

A RETROSPECTIVE OF A COMPUTERIZED CONGRESS SUPPORT SYSTEM FOR IFAC-81, KYOTO JAPAN

BY

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ABSTRACT

This article described our experience on a computerized congress support system which we developed and exploited successfully for IFAC-81 World Congress that was held at the Kyoto International Conference Hall in Kyoto, Japan. A Registrant and a Paper Database were built as two major constituents of the system that was under a control of our own Database Management System. The congress support system was fully exploited before, during, and after the congress. These and other related issues are retrospectively reviewed in some detail.

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1. INTRODUCTION

We developed and exploited successfully a computerized information system for 8th IFAC Triennial World Congress which was held from August 24 to 28, 1981, at the Kyoto International Conference Hall in Kyoto, Japan. IFAC, the International Federation of Automatic Control, founded in 1957, is a world-wide federation which has 40 national member organizations representing the scientific and engineering societies of each country.

IFAC-81 was a big congress. As shown by Table 1, it enjoyed more than 1,600 attendants from 46 countries. It had 116 Technical and 7 Plenary Sessions, 7 Case Studies, 16 Round Table Discussions, 10 Film Sessions, 5 Technical Visits, and 15 Exhibition by leading firms of Japan. The preprint of the congress contained more than 600 papers and ran to 4000 pages. Besides such technical features, numerous social and cultural activities were offered to introduce the cultural aspects of the country and its former capital, Kyoto[1].

One year prior to the congress, the Japan National Committee was apprehensive of organizing such a big congress by traditional means which were fully dependent on man power. The National Committee then asked us to develop a computerized congress information system to support IFAC-81, and we started the project early 1981.

The information system which would exploit modern database technologies was expected to have advantages in the following points over the traditional means.

(1) Efficiency: The database offers an efficient tool of making mailing labels, name cards, lists of attendants and papers, authors catalogue, keyword index, etc. Any information relevant to requests from users can be retrieved and stored in seconds. The printout can be in convenient formats.

(2) Flexibility: A variety of inquiries are made by users including National Committee, Local Working Groups, Secretariat, and attendants at the congress, etc. The flexibility of the database system can cope with this manifold situation. For instance, the list of registrants with the same names, or the top ten of the fields of interest of registrants can be obtained easily.

(3) Maintainability & Correctness: Data about registrants and papers are centered at the data base, and they can be maintained systematically; the data formats can be updated in a unified way and be prevented from getting scattered and lost; errors of the data are located and fixed easily; data formats can be standardized.

(4) Interoperability: Various groups of people are involved in organizing the congress. These groups work on different objectives such as editing session programs, processing registration forms, preparing for social events, etc. They are likely to pursue their own interests and lack communications among them. This kind of sectionalism is a source of troubles. The joint ownership of the information through database improves the situation. For instance, technical papers which lack speakers can be identified easily for people in charge of technical sessions by linking two sets of data about authors and registrants.

(5) Reliability: The computerized information system performs its intended functions more precisely than traditional means; the latter often incurs human error in processing general accounts and statistical data.

(6) Reusability: The information system is not specific to IFAC-81. It can be used for other congresses; as a matter of fact the Hungary National Committee is considering using the same system as a possible choice for IFAC-84 in Budapest.

In contrast to the advantages mentioned above, we were also aware of the following disadvantages which would have to be reduced to achieve a successful use of the information system.

(1) Data Input Error: Initial version of source data to construct the database can not be free from error. A tiny mistake about a mailing address may cause a problem afterwards. Some software supports must be invented to identify and correct the error.

(2) Large Source Data: A big congress like IFAC-81 involves a large amount of source data about registrants and papers. It calls for much hard work to make the information into machine-readable forms. Text editors and file-merge techniques must be utilized at least.

(3) Software & Hardware Reliability: A bug hidden in a piece of software is sometimes enough to destroy the database and all the indispensable data may be lost. The same consequence can happen through failures of hardware such as computer, disk or telephone lines. Redundant database configurations and bookkeeping of database history must be proved against such contingencies.

(4) Operability: When the system has poor operability, many operator errors occur and the IFAC-81 people may finally give up using it. The operating procedures of the information system must be very simple ones, and some software interlocks should be provided to nullify possible operator errors.

We describe in the remainder of this paper how the information system was developed and exploited for IFAC-81. Section 2 outlines the system. Two major databases and their tag (or field) are discussed. Resources and overall procedures for building and accessing the databases are briefly discussed. We then describe in section 3 our Database Management System (DBMS), principal software. The building procedure of the databases are presented in section 4 in some details. Section 5 describes how the information system was actually exploited before, during and after IFAC-81.

2. OUTLINE OF CONGRESS INFORMATION SYSTEM

2.1 Registrant/Paper Databases

The registrants and papers are two major elements of the congress. Accordingly, we developed a Registrant Database and a Paper Database as two cores of the information system. This dualism facilitated building the system and improved its reliability; the two databases could be built independently; failures of one database did not influence the other. The two databases were designed to be retrieved in an inter-connective way, regardless of the dual configuration. For example, technical papers with the authors not yet registered for the congress could be retrieved.

Table 2 shows 38 tags for the Registrant Database. Each tag assume one or more values (or occurrences). A whole set of values of these tags characterizes a particular registrant and forms one record of the database.

The tags except for MA (Mailing address), NA (name of accompanying persons), TA (travel agency) and C (comments) were inverted tags. An inverted file similar to an author catalogue at libraries was created for the inverted tags: a set of registrants relevant to a given tag value could be retrieved directly by the inverted file. For non-inverted tags, on the other hand, a sequential search was required. We make here some brief comments on the tags in Table 2.

(1) NO: Each registrant was given a unique registration number. Its numbering was made sequentially according to the order of receipts of registration forms.

(2) TS: The values of this tag indicated the Technical Sessions, Case Studies, or Round Table Discussions the registrant had intended to attend. This information, for instance, could be used to determine session rooms of different sizes by examining expected numbers of attendants at the sessions.

(3) FI: Each registrant was requested to write down on the registration form his/her fields of interest; a standard keyword catalogue was attached to the form to facilitate the selection of the fields. Some session chairmen were assigned, based on this information. A subset of registrants who had the same fields of interest could be retrieved on-line at the congress site, facilitating human communications.

(4) RF: Possible tag value were; D0 (invitation); D1 (ordinary fee for early registration); D2 (ordinary fee for late registration); S1 (student fee for early registration); S2 (student fee for late registration).

(5) AP: This was the number of accompanying persons of each registrant. The fact that n accompanying persons existed was denoted by AP*n. This was simplified to AP for one accompanying person. The tag was empty for the registrant without the accompanists. Similar notation was used whenever it was required to express numbers of this type. The names of the accompanying persons were registered under the tag NAP.

(6) PP: The preprint of the papers consisted of 25 handy separate volumes. Each volume contained about 160 pages. The volumes were gathered into three groups; part A, part B and part C. The tag value indicated the parts the registrant wanted to receive via airmail in advance to the congress.

(7) AC: There were three area codes for the airmail service of the preprint. The value 1*2, for example, showed that two out of the three parts had to be sent to the area code 1, the area comprising Australia, Korea, China and South East Asia.

(8) SE, CA, TV, PT: The symbol SE2*3 indicated that 3 persons would attend at Social Event 2, i.e., the banquet. Similar notation applied to CA, TV and PT.

(9) HN, HD: The hotel name finally reserved for the registrant became the value of tag HN. The value of tag HD, on the other hand, was the hotel name the registrant had intended to stay at. A letter of explanation was sent to the registrant when a hotel different from his/her desire had been reserved.

(10) TO: This was the total amount of the registration fee. When the amount calculated by the registrant turned out incorrect, the prefix P standing for 'Private Calculation' was attached to the incorrect amount. The correct amount also became a value.

(11) ST: This tag indicated overall status of the registration. For example, when the registration was cancelled, the value C was recorded under tag ST. A double registration could be processed similarly, canceling appropriate one of two. A date of check in at a registration desk was another example of the tag value.

(12) HST: Table 3 shows values of tag HST (human status). Particular information about the registrant was recorded under the tag. When the registrant was an author of some papers accepted for the congress, the corresponding paper ID numbers were written here to link the registrant with the Paper Database.

(13) MST: Possible values of this tag were; P (paid exactly); L (paid less); M (paid more); U (not paid). Some values of the tags in Table 2 could be determined upon receipt of the registration form, while others could only be specified after the hotel reservation or the arrival of the registration fee, etc. Accordingly, the Registrant Database had to be updated continuously. This was done by the five people of the IFAC-81 Secretariat at the Kyoto International Conference Hall.

Tags for the Paper Database are shown in Table 4. Each paper was characterized by a set of values of three tags. The authors of the paper were asked to select appropriate keywords from a standard catalogue, the same one as in the case of the Fields of Interest. The keywords selected were recorded under tag KE. In this way it became possible to retrieve a set of papers relevant to the fields of interest of a particular registrant. The session name, SS, were useful in guiding the attendants into the session of interest to them. The VOL and PA were required to locate the papers in the 4000 page preprint. The Paper Database was built by two people of an IFAC-81 Local Working Group.

2.2 Procedural Aspects

Fig. 1 shows some procedural aspects of building and exploiting the Registrant Database. Similar procedure was taken for the Paper Database.

The source data were fed into the database either from a seed file or from a typewriter terminal by manual input. The seed file was used when a large amount of data had to be fed. The file was

classified into the three categories:

- (1) Seed file for initial data input for each registrant.
- (2) Seed file for insertion of new data.
- (3) Seed file for deletion of old data.

A sophisticated text editor was available for the efficient preparation of the seed files. Several computer programs were written to check the correctness of the seed files. This facilitated the proof reading of the source data and prevented incorrect data from entering the database. For instance, the registration fee calculated by the registrant was checked and exact fee was generated when the calculation turned out to be incorrect; when the source data violated standard data formats, the fact was displayed on the terminal. The seed file were normalized into suitable forms, and the resulting files were fed into the databases. The database was updated by manual input at the typewriter terminal for small amount of insertion/deletion.

The database updating history was kept in disk and a copy of the database was made every week. The current database was duplicated whenever it was required to change the contents of the database. Safety interlocks preventing erroneous copy operations etc., were kept secret from users. The database in this way was protected from possible hardware/software failures and operator errors.

Through on-line terminals, the database was retrieved by users such as IFAC-81 Secretariat, Japan National Committee, Local Working Group, etc., facilitating the preparation of the congress. Other users included the attendants at the congress site during the congress.

2.3 Resources

Table 5 summarizes human, hardware, software and monetary resources for the development and exploitation of the information system. We could enjoy special discount fee for the CPU time and the use of the disks.

3. DATABASE MANAGEMENT SYSTEM

A software, called DataBase Management System (DBMS), was required to create and retrieve the database. At the start of the project, we had intended to use a commercial DBMS. However, we had to give up this line because of some difficulties in modifying large scale software to be suitable for our purpose. Other reasons included budgetary considerations, availability of the DBMS, our lack of experience on such DBMS, and finally problems of rescuing the system from contingencies. We decided to develop our own DBMS. It was about ten months prior to the congress.

3.1 File Organization

The DBMS manages seven direct access files. Among them, KEY and INVERT constitute an inverted file, while FIRST and OUT a master file. The remaining three ones are work file used during the retrieval phase of ten databases. The database itself thus consists of the first four files, as shown by Fig.2. We now briefly discuss these files.

(1) KEY: A value of an inverted tag is either a word or phrase. The latter comprises two or more words connected by hyphens. Thus, PROF or OPTICAL-CONTROL are both examples of the value.

The KEY file is a balanced tree[2]. It houses the values of the inverted tags, their reflections, and the constituent words of the phrases. The symbols '&' and '+' are prefixed respectively to the reflections and the constituent words in order to distinguish them from the original tag values. For example, the following character strings are stored in KEY for the value of OPTIMAL-CONTROL as a field of interest:

OPTIMAL-CONTROL	FI:
+OPTIMAL	FI:
+CONTROL	FI:
&LORTNOC-LAMITPO	FI:

The character strings prefixed by '&' and '+' are utilized in backward-coincidence and word-coincidence retrievals, respectively.

The KEY file also houses the pointers PK-1 towards INVERT and the total number N of records (or registrants/papers) relevant to each string, as shown by Fig. 2.

Fig. 3 illustrates a balanced tree for 30 number strings {1, 2, ..., 30}. The number 22 can be located in the following way:

- At the root of the tree, we see that 22 is greater than 20. Thus, we follow the right pointer downward, reaching node A.
- At node A, we see that 22 is smaller than 23. Thus, we follow the left pointer downward, reaching leaf B.
- The number 22 can be located finally by a (binary) search in leaf B.

Fig. 3 is a balanced tree with the degree of 2; we actually used a tree with the degree of 40 for our information system.

(2) INVERT: This file houses pointers PI-1 directed to itself and pointers PI-F towards FIRST. The former pointer traces a set of registration/paper ID numbers and takes on zero at the final ID number in the set, while the latter assumes an ID number in the set.

(3) FIRST: This file has pointers PF-O towards OUT. At the address equal to a registration/paper ID number, this pointer points the first address on OUT where the full information about the registrants/paper starts.

(4) OUT: This file houses the full information mentioned above. The whole data on a registrant/paper can be traced by the pointers PO-O which assume zero at the end of the data.

Fig. 2 also illustrates how registrants with the fields of interest of OPTIMAL-CONTROL can be retrieved. First, OPTIMAL-CONTROL is located on the balanced tree, KEY, in a similar way as in Fig. 3. It turns out that 3 registrants are relevant, i.e., $N=3$. The 3 registration numbers, {6, 1, 5} are written at the column PI-F of INVERT. The fact that $PK-I=13$ in KEY indicates that these registration numbers start at address 13 on INVERT. The INVERT is read at this address and then the pointers PI-I are traced, yielding the set of three registration numbers, {6, 1, 5}. This type of sets of ID numbers can be combined by boolean operations, AND, OR, NOT, producing new sets at the retrieval phase.

Detailed information about the 3 registrants can be found when we move to FIRST and OUT files. The pointers PI-F in INVERTED point a set of addresses {6, 1, 5} on FIRST. The pointer PI-O at these addresses, in turn, point a set of first addresses {1, 9, 13} where the full data about each of the registrants start in OUT. The detailed information can be obtained by tracing the pointers PO-O towards their zero value.

3.2 Software Organization

The DBMS consists of three main modules called NEVER, UPDATE and SEEK. These are written in PL/I. We also have as auxiliary constituents several application programs; these are, for instance, name card generating program and seed file error-check program. So called command procedures automate the allocation and duplication of files, the execution of the DBMS, etc. We now describe briefly the three main modules.

(1) NEVER: This initializes the database. The following information must be specified: (a) name of the database; (b) specifications of the balanced tree; (c) sizes of the files. The term NEVER implies that this module is executed only once and never be used again during the lifetime of a particular database.

(2) UPDATE: This loads the database with initial version of the source data and updates it hereafter. At the first trial of the load, the total number of tags, the tag names and the distinction between inverted and non-inverted tags are specified. The source data for loading or updating can be fed into the database either by the seed files or by manual input from a typewriter terminal. Main function of UPDATE are:

a) Insertion of new tag values,

- b) Deletion of old tag value,
- c) Addition of new tags,
- d) Listing tag values in alphabetical order,
- e) Dumping the master and inverted files.

(3) SEEK: This module retrieves the database. More than one user can simultaneously access the database under a TSS support. Table 6 summarizes commands available for SEEK.

4. BUILDING DATABASES

Fig. 4 is an example of the seed file. This contains the source data about registrant #98 at the time of receipt of the registration form. Fig. 5 shows a process of feeding the registrant into the database through UPDATE. Commands from a terminal are underlined.

Fig. 6-(a) is a seed file of additional data about the same registrant. This is normalized into a sequence of commands as shown in Fig. 6-(b). The result is then fed into the database in a similar way as in Fig. 5, updating the information about the registrant. Fig. 7 shows a sample of the database updating history that is kept in a file.

5. HOW THE SYSTEM WAS EXPLOITED

5.1 Before The Congress

The exploitation before the congress include:

- (1) Selection of session rooms of various sizes by examining the statistics with respect to tag SS, i.e., the sessions the registrants intended to attend at.
- (2) Selection of session chairmen and co-chairmen via field of interest.
- (3) Generation of list of registrants which was arranged in alphabetical order of names and was sorted by country. A list of 54 pages was distributed to the registrants just before the congress. An additional list containing the new registrants hereafter was distributed on the final day of the congress.
- (4) Generation of authors catalogue for the preprint. The authors were arranged in alphabetical order of their names. Paper titles, preprint volumes, pages and sessions could be identified easily, given an author's name. The catalogue became a part of the preprint.
- (5) Printing pressure sensitive mailing labels. Any sets of printed out. The labels were useful in mailing the preprint, confirmation letters and notices, to name just a few usages.
- (6) Printing colorful name tags that were classified into those for registrants, accompanying persons, secretaries, exhibition personnel, etc. An application program created the name tags by an X-Y plotter; the data from the database were used there. The name tags with too short or too long names could be made elegantly.
- (7) Printing name labels for pigeon boxes. These were arranged in alphabetical order and attached to the pigeon boxes one after another.

(8) Making statistical reports. The statistics were the numbers of registrants by country, affiliation, session, field of interest, registration fee, language, social event, cultural activity, technical visit, post congress tour, hotel name, hotel check in date, etc. The data were used in a variety of ways; reporting registration status to the Japan National Committee and Local Working Groups; reserving busses for cultural activities and technical visits; predicting final number of registrants; accelerating the registrations in particular areas; picking up executives persons at airport, etc.

(9) Retrieval of a subset of registrants for quick dispatch of registration business. For instance, the registrants who had paid less or more could be retrieved easily, and the registration business was transacted accordingly.

(10) Finding papers or sessions lacking speakers. This was done by linking the Paper Database with the Registration Database. The result was reported to a working group which was in charge of paper presentation.

(11) Packing briefcases for registrants. More than 25 items had to be packed for each registrant. They were tickets for various events, invitation letters to banquet for an executive registrant and his/her accompanying persons, an abstract volume in English, French, German or Russian, payment or payback form, watches as a IFAC-81 memento for accompanying persons, invitation letter to a limited reception hosted by the Japan National Committee, notices and letters of various kinds, etc. Items to be packed in the briefcase differed from registrant to registrant. Lists of items for the registrants were made in convenient formats and the packing was carried out efficiently. A pressure sensitive label summarizing the packing content for each registrant was attached to his/her envelope, facilitating the validation of the content.

(12) Supporting check in at registration desks. On presentation of the confirmation form at the registration desk, the registrant could receive his/her briefcase. When the registrant stayed at one of the 10 specified hotels, he/she could check in at the desk in that hotel one day before the congress. Those who did not stay at those hotels could check in at the desk in Kyoto Hotel on the same day. During the congress, the registration desk was open at the congress site. Our database system yielded the following lists to support the check in at different places and with diverse registrants.

a) [HN/NA/NO/CO/MST/RF/PP/PDA/AP/C/IN]: for Japanese and foreigners separately; in order of registration numbers.

b) [HN/NO/NA/CO/AF]: for registration desk at each hotel separately; in order of registration numbers.

c) [HN/NA/NO/CO/MST/RF/PP/PDA/AP/C/IN]: for Japanese and foreigners separately; in alphabetical order of registrant names. This was a master list to collect the results of registrants at the ten different places one day before the congress.

d) [HN/NO/NA/CO/AF]: in order of registration numbers. This was an another master list.

The two master lists were used for late check in at the registration desk during the congress.

5.2 During The Congress

An on-line information service called CAPS (Computer-Aided Participant Support system) was made available through five computer terminals at the congress site during the congress. By request of the attendants, the CAPS could provide manifold information about registrants, papers and sessions of IFAC-81. For example:

(1) Self-guided technical session tour schedule specially tailored in accordance with field of interest of a particular attendant. A sample output for the field of interest of COMPUTER-CONTROL ORed by DIGITAL-CONTROL is shown in Fig. 8. This kind of diagram was informative because more than 15 sessions including technical ones went in parallel at IFAC-81[3].

(2) IFAC-81 friends who had the same field of interest as an attendant did.

(3) List of papers which an attendant was surely interested in.

(4) IFAC-81 statistics such as

a) the numbers of registrants by country, by field of interest, by affiliation, etc.,

b) the numbers of papers by country, by keyword, by author's affiliation, etc.

c) the top ten technical sessions which had attracted so many registrants, or the top ten most popular field of interest.

(5) List of registrants by country, affiliation, session or by hotel, etc. People from countries with small delegates often wanted to have information about attendants from their countries. Industry people were interested in registrants and papers from their competitors. Session chairmen wanted to know registrants who intended to attend at their sessions.

These are only part of the information the CAPS gave to the attendants. We describe here somewhat funny usage, concluding the CAPS which was so successful.

(1) A list of Dept. of System Engineering. An attendant wanted to have the list in order to recommend several suitable university departments to a child of his friend.

(2) A signature on a discussion form was difficult to read. Only part of it was readable. The correct name was identified by the CAPS for a speaker of paper who brought the form.

(3) A university professor wanted to have a list of keywords. He intended to use it to select subjects of thesis for his students.

The Registrant Database was updated continuously during the congress as new registrants came. On the final day of the congress, a list of late registrants was made and distributed.

5.3 After The Congress

Several summary reports of big volume were distributed to the Japan National Committee, competent authorities, etc. An authors catalogue for the coming proceedings of IFAC-81 was edited. A keyword catalogue became available. The balance of accounts of the registration fee was calculated by the system. A list of typical keywords was sent to the editor of the IFAC Journal AUTOMATICA for revision of the existing keyword list.

6. COCLUSIONS

The congress information system was very successful, although there remain rooms for further improvements. They are, for example:

- (1) Reduction of secondary memory size required.
- (2) Simultaneous updating of the database by more than one user.
- (3) Simpler ways of executing popular sequences of commands.

The six advantages described in INTRODUCTION turned out to be true. Some negative points described there still persist to the extent that these are less significant than the advantages.

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Table 1 Outline of IFAC-81 Kyoto Congress

Duration:	August 24-28, 1981
Attendants:	1432 registrants and 190 accompanying persons from 46 countries
Papers:	611 papers were accepted
Events:	Opening Session, 7 Plenary Sessions, Closing Sessions, 116 Technical Sessions, 7 Case Studies, 16 Round Table Discussions, 10 Film Sessions, 5 Technical Visits, 15 Exhibitions, 2 Social Events, 5 Cultural Activities, 4 Post Congress Tours, Informal Meetings
Preprint:	25 separate volumes and total of 4000 pages more.
Abstracts:	157 pages in English, French, German and Russian

Table 2 Tags for Registrant Database

Tag Name	Implication	Examples of Tag Value
NO	registration number	0001, 1265
TI	title	PROF, DR, MR, MRS, MISS, MS
NA	name (first-last-initial)	SMITH-JOHN-M
AF	affiliation	UNIV-OF-HOUSTON
MA	mailing address	MR. JOHN M. SMITH DEPT. OF CHEM. ENGR. COLLEGE OF ENGR. UNIV. OF HOUSTON HOUSTON, TEXAS 77004, USA
CO	country	USA, USSR, GDR, UK, JAPAN
NAP	name of accompanying persons	MRS-SMITH-BETTY
TS	technical sessions, etc.	1, 12, CS1, RT2
FI	field of interest	MONTE-CARLO-MECHOD
RF	registration fee	D0, D1, D2, S1, S2
AP	number of accompanying person	AP, AP*2, AP*3
AV	language of abstract volume	E, F, G, R
PP	preprint parts	A, B, C
AC	area code	1, 2, 3, 1*2, 1*3
SE	social events	SE1, SE2, SE2*2
CA	cultural activities	CA1, CA2, CA6*2
TV	technical visits	TV1, TV2, TV5*2
PT	post congress tours	PT1A, PT1B, PT4*2
RT	room type	S, T, TR(triple)
RC	room charge	10000
HC	hotel class	A, B, C, D
HN	hotel name reserved	HOLIDAY-INN
HD	hotel name desired	KYOTO-HOTEL
IN	check in date	8.23
OUT	check out date	8.29
TA	travel agency	IFAC-TOURS
TO	total of registration fee	450000, P42000
C	comments	WITH A BABY
ST	registration status	C, 8.24
HST	human status	NOC, 025, TS-CH-115
MST	money status	P, L, M, U
MDA	money receipt date	4.29
MNA	money remitter name	KYOTO-STEEL-LTD
MAM	money amount of remittance	42000
MCH	money remittance charge	2000
MIN	net money input	40000
CDA	confirmation date	5.10
PDA	preprint mailing date	6.11

Table 3 Examples of Values of HST (Human Status)

Tag Value	Implication	Tag Value	Implication
EC	Executive Council	KOMMON	Advisory Committee
P-PRSD	Past-President	SHIMON	Consultative Committee
NOC	National-Organizing-Committee	PL-S	Plenary-Speaker
FB	Fund-Raising Committee	LOC-C	Local Organizing-Committee
IPC	International Programming Committee		Chairman
H-SEC	Honorary-Secretary	TS-CH-	Technical Session-Chairman
P-SEC	Past-Secretary	TS-COCH	Technical Session-Cochairman
AUTO-ED	Automatica-Editor	AUTH	First Author of Papers
S-FED	Sister-Federation-President	COAUTH	Coauthor of Paper
AC	Advisory-Committee	CS-CH-	Case Study-Chairman
PC	Policy-Committee	CS-COCH	Case Study-Cochairman
PAC	Public-Affairs-Committee	UNEI	Steering Committee
TC-CH	Technical Committee-Chairman	LOC-WG	Local-Working Group
TC-VCH	Technical Committee-Vice-Chairman	157, 301	Paper ID Numbers

Table 4 Tags for Paper Database

Tag Name	Implication	Examples of Tag Value
NO	paper ID number	001, 328
IC	same as above	
TI	title of paper	LEARNING CONTROL OF LINEAR SYSTEMS
SS	session	1, 12, CS1, RT2
SP	order of presentation	1, 2, 3, 4, 5, 6
DA	date of presentation	8.24
VOL	volume of preprint	1, 3, 20
PA	pages in preprint volume	25-30
AU	authors	LANDAU-K, ICHIKAWA-M
AA	authors affiliation	STANFORD-UNIV, TOKYO-UNIV
NAA	nationality of authors	USA, JAPAN
NA	nationality of paper	USA
KE	keywords	LEARNING CONTROL, LINEAR-SYSTEMS
AB	abstract	E, F, G, R
TI	cancel information	C

Table 5 Resources used for Congress Information System

1. Human		
Software Development:	4 persons	
Building Registrant Database	5 persons	
Building Paper database	2 persons	
Operation of CAPS	7 persons	
2. Hardware		
Computer	Big commercial computer	
User Area	512 KB	
Disk Memory	100 MB	
Mass Storage System	200 MB	
Terminal	5 on-line terminals	
3. Software		
DBMS	6000 PL/I statements	
Applications	1500 PL/I statements	
Others	TSS support, Text editor, etc.	
4. Expenses		
CPU time fee	300000 yen	
Secondary memory fee	150000 yen	
Software Development	600000 yen	
Expendables	100000 yen	
Others	200000 yen	
5. Sources		
Japan National Committee	1350000 yen	

Table 6 Commands for Retrieval Module SEEK

Commands	Function
BEGIN	start SEEK
END	terminate SEEK
HELP	describe command usages
EXPAND	display tag value in alphabetical order
PIVOT	a version of EXPAND
ELEMENT	a version of EXPAND
SELECT	complete coincidence retrieval
FORWARD	forward coincidence retrieval
BACKWARD	backward coincidence retrieval
WORD	word coincidence retrieval
PARTIAL	partial coincidence retrieval
RECORD	retrieval by ID numbers
TAG	empty tag retrieval
COMBINE	AND, OR, NOT operations
ASCEND	sort in ascending order
SORTA	a version of ASCEND
DESCEND	sort in descending order
SORTB	a version of DESCEND
DISPLAY	display history of retrieval
TAGLIST	display tag names
FORMAT	define printout format
PRINT	print out
ADDRESS	print out mailing labels
CPPRINT	print in tabular form
HEAD	generate a set of tag value
FOOT	retrieval by a set of tag value
DFOOT	a version of FOOT
HFPRINT	print out using two databases
SESSION	print out Session Diagrams
MODULE	select a database
SHIFT	move to another database

Fig.1 Procedural Aspects of Registrant Database

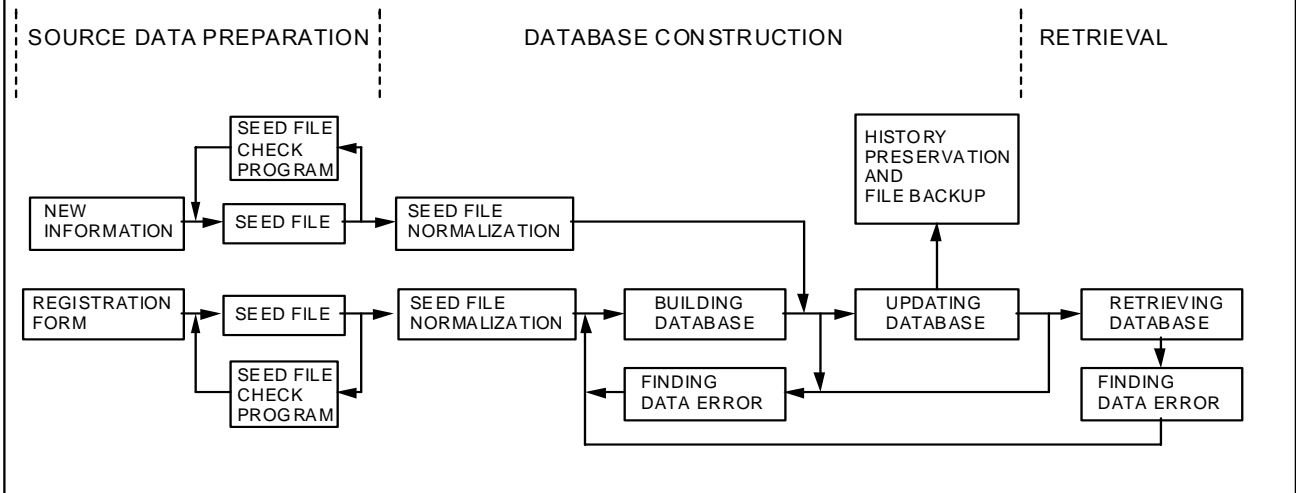


Fig.2 File Organization of DBMS

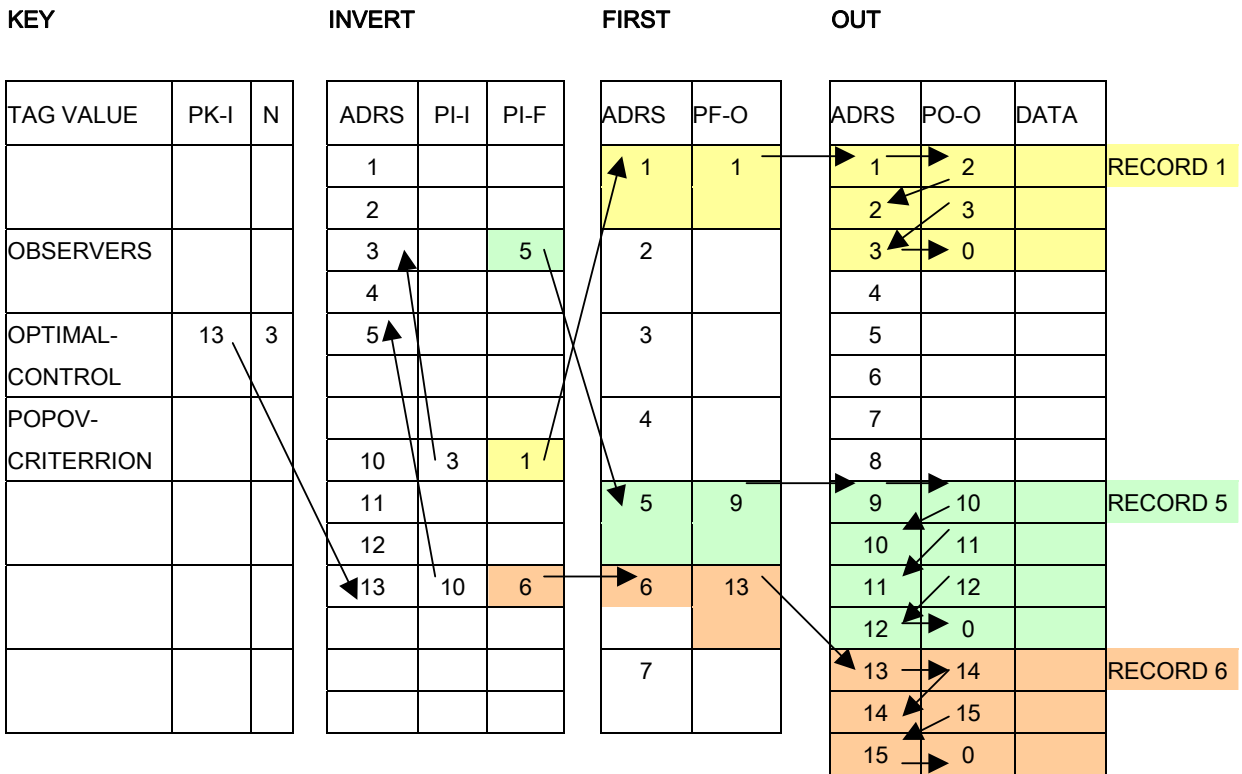


Fig. 3 A Simple Example of Balanced Tree

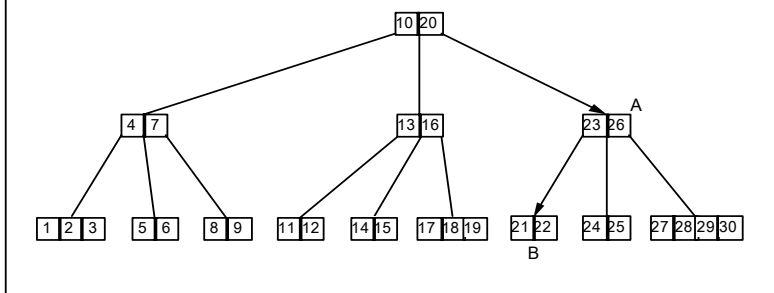


Fig. 4 An Example of Seed File

```

19370 *
19380 NO: 0098
19390 TI: MR
19400 NA: SMITH-JOHN-M
19410 AF: UNIV-OF-HOUSTON
19420 MA:
19430 MR. JHON M. SMITH
19440 DEPT. OF CHEM. ENGR.
19450 COLLEGE OF ENGR.
19460 UNIV. OF HOUSTON
19470 HOUSTON, TEXAS 77004
19480 USA
19490 CO: USA
19500 AP: AP
19510 NAP: MRS-SMITH-BETTY
19520 TS: 1 2 37 38 39 63
19530 104 110 CS1 RT6 RT8
19540 FI: MULTIVARIABLE-SYSTEMS
19550 NONLENEAR-SYSTEMS CAD
19560 RF: D1
19570 AV: E
15980 SE: SE1*2
19590 CA: CA3
19600 RT: T
19610 HC: C
19620 IN: 8.21
19630 OUT: 9.4
19640 TO: P60000 57500
19650 C: AP PLUS BABY
19660 *
  
```

Fig. 5 Feeding Registrant #98 into Database

```

READY
EX UPDATE
DATABASE NAME: REGIST
SEED FILE NAME: SEED2
  SYSTEM REGIST
  97 REGISTS HAVE BEEN PROCESSED
TAG NO.    1  0 NO:
TAG NO.    2  1 TI:
.
.
.
TAG No.   38  1 PDA:
BATCH PROCESSING? (B)
CONVERSATIONAL PROCESSING? (C)
DUMP PROCESSING? (D)
INPUT "B" OR "C" OR "D" OR "END" : B
SEED FILE IS OPENED.
STARTING REGIST NUMBER IS 97
INPUT STARTING REGIST NO OR "OK": OK

NO: 0098

INPUT "B" OR "C" OR "D" OR "END" : END
READY
  
```

Fig. 6 Seed File for Additional Data and its Normalized Form

07890 *	
07900 NO: 0097	
07910 HST: EC	
07920 *	
07930 NO: 0098	03620 ADD 0097 HST: EC
07940 MDA: 4.22	03630 ADD 0098 MDA: 4.22
07950 MAM: 60000	03640 ADD 0098 MAM: 60000
07960 MCH: 750	03650 ADD 0098 MCH: 750
07970 MIN: 59250	03660 ADD 0098 MIN: 59250
07980 MST: M*2500	03670 ADD 0098 MST: M*2500
07990 *	
08000 NO: 0099	
(a)	(b)

Fig. 7 Database Updating History

00390 DEL 0010 FI: AUTOMATIC-TESTOMG
 00400 ADD 0010 FI: AUTOMATIC-TESTING
 00410 DEL 0036 FI: BOUNDARY-VALU-PROBLEM
 00420 ADD 0036 FI: BOUNDARY-VALUE-PROBLEM
 00430 DEL 0058 FI: D1
 00440 ADD 0058 RF: D1
 00450 DEL 0058 FI: RF"
 00460 DEL 0075 AV: 45000
 00470 ADD 0075 TO: 45000
 00480 ADD 0002 MDA: 3.25

Fig. 8 Session Diagram guiding Attendant

DATA/ROOM	A	B-1	B-2	C-1	C-2	F	D	G	H	I	J	K
24/13.40			**	**	*							
24/15.10				*				**		*		*
25/10.00						*	**		**			**
25/14.40	*					**	*		*		**	
26/10.00							*			*	*	*
26/13.40				*			**	*	*	*	*	*
27/10.00		*	*				**			*	*	
27/14.40							*		*			
28/10.00						*			**		*	*
28/14.40				*					**		*	

More symbols "*" imply sessions related more.