronyms.

ENQUIRY— Enquiry handling program. It helps in searching inventory level information and retrieves the information as per user's requirement.

RSPLOT— Plots the required station data points with Indian coastal line and the boundary line of Indian Exclusive Economic Zone area.

4. System Description

The system is designed to carry out following functions as a response to end users query (as shown in fig. 2 and 3).

4.1 Storage and maintenance of data in classified and orderly form and flag the sensitive data/information.

4.2 Simple manipulations of data.

4.3 Limited selection and projection of data.

4.4 Retrieval of data pertaining to selected parameters.

4.5 Produce reports and catalogues like station catalogue and cruise catalogue etc.

4.6 Prepare statistical summaries.

4.7 Selectively plot the station position with the Indian coast and Exclusive Economic Zone lines.

IIS acts as 'door entry' or index for oceanographic data bank. It provides timely inventory level information as a ready response to user's enquiry. It serves as common ground for national and international data exchange. It accepts the input data in a particular format, from either magnetic media or manual entry through terminal or other media as shown in Fig.1. The manager's control is provided under this system for security of the information.

The described system is implemented at IN-ODC, NIO for managing large volumes of oceanographic inventory level data. Under this system, 11 years oceanographic data is being managed which has been collected since 1976. The volumes of the inventory level data bank is about 10 mega bytes. The system is implemented on ND-520 under Sintran III-500/VM (J) version of operating system.

5. Retrieval System

The retrieval system is designed in such a way that data can be retrieved by specifying the appropriate constants of the query in reply to system's query. Thus, in user friendly way, user is expected to furnish information through terminal in following order.

5.2 Specify range of geographic area in terms of latitude and longitude for which data is required.

5.3 Specify period (eg. months like 01 for January, 02 for February etc.) or season (premonsoon, postmonsoon etc.)

5.4 Specify depth in meters.

5.5 Lastly user has to specify parameter in form of ROSCOP codes.

Based on user's requirement, user may furnish information for all these specifications or either of three. System will first recognise, whether user's request is single query or multiple query. Depending on this, query will be handled by single or multiple query handling system (as shown in fig. 3.)

System follows the flow chart (fig. 3) for handling user's request in following manner.

a. Recognises how many queries are included in user's request (eg. single ie.

Q=1; double ie. Q=2; or multiple ie. Q=3)

b. Follows the path accordingly (Q1, Q2, or Q3)

c. Searches appropriate information from Station subsystem as shown in fig. 2 and 3.

d. If the user's enquiry is fulfilled, then system searches required parameter/discipline based on ROSCOP codes from Parameter subsystem otherwise control goes back to report user.

e. Once the parameter is selected, system provides complete information in the form of a report. It also replaced ROSCOP codes by appropriate parameters acronyms.

If user is required information for another geographic area, parameter, depth or period, he is required to follow the path once again. Retrievals will be in the form of listing, report, graphs as hard copy or on magnetic tapes. Using inbuilt graphing facility, provision is made for plotting station locations where particular parameters is collected along with Indian coastal line and the boundary line of Indian Exclusive Economic Zone.

6. Advantages

IIS has following advantages over conventional system.

- * It is more *flexible*, as developed in most common FORTRAN-77 language, therefore, portable.
- * *Easy* for operating. As there is no need for any knowledge of database management system.
- * As the system is based on internationally known ROSCOP coding system, it is easy to *communicate* and exchange the information worldwide.
- * Data bank is *non-volatile*. Once the data is stored to the system, it remains there indefinitely.
- * As enquiry handling system is in *modular form*, its response to the user's enquiry is faster.
- * "System" supports the *graphic facilities* in preparing maps, charts, etc.
- * As security locks are provided at various levels, it *protects* the information dissemination and likely misuse etc.
- * "System produces different kinds of catalogues and indices for *ready reference* of information.
- * System is designed in a modular form therefore it is flexible for *future update*.

VIEW OF III SYSTEM

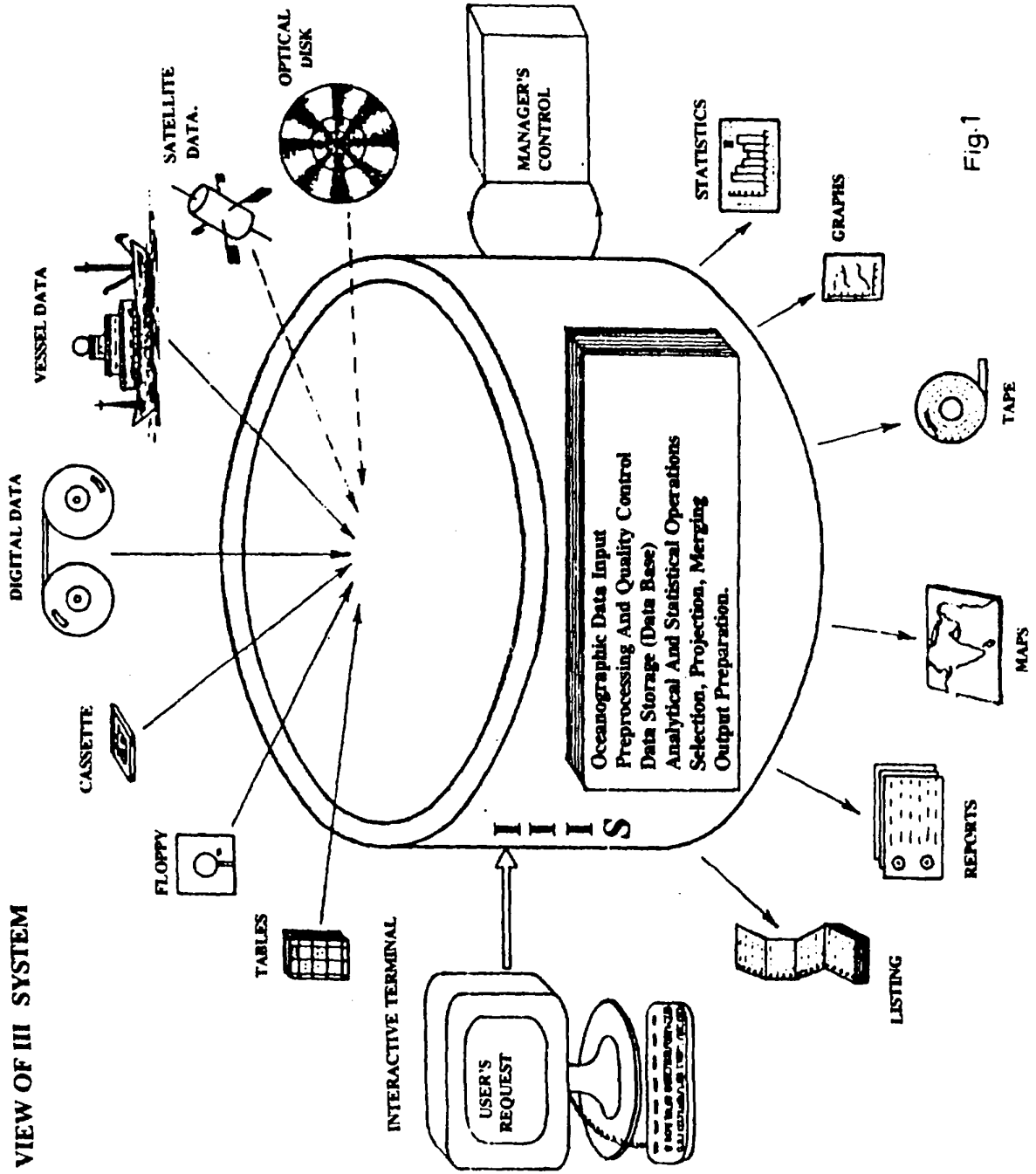


Fig.1

INTEGRATED INVENTORY INFORMATION SYSTEM (IIS)

IIS

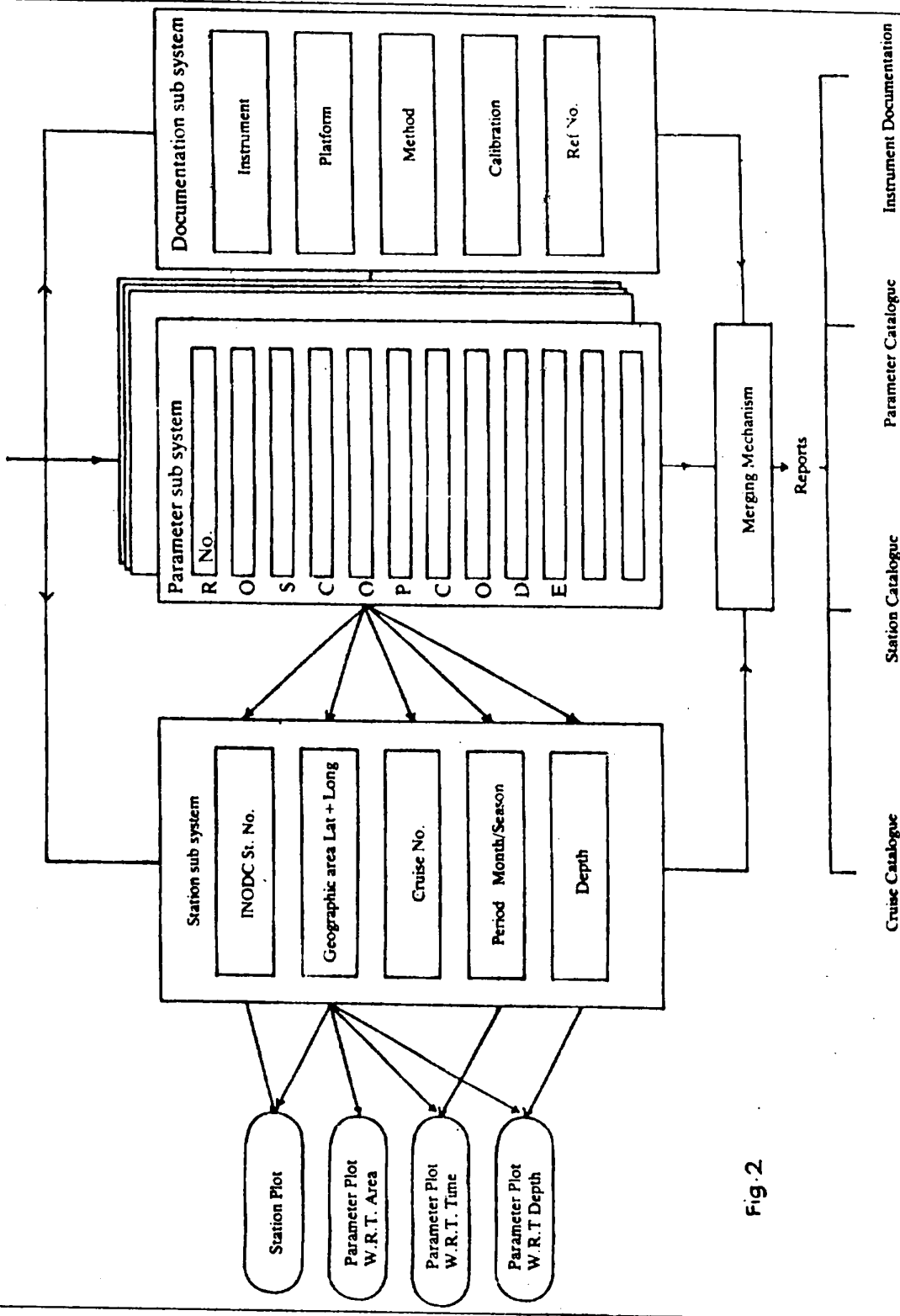


Fig.2

RETRIEVAL SYSTEM

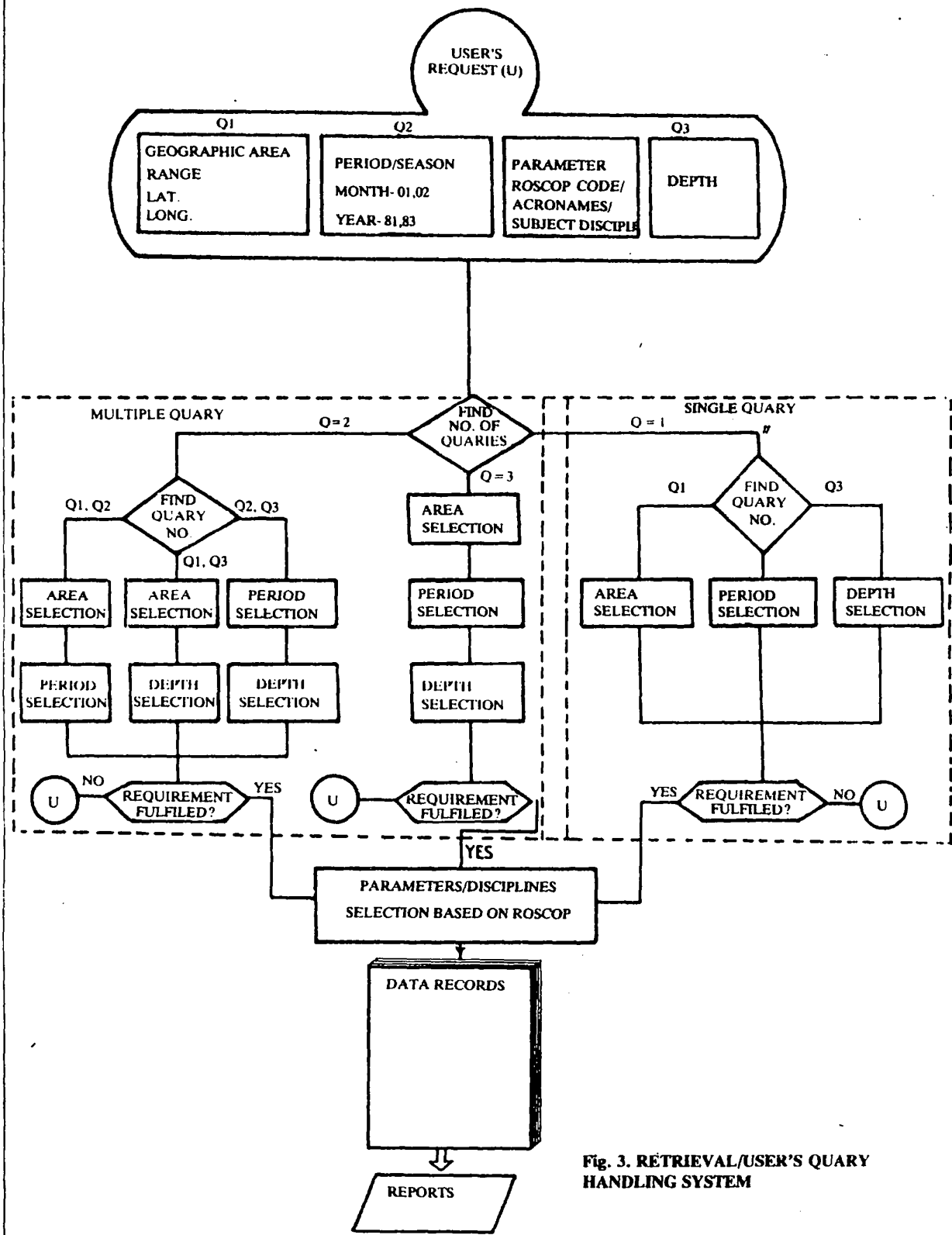


Fig. 3. RETRIEVAL/USER'S QUARY HANDLING SYSTEM

7. Disadvantages

- It is not supporting the multiple users environment.
- As system is based on ROSCOP coding system, it is restricted to limited application.
- The graphic facility is portable, if the basic graphics routines are available on the system.

8. The Future

- The system will be the front module in the main data processing system.
- This will be under SIBAS data base environment which has CODASYL structure.
- Facility will be developed for online access of the information/data through necessary links from remotely situated centres.
- Electronic data bank along with the system will be made available in a compact optical hard disc (CDROM) for users.

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Japan-Asia Conference on Computerization

A Report

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Theme of the Japan-Asia conference on computerization was to discuss the status and future plans of computerization in the Asian countries, in particular, manufacturing of large and small computers and peripherals, software development, computer policy, data communication, native languages capability, and manpower training.

The conference which was held in Tokyo on 16th and 17th September 1987 was attended by representative of the computer societies of China, Hong Kong, India, Indonesia, S. Korea, Malaysia, Philippines, Singapore, and Thailand besides representatives from Japanese industry and government. It was organized by the Centre of International Cooperation for Computerization, (CICC), Japan and funded by MITI.

Each of the representatives presented a paper on their respective countries. The Chinese representative focused on the major sectors of economy that are slated for Computerization. Hong Kong being a centre of commerce has emphasized computerization of banking, electronic fund transfer, transaction processing, etc. The computerization has been primarily based on foreign supplies. The Indian scene is characterized by a rapid growth in installation of computers in the last three years. The seventh plan envisages that this growth would continue in the plan period. The manufacture of computers, however, is still based on collaborations and imports. Native language capability has started becoming available at competitive prices.

There were similar presentations by the other representatives. Singapore representative described the Information Technology plan which appeared to be the best thought out and comprehensive plan. Besides covering the computer industry,

its applications and manpower training, it also goes into details of how to spread computer culture, create an environment for creativity, build the communication infrastructure, and coordinate policies with implementation.

Japan has a major project for development of a rich and hardware-independent software environment. Named the Sigma project it has a budget of US \$ 172 million and has brought together some eighty companies. It envisages development of a Sigma workstation running UNIX like Operating system with graphics, multimedia, and Japanese language capability. Networking capability will also be available. The project is expected to complete by 1990. Software developed by the project will form the basis of products by the participating companies.

Japan has a national certification examination for information processing engineers. This has been conducted since 1969 and has played a major role in bringing all CS education above basic minimum standards.

CICC proposed to start training of "data processing engineers" in the respective countries and make CAI software in native languages available for the purpose. It has already started collaborative projects in machine translation with China, Indonesia, Malaysia and Thailand.

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