北海道大学工学部研究報告
第117号（昭和59年）

Bulletin of the Faculty of Engineering,
Hokkaido University, No. 117 (1984)

Implementation of the ALGO System on ORION

Kaname AMANO* and Takashi MAEDA**
(Received September 30, 1983)

Abstract

We have implemented an algorithm information system ALGO on the information retrieval system ORION. The ALGO database consists of about 3000 records of information concerning computation algorithms of various fields published in scientific journals and publications. Information items of a record are title, authors, affiliation, journal, volume, number, page, year, references, modified SHARE classification codes, ACM CR categories and subject descriptors, ACM CR general terms, additional keywords and phrases, abstract, programming languages, etc. FORTRAN, PL/1 and some ALGOL programs of the ACM algorithms stored on the disks are available with the interface of the ORION run module call and a routine for execution of the HITAC VOS3 TSS commands in the retrieval process.

1. Introduction

We have implemented the algorithm information system ALGO [1] on the information retrieval system ORION (Online Retriever of InformatiON produced by Hitachi Ltd.) [2, 3], which is for collecting and storing the information about quality computational algorithms to be used in a wide range of scientific field and for providing the information corresponding to requests of general users with various motivations. By the algorithm information, we have called collectively the information about algorithms of various fields and forms existing, and the information about their analysis, performance evaluation, modification, revision, etc. The ALGO database consists of about 3000 records of algorithm information made up of such items of information as title, authors, affiliation, journal, volume, number, page, year, references, modified SHARE classification codes, ACM CR categories and subject descriptors, ACM CR general terms, additional keywords and phrases, abstract, programming languages, etc., which are taken from the following information sources: ACM algorithms, Algorithms Supplement of The Computer Journal, Index by Subject to Algorithms appearing in Communications of the ACM and research papers of ACM Transactions on Mathematical Software. The FORTRAN, PL/1 and some ALGOL programs of the

* Hokkaido University Computing Center, Sapporo 060, Japan
** Department of Engineering Science, Faculty of Engineering, Hokkaido University, Sapporo 060, Japan

ACM algorithms stored on the disks are available with the ORION's function of run module call and the routine for HITAC VOS3 TSS command execution in the retrieval process.

Program libraries, which may include a highly organized set of systems and packages of the selected mathematical softwares, e. g., IMSL, LINPACK, EISPACK, FUNPACK, SPSS, BMD, SAS, etc., have been the most popular approaches to dissemination of the algorithms. Ideally, a program library should be constructed by carefully selected, well-maintained, usually semi-compiled and readily executable general purpose programs, together with their manuals and some sort of index or directory [4, 5]. It is necessary to select or develop tailored programs for the intended computational domain and to test them thoroughly before they are released to general users. Some of the existing program libraries have been used effectively, especially in their intended domain. However, the requirements for effectiveness of these libraries have sometimes been accompanied with some problems: restriction in application fields and number of algorithms imposed by qualitative and quantitative selection, difficulty in incorporating the results of up-to-date research and development, unopenness of the details of the algorithms to general users, etc. The ALGO system does not necessarily provide the programs readily applicable to computations like BAL [6] and MBS [7], but it has the following advantages complementing some of these difficulties of the program libraries: availability of the up-to-date information about quality algorithms of a wide range of computation field published through various media, the original and detailed contents of algorithms by referring to the information sources, etc.

This paper is mainly concerned with the contents of the ALGO database and the user interface of the ALGO system. See the user's manual [8] for more detailed usage of the system.

2. Contents of the ALGO Database

2. 1 Information Sources

Information sources of the ALGO database are as follows (Table 1): (1) ACM algorithms (1960-1982; 1045 records about 591 algorithms), (2) Algorithms Supplement of The Computer Journal (1966-1982; 159 records about 114 algorithms), (3) Index by Subject to Algorithms (1960-1982; 1643 records about nearly equal number of algorithms), etc.

ACM algorithms have been published in Communications of the ACM (1960-1975) and ACM Transactions on Mathematical Software and ACM Transactions on Programming Languages and Systems (1975-1982). It is stated in the ACM Algorithms Policy that algorithms are published to make the fruits of software research available to as many audience as possible and that an algorithm must be complete, portable, well documented and well structured. The contribution is in one of

Table 1 Information sources of the ALGO database

A L	Argonne National Laboratory, NATS Project	1
A S	Applied Statistics	176*
B T	B. I. T.	65
C A	Communications of the Association for Computing Machinery	492*
C B	Computer Bulletin	9
C C	Computer Physics Communications	335
C H	Chiffres	3
C J	Computer Journal	114*
C P	Computing	47*
H A	U. K. A. E. A., Harwell Reports	17
I C	I. C. C. Bulletin (International Computation Center)	1
J C	Journal of the Association for Computing Machinery	13
M C	Mathematics of Computation	14
N M	Numerische Mathematik	88
S N	SIAM Journal on Numerical Analysis	4
T O	ACM Transactions on Mathematical Software	98*
T P	ACM Transactions on Programming Languages and Systems	1*
Z M	Zastosowania Matematyki	46

unit : records (≈ algorithms) and algorithms for *

the forms of (a) algorithm (proposal of an algorithm in a programming language with brief explanation about its function, performance, usage, ...), (b) certification (report on a previously published algorithm about its correctness, extensive testing, ...), (c) remarks (report on a previously published algorithm usually concerned with corrections or modifications), and others including translation, survey, etc. The contributions of the Algorithms Supplement of The Computer Journal, which we call CJ algorithms, are algorithms and notes corresponding to the certifications, remarks, etc., of the ACM algorithms. Index by Subject to Algorithms is the list of computational algorithms published in ten to twenty numbers of scientific journals and publications, which appears in the Communications of the ACM. They include ACM and CJ algorithms but, for the early years of 1960-1980, only brief information in an abbreviated form is recorded.

The ALGO database contains also the 200 research papers of the ACM Transactions on Mathematical Software (1975-1982).

2. 2 Application Fields and Programming Languages

These algorithms cover a wide range of computation fields. Table 2 shows the modified SHARE classification system, which is widely used for classifying algorithms, together with the number of ACM and CJ algorithms for each classification code. Table 3 shows the numbers of records (nearly equal to the numbers of algorithms) of the Index by Subject to Algorithms (1960-1980) with the SHARE codes in rows and the information sources in columns.

Table 4 shows the number of ACM and CJ algorithms for each publication year

Table 2 The modified SHARE classification system

		ACM	CJ
A 1	real arithmetic, number theory	32	5
A 2	complex arithmetic	3	2
B 1	trig and inverse trig functions	3	1
B 2	hyperbolic functions		
B 3	exponential and logarithmic functions	3	
B 4	roots and powers	3	
C 1	operations on polynomials and power series	11	1
C 2	zeros of polynomials	14	1
C 5	zeros of one or more nonlinear equations	17	4
C 6	summation of series, convergence acceleration	13	1
D 1	quadrature	34	2
D 2	ordinary differential equations	9	1
D 3	partial differential equations	10	
D 4	differentiation	2	
D 5	integral equations	3	2
E 1	interpolation	17	8
E 2	curve and surface fitting	27	5
E 3	smoothing	4	
E 4	minimizing and maximizing a function	14	7
F 1	matrix operations, including inversion	31	4
F 2	eigenvalues and eigenvectors of matrices	22	2
F 3	determinants	5	
F 4	simultaneous linear equations	36	8
F 5	orthogonalization	3	
G 1	simple calculations on statistical data	8	3
G 2	correlation and regression analysis	5	1
G 5	random number generators	15	1
G 6	permutations and combinations	29	5
G 7	subset generators	4	4
H	operations research, graph structure	44	13
I 5	input-composite	3	
J 6	plotting	8	7
K 2	relocation	3	
L 2	compiling	1	
M 1	sorting	20	11
M 2	data conversion and scaling		1
O 2	simulation of computing structures	4	
R 2	symbol manipulation	2	
S	approximation of special functions... Functions are classified S01 to S22, following Fletcher-Miller-Rosenhead index of math. tables	105	4
Y 1	physics applications		
Z	all others	29	10

unit : algorithms

Table 3 SHARE codes and information sources of the Index by Subject to Algorithms (1960–1980)

	AL	AS	BT	CA	CB	CC	CH	CJ	CP	HA	IC	JC	MC	NM	SN	TO	ZM	SUM
A 1			2	30				6	2					1		2	1	44
A 2			1	3				2										6
B 1			3	3		1								5			1	13
B 2			2															2
B 3			1	3										2				6
B 4				3														3
C 1				9			1	1								1		12
C 2			3	13				2	2				1			1	2	24
C 5			6	13				5	6	2			1		1	3		37
C 6		3	3	12			1	3	2					1		1		26
D 1		1	2	34				5	7				2	4			1	56
D 2				5				3	1					2		3	1	15
D 3			1	2		3				1			1	5		6	1	20
D 4			1	1										1				3
D 5				3		2		2	1					1		1		10
E 1		2	1	13				10	6	1				1	1	4	3	42
E 2		4	1	23		3		6	1	1		1		7	1	5	1	54
E 3		1	1	3										1		1		7
E 4		4	1	10	2	1		6	1	4						4	3	36
F 1		9	2	24		1		4	6	2	1	1	2	10	1	6		69
F 2	1		3	12		2		8					2	18		7	1	54
F 3		1		5														6
F 4		3	5	25		1		15	2	5		1	1	8		10	2	78
F 5		3		2					1									6
G 1		67		6	1	2		2	1							1	6	86
G 2		19		5		1		2	4								3	34
G 5		4		15	1	2		1	1			3						27
G 6		2	2	28	1	1		8	1				1			1		45
G 7		2		4				4	1									11
H		5	7	40	1	2		15	28			2	1	1		5	15	122
I 5		1		3		1												5
J 6		7		9		5		8	1	1						1		32
K 2		4		3													1	8
L 2		2	3	1				2				1						9
M 1		1		21	1			10				4						37
M 2				1		1		1										3
O 2		2	1	4					1									8
R 2			3	2		1		1										7
S		20	7	99	1	3	1	3					1	20		10	2	167
Y 1				1		291												292
Z		1	3	23	1	11		11	3				1			8	2	64
SUM	1	168	65	516	9	335	3	146	79	17	1	13	14	88	4	81	46	1,586

unit : records (≈ algorithms)

Table 4 Number of ACM and CJ algorithms for years and programming languages

year	ACM algo.	AL	FT	PL	AS	CJ algor.	AL	FT	MT
1960	30(36)	30							
1961	43(67)	43							
1962	76(140)	76							
1963	69(143)	69							
1964	27(61)	27				9(16)	9		
1965	27(48)	27				for 1964 and 1965			
1966	21(36)	21				6(7)	6		
1967	25(41)	25				16(23)	16		
1968	25(38)	23	2			5(6)	4	1	
1969	24(57)	17	8			8(13)	6	2	
1970	35(67)	27	8			18(25)	14	3	1
1971	15(19)	8	7			10(15)	7	3	
1972	22(39)	3	19			4(6)	4		
1973	33(55)	12	19	2		5(5)	3	2	
1974	16(34)	4	12			4(8)	2	2	
1975	10(25)	1	7	2		6(9)	3	3	
1976	12(26)	1	11			2(2)		2	
1977	13(18)	1	12			7(8)	2	5	
1978	12(18)		12			6(7)	2	4	
1979	10(19)		10		1	4(5)	2	2	
1980	19(21)		19			1(1)		1	
1981	16(19)		16			2(2)	1	1	
1982	11(18)		11			1(1)	1		
	591(1,045)	415	173	4	1	114(159)	78	25	1

unit : algorithms, and records including certifications, remarks, etc., for ( )

together with the classification by programming languages, where AL, FT, PL, AS and MT mean the ALGOL, FORTRAN, PL/1, Assembler and Meta languages, respectively. The FORTRAN program first appeared in 1968, and increased in number explosively in the case of ACM algorithms.

3. Implementation of ALGO on ORION

We have implemented the ALGO system on the HITAC VOS3 information retrieval system ORION.

The ALGO database consists of records each corresponding to a document, and the record consists of fields shown in Table 5 (definition by DDL : Data Definition Language). The CR categories and subject descriptors are employed in the ACM articles and form a tree structure covering the whole field of computer science. The CR general terms are ten and seyeral ones applicable to any element of the classification tree such as algorithms, design, documentation, economics, etc. Each record of Index by Subject to Algorithms (1960-1980) has only two fields of DN and SU ; the latter is not shared by records of the other sources and contains a simplified form of information corresponding to AN, TI, JO, VO, PA, YE, SH and PL. The field types S and KEY mean the character string and the unique accession number,

Table 5 Field definition of the record of ALGO database

no	name	type		prefix		output label	contents
1	DN	S KEY				D DOC NO	document number
2	AN	S	INDEX	AN:		D ALG NO	algorithm number
3	TI	S	INDEX	TI:	KE:	D TITLE	title
4	AU	S	INDEX	AU:		D AUTHOR	authors (affiliation)
5	JO	S	INDEX	JO:		D JOURNAL	journal
6	VO	S				D VOLUME	volume
7	NU	S				D NUMBER	number
8	PA	S				D PAGE	page
9	YE	S	INDEX	YE:		D YEAR	year
10	RE	S				REFERENCE	references
11	SH	S	INDEX	SH:	KE:	D SHCODE	SHARE classification codes
12	CA	S	INDEX	CA:	KE:	D CATEGORY	ACM CR categories and subject descriptors
13	GT	S	INDEX		KE:	D G TERM	ACM CR general terms
14	KE	S	INDEX		KE:	D KEYWORD	additional keywords and phrases
15	AB	S				ABSTRACT	abstract
16	PL	S	INDEX	PL:	KE:	D P LANGUAGE	programming languages
17	SU	S	INDEX	SU:		D BY SUBJECT	index by subject to algorithms (1960–1980)

```
DOC NO        1041
ALG NO        ACM ALGORITHM 590
TITLE         DSUBSP AND EXCHQZ: FORTRAN SUBROUTINES FOR COMPUTING
              DEFLATING SUBSPACES WITH SPECIFIED SPECTRUM
AUTHOR        VAN DOOREN P. (STANFORD UNIVERSITY)
JOURNAL       ACM TRANSACTIONS ON MATHEMATICAL SOFTWARE
VOLUME        8
NUMBER        4
PAGE          376-382
YEAR          1982
SHCODE        F4
CATEGORY      G.1.3 (NUMERICAL ANALYSIS): NUMERICAL LINEAR ALGEBRA -
              EIGENVALUES; G.M (MATHEMATICS OF COMPUTING):
              MISCELLANEOUS - FORTRAN
GTERMS        ALGORITHMS
KEYWORD       GENERALIZED EIGENVALUES, QZ ALGORITHM
P LANGUAGE    FORTRAN

DOC NO        1645
BY SUBJECT    F4   27 LIN EQ WITH SYS NON-DEF MATRIX     BT,10-70(386)

DOC NO        1962
BY SUBJECT    F4  408 SPARSE MAT. PACKAGE (PART 1) (F)   CA,14-71(265),16-73(311),
                                                            16-73(578)
```

Fig. 1 Examples of the records of ALGO database

respectively. Index terms are extracted from the fields denoted by INDEX. Symbol "D" in the output label denotes the default fields for display. Fig. 1 shows some examples of the records of the ALGO database.

ORION is an information retrieval system with inverted files, to which some commands have been added using the ORION's run module call function. Table 6 shows the user's commands of the ALGO/ORION system. The parentheses indicate the alternative command names defined by DDL.

Table 6 User's commands of the ALGO/ORION system

session control	
ALGO	start retrieval
QUIT(Q)	end retrieval
RESTART	change database
SET	set options
search and output	
ADDRESS	address assignment of the offline print
DISPLAY(D)	display the retrieved set
EXPAND	expand search
FIND(F)	index search and range search
PRINT	offline print of the retrieved set
SCAN(S)	sequential search in the retrieved set
SORTO	sort the retrieved set
TITLE	title assignment of the offline print
auxiliary	
?	ask information about the system
CLOOK	display cpu and elapsed time
LIST	ask information about the system
LOOK(L)	display index terms
PROFILE'S	commands for using profiles (a stored set of commands)
REPORT'S	commands for report making with some data processing
RUN	call user's programs
run module	
HELP	ask information about the system
PROGRAM	program operation by HITAC VOS3 TSS commands
TERM	ask information about technical terms

4. Usage of the ALGO System

ORION produces a set of hit-records, each with a sequential number, which satisfy the given search conditions. Users assign the set numbers for set operation, output of the contents of the records, etc.

4. 1 Search and Display

The basic commands for searching data are FIND and SCAN : the former is for a high speed index search using the inverted file and the latter is for a sequential search with various search conditions for the contents of the specified fields of the specified set of records. The main part of their syntax is :

— FIND(F) —
function : index search
syntax : FIND(F) { indexsearchterm / setnumber } [{ AND NOT / AND / OR } { indexsearchterm / setnumber }] ...
operands : indexsearchterm=[indexprefixdelimiter]⟨string⟩
example : FIND KE: LINEAR
FIND 1 AND AU: RICE J.
FIND LINEAR* OR KE:*LINEAR

— SCAN(S) —
function : sequential search
syntax : SCAN [setnumber] [NOT] sequentialsearchterm
[{ AND NOT / AND / OR / ALSO } sequentialsearchterm] ...
operands : sequentialsearchterm=
(1) field operater [⟨string⟩[,⟨string⟩...]]
(2) field ⟨string⟩ [operator ⟨string⟩]
operators=(1) EQ,=, NE, PR, AB, INCLUDE, INC, blank, SS, SF, etc., to assign the relation between the specified terms and the contents of database records
(2) W=n, W⟨n, W⟩n, ADJ, C=n, C⟨n, C⟩n to assign the relation between the specified terms
example : SCAN 7 TI SYMMETRIC*
SCAN 7 TI PARTIAL ADJ DIFFERENTIAL

Partial match condition is available with the symbol " * " which means arbitrary character string. In the SCAN commands, the other symbols " @ " (an alphabet), " | " (a numeral), " $ " (an alphabet or a numeral), " _ " (a non-alphanumeral) and " ? " (an arbitrary character) are available, too likewise. If no prefix is given in the index search command, " KE : " is adopted by the system.

ORION has some special search functions using a set of records as a part of the search conditions. They are for universe searches when restricting the range of search within a specified set of records, for hierarchical searches when making AND operation automatically between the current and most recent sets, and for expand searches when classifing a specified set of records with the values of specified field and searching whole database according to the classification.

The contents of the records, resulting from these various types of search requests, are displayed with the following command :

— DISPLAY (D) —
function : display the contents of the specified recoreds of the specified set
syntax : DISPLAY[=setnumber] [field, [field]... / ALL] [FOR integer / ALL]
examples : DISPLAY
DISPLAY=10 TI, AU, JO, YE FOR 1

Default values are the current set number, the fields denoted by " D " in Table 5 and all records in the specified set, respectively.

4. 2 Auxiliary Retrieval Assistance

ORION has many auxiliary commands for retrieval assistance such as using profiles (a stored set of commands), requesting information about the system and its usage, report making, calling programs called run modules, etc. Especially, before

starting index search, it is recommended to display the list of index terms with the following LOOK command:

— LOOK (L) —
function : display the specified number of index terms near the specified character string
syntax : LOOK [(integer)] [⟨string⟩]
examples : LOOK AU: RICE*
LOOK (10) KE:* linear

Default values are the number difined by DDL and the search term used most recently.

Users can get the information about the system with the LIST and "?" commands by specifying the topics prepared by ORION. But, the information available with these commands is sometimes insufficient because of lacking some important information about the system. Thus, we have added two following run module commands. One is the HELP command, which is based on the user's manual stored on the disks, for online reference to the information such as list of topics available, information sources and contents of the database, definitions of the fields of the record, classification codes, usage of the main commands, and the offline print of the manual. The other is the TERM command, which is based on the online dictionary of about 11 thousand technical terms collected from mathematics and computer science, for finding correct spellings of the technical terms and their related terms, their information sources, etc.

4. 3 Source Programs

FORTRAN, PL/1 and some ALGOL programs of the ACM algorithms stored on the disks are available with the PROGRAM run module command. This command has an interface to a TSS command execution, then almost all processings by the HITAC VOS3 TSS commands including listing and copying of all of these programs and compiling, linking and running for FORTRAN and PL/1 programs are available, in principle. But, users must, in advance, make all preparations such as input data, driver routine, etc.

5. Example of the ALGO Retrieval

The system becomes effective on user's requests which are given explicitly by the names of the methods used in the algorithms and a set of classification codes and keywords representing the properties of the algorithms and problems to be solved.

Fig. 3 shows an example of the ALGO retrieval. Underlines show the input parts. Brief explanation of the example is as follows:

(1) Start of the ALGO retrieval.

(2) Index search for the records with the index search term "AU : RICE * ". Here, the symbol " i/ " is the prompting from the system demanding the input of

```
ALGO                                                              ( 1)

*****************************
* WELCOME TO ALGO           *
* LAST UPDATE DATE = 830712 *
*             TIME = 124136 *
* NO OF RECORDS = 3009      *
*****************************

ENTER YOUR REQUEST
   1/ FIND AU:RICE*                                               ( 2)
*       3    1/  AU:RICE (2 TERMS COMBINED)
   2/ LOOK (2) AU:RICE*                                           ( 3)

  .ITEMS.    TERMS
A       1  AU:RICE H. G.
B       2  AU:RICE J. R.
***** END OF INFORMATION *****
PICK LETTERS TO COMBINE
   2/ B                                                           ( 4)
   2 ITEM SAVED AS SET 0
CONTINUE PICKS OR REQUESTS
   3/ DISPLAY TI,JO FOR 1                                         ( 5)

ITEM 1

TITLE       ADAPT, ADAPTIVE SMOOTH CURVE FITTING
JOURNAL     ACM TRANSACTIONS ON MAHTEMATICAL SOFTWARE
   3/ HELP                                                        ( 6)

**** START OF HELP ****
AVAILABLE TOPICS:
   TOPICS ALGO DATABASE FIELDS SHCODE CATEGORY ORION
   COMMANDS FIND(F) SCAN(S) LOOK(L) DISPLAY(D) PROGRAM HELP TERM QUIT(Q)
   MANUAL (TO PRINT USER'S MANUAL) END (TO END HELP)

WHICH TOPIC ?
FIELDS                                                            ( 7)
NO NAME TYPE          PREFIX   OUTPUT LABEL  CONTENTS
------- ----------    -------  ------------  --------------------------
 1 DN   S KEY                  D DOC NO      DOCUMENT NUMBER
 2 AN   S     INDEX    AN:     D ALG NO      ALGORITHM NUMBER
 3 TI   S     INDEX    TI: KE: D TITLE       TITLE
  :

WHICH TOPIC ?
SHCODE                                                            ( 8)
  :
F4  SIMULTANEOUS LINEAR EQUATIONS
E1  INTERPOLATION
  :

**** END OF HELP ****

   3/ FIND SH:F4                                                  ( 9)
*       57    3/  SH:F4
   4/ FIND LINEAR AND EQUATION*                                   (10)
*      132    4/  LINEAR

*      152    5/  EQUATION (2 TERMS COMBINED)
*       54    6/  LINEAR AND EQUATION*
   7/ FIND 3 AND 6                                                (11)
*       25    7/  3 AND 6
   8/ FIND 6 AND SYMMETR*                                         (12)
*       31    8/  SYMMETR (2 TERMS COMBINED)
*        3    9/  6 AND  SYMMETR*
  10/ SCAN  9 TI POSITIVE ADJ DEFINITE*                           (13)
*        1   10/  SCAN  9  TI POSITIVE ADJ DEFINITE*
  11/ DISPLAY                                                     (14)
```

```
ITEM 1

DOC NO       934
ALG NO       ACM ALGORITHM 512
TITLE        A NORMALIZED ALGORITHM FOR THE SOLUTION OF POSITIVE
             DEFINITE SYMMETRIC QUINDIAGONAL SYSTEMS OF LINEAR
             EQUATIONS
AUTHOR       BENSON A. AND EVANS D. J. (LOUGHBOROUGH UNIVERSITY OF
             TECHNOLOGY, ENGLAND)
JOURNAL      ACM TRANSACTIONS ON MATHEMATICAL SOFTWARE
VOLUME       3
NUMBER       1
PAGE         96-103
YEAR         1977
SHCODE       F4
CATEGORY     5.14, 5.17
KEYWORD      LINEAR EQUATIONS, NORMALIZED SOLUTIONS, PERIODIC
             QUINDIAGONAL, SYMMETRIC POSITIVE DEFINITE
P LANGUAGE   FORTRAN

  11/ PROGRAM                                                    (15)

**** START OF PROGRAM ****
ENTER THE ACM ALGORITHM NUMBER
512                                                              (16)
DATASET NAME OF THE ACM ALGORITHM 512 IS 'MO0620.ACM.PROG(A512)'

ENTER THE TSS COMMAND OR END
LIST 'MO0620.ACM.PROG(A512)'                                     (17)
C ACM ALGORITHM 512
      SUBROUTINE FACTOR(A, B, C, G, H, N)
C THE SUBROUTINE IS A NORNALIZED FACTORISATION OF A SQUARE MATRIX OF
C ORDER GREATER THAN 4.
C THE COEFFICIENT MATRIX P IS SYMMETRIC, POSITIVE DEFINITE AND
C QUINDIAGONAL WITH NON-ZERO ELEMENTS ALSO IN THE LAST TWO COLUMNS OF
  :

**** END OF PROGRAM ****

  11/ QUIT                                                       (18)

***************
* END OF ALGO *
***************
```

Fig. 2 Example of the retrieval of ALGO system

command; "i", which increases by 1, is given to the set of hit-records resulting from the corresponding search.

(3) Display of two index terms which start with "AU: RICE".

(4) A record set is created for the index search term "AU: RICE J. R.".

(5) Display the title and journal of the first 1 record of the current record set.

(6)-(8) Display of the database fields and modified SHARE classification codes with the HELP command.

(9)-(13) The record set 10, which consists of only one record, result from the two index searches (10) and (12) and one sequential search (13) with the following condition: One of the fields with the prefix "KE:" has the terms of "linear", "equation *" and "symmetr *", and the title has the phrase of "positive definite *".

(14) Display of the contents of the records of the current set.

(15)-(17) Display of the source program of the ACM algorithm 512 by the PROGRAM command.

(18) End of the ALGO retrieval.

6. Concluding Remarks

We have implemented the ALGO system on ORION, which can provide the information about up-to-date quality computational algorithms and some of their source programs to be used in a wide range of scientific field corresponding to user's requests with various motivations. The ALGO system aims mainly at assisting general users of algorithms in solving their specific problems by computers. However, the system will be useful also for the researchers of algorithms because it offers an original information source required for analysis of the existing algorithms and development of new ones.

We are now preparing to make the ALGO system open to general users at Hokkaido University Computing Center. Updating of the database will be made every year.

Aknowledgement

The authors wish to thank Mrs. A. Mochida and Mrs. Y. Nakayama (Hokkaido University Computing Center) for their kind help in constructing the database and the system, and to Mr. M. Chiba (Hokkaido University Computing Center) for his useful discussion at an early stage of the progress of this work. Thanks are also due to Prof. M. Kitamura for his careful and patient reading of the manuscript.

References

[1] Amano, K. and Maeda, T : Bull. Faculty Engrg., Hokkaido Univ., in this issue.

[2] HITAC VOS3 manual (8090-6-502), Hitachi Ltd. (in Japanese).

[3] HITAC VOS3 manual (8090-6-503), Hitachi Ltd. (in Japanese).

[4] Rice, J. R. : Mathematical Software (ed. Rice, J. R.), 13-25, Academic Press, 1971.

[5] Chan, T. F., Coughran, W. M. Jr., Grosse, E. H. and Heath, M. L. : ACM Trans. Math. Softw. **6**(2), 135-145, 1980.

[6] Blain, G., Labarthe, A., Rault, J. -C., Sciardis, M. and Zamansky, P. : Information Processing **74** (ed. Rosenfield, J. L.), 547-551, North-Holland, 1974.

[7] Bever, M., Gaube, W., Lockemann, P. C. and Mayr, H. C. : Database Management : Theory and Applications (ed. Holsapple, C. W., et al.), 107-130, D. Reidel Pub. Co., 1983.

[8] Amano, K. and Mochida, A. : in preparation for Center News, Hokkaido Univ. Computing Center. (in Japanese).