

SYNERGISTIC CONSULTANTS INCORPORATED
MERCURY

MERCURY is a generalized information retrieval and analysis system with sufficient capabilities to form the basis for a wide variety of management information systems (MIS). The basic function of an MIS is to allow decision makers to perform timely analyses of extremely large quantities of data. This requires the creation and maintenance of a data base of information, selective retrievals from the data base, generation of specialized reports, and mathematical analyses of the data. To form a complete MIS, MERCURY need only be supplemented with specialized programs to prepare data files in the prescribed format. However, its effectiveness is enhanced with the addition of a variety of sophisticated file maintenance programs.

MERCURY evolved from the experience gained with the JUPITER retrieval system implemented by Synergistic Consultants Incorporated for the Ozarks Regional Commission (ORC) Regional Resources Management Information System (RRMIS). Almost all of the system is written in machine independent software. The input and output routines are machine dependent, and these are a part of a Fortran library package called FLIBSCI which is described elsewhere. Data files may be stored on the disk for rapid retrieval or on magnetic tape if dictated by storage limitations. It is felt that this system is a significant step in the employment of minicomputers as full scale operating systems.

The general features and characteristics of the Mercury software system are as follows:

- 1) MERCURY is operated with an English-like command language easily mastered by persons having no computer background or knowledge of computer languages.
- 2) MERCURY may be operated in either the interactive (conversational) or batch mode. Its use in an interactive mode allows decision makers to perform studies in "real time" by asking questions, obtaining the answers, evaluating these answers, and asking new questions.
- 3) MERCURY is a truly generalized system which can be applied to any desired data base. Each data base is a collection of data files, each of which is an aggregation of records, each of which is a group of specific items or attributes. Each attribute represents a single fact or piece of information. Format files are specified for each data file to establish the ordering of attributes and the type of information for each record. Data files are self-defining to the retrieval system in terms of the format files.
- 4) Any attribute or functional combination of attributes within the file may be defined and retrieved. This definition is done by the user and contrasts to some systems where only preprogrammed outputs are available.

- 5) Any functional combination of attributes within the file may be used as the qualifier upon which record selection is based. This definition is done by the user and contrasts to some systems where certain "key" words are the only ones allowed in the selective process. To reiterate, in MERCURY all entries are key words, whether for information output or for record selection. As a part of the selection process, attributes or combinations thereof can be combined in Boolean expressions to form extremely complex selection criteria.
- 6) Scoring of a set of attributes can be accomplished with user supplied goals and priorities. Scoring permits information to be evaluated against a set of goals and it permits information to be evaluated in a "grey" region by weighting the importance of key attributes as opposed to black and white record selection criteria.
- 7) Up to thirty functions may be defined which may contain attributes, scores, and other functions related with the standard arithmetic operators, +, -, *, and /.
- 8) The information output can be expressed in a variety of formats, including vertical listing, horizontal listing, and graphical plots.
- 9) Statistical analyses may be performed which include determination of number of qualifying records, maximum, minimum, sum, average values, and standard deviation. These analyses may be performed on attributes, functions, or scores.
- 10) Tables of sums of attribute, function, or score values may be formed in terms of specified values for two other scores, functions, or attributes. This capability is analogous to that of the PROject TRACKing system developed for the Oklahoma Office of Community Affairs and Planning by SCI.
- 11) Reports with predefined formats may be generated from data files. This capability is an essential part of a management information system, and makes the preparation of periodic review data such as weekly status reports, very simple.
- 12) Outline changes may be made to data files to permit continuous updating of files. A major problem with information systems is keeping the data current and accurate. With this capability to change data, errors may be easily corrected as they are discovered and changes may be immediately entered, e.g. inventory control where items are entering and leaving stock.
- 13) Secondary files may be created which contain the results obtained with MERCURY operations on primary data files. These secondary files can also be MERCURY compatible and may be merged, sorted, or otherwise further processed.

- 14) Command files may be used for a series of MERCURY instructions. This capability is particularly useful for periodic operations such as the preparation of daily or weekly data.

In summary, a user with a minimum of training can quickly specify a data file, selectively extract data from it and display the data in a variety of formats, perform analyses of data trends and form conclusions, and prepare reports documenting the results.

The following pages are syntax charts of the query language of MERCURY. They outline the commands which may be issued by the user in retrieving information from the user's data base through the use of MERCURY.

The MERCURY system includes a very simple to use report generator called HGREPGEN. A description of the commands of this report generator is also included.

MERCURY COMMANDS

LOAD {AND DESCRIBE} [FORMAT] File <file name>
DATA]

LOAD COMMAND FILE <file name>{<text-1>, {<text-2>, ...{<text-9>}}}}}

LOAD BINARY FILE <file name>, <file name> <file name>

DEFINE {RETRIEVAL} LIST AS <L-spec₁>, <L-spec₂>, ..., <L-spec_m>, $m \leq 30$

DEFINE <criterion number> AS <logical expression> WEIGHTED [<numeric constant>
<P-spec>]

DEFINE <function number> AS <function expression>

DEFINE ID AS <identification number>

DEFINE WHERE CLAUSE AS <where clause>

REVIEW CRITERIA

PRINT {AND DESCRIBE} [LIST
ACROSS
ANALYSIS
NOTHING] {<where clause>}

PLOT {AND DESCRIBE} <P-spec_x> VS <P-spec_y> FROM <x-low> TO <x-high> AND FROM <y-low> TO <y-high> {<where clause>}

TABULATE {AND DESCRIBE} <P-spec> FOR <P-spec_x> VS <P-spec_y> {<where clause>}

REPORT HGREPGEN <file name> <line width> <page length> {echo}

CHANGE LIST {<where clause>}

MERCURY COMMANDS (cont)

PRINT VALUE OF <function number>
 <attribute number> <record number>

MODIFY <attribute number> <record number> TO <alphanumeric constant>

MODIFY <function number> (0) TO <numeric constant>

PAGE

INPUT <filename>

OUTPUT <filename>

SELECT <first record number> <last record number> <number> <number>

INPUT ONTO DATA FILE

ACTIVATE {OUTPUT} <filename>
DEACTIVATE

RESET

EXIT

MERCURY COMMANDS (cont)

LIST specification

<L-spec> ::=

[{SUM} <attribute number> { TO <attribute number> }
 <criterion number>
 <function number>
 SCORE
 NSCORE]

PLOT specification

<P-spec> ::=

[{SUM} <attribute number (with numeric field) >
 <criterion number>
 <function number>
 SCORE
 NSCORE]

<criterion number> ::= CR<n>

, n a positive integer ≤ 30

<function number> ::= FN<n>

, n a positive integer ≤ 30

<identification number> ::= <n>

, $0 \leq n \leq 99$

<where clause> ::= <logical expression₁> { AND OR <logical expression₂> } { AND OR ... <logical expression_n> } }, $n \leq$

<logical expression> ::=

[{ ANY } { ALL } { SUM } <attribute number>
 <criterion number>
 <function number>
 SCORE
 NSCORE]

[[EQ LE GE NE GT LT] [<P-spec>
 <numeric constant>
 <alphanumeric constant>]
 BETWEEN <P-spec> AND <numeric constant>
 EXISTS
 FAILS
 SEQ <alphanumeric constant>]

The Report Generator, HGREPGEN

A report generator is available for use with the MERCURY System. This report generator has the ability to read a file of input information containing a set of terse, readily understood commands to produce reports of great complexity from any MERCURY data and format files. The input commands are described by the following:

MERCURY Command (to bring HGREPGEN into action):

REPORT HGREPGEN XX5 70 0 {<character>}

A diagram illustrating the relationship between three variables: 'file containing HGREPGEN commands', 'line width of output device', and 'page length'. The 'file' label has an arrow pointing up to a horizontal line. The 'line width' label has an arrow pointing up to a vertical line segment. The 'page length' label has an arrow pointing up to a horizontal line segment. These three segments are connected by a series of right-angle turns, forming a path that represents the calculation of page length based on the file and line width.

MERCURY will transfer control to HGREPGEN which will echo all input commands, if < character> exists, from file XX5 (or whatever file is named) and terminate the compilation of HGREPGEN statements with "::::" rather than the usual "...." of MERCURY.

It will continue and write the report output file on the file specified by a previously executed MERCURY command,

ACTIVATE <report-output file name>.

A WHERE clause may be specified only by a

DEFINE WHERE CLAUSE AS ...

MERCURY command issued just before the REPORT command.

The HGREPGEN command may be written directly from the MERCURY System by use of:

INPUT <HGREPGEN command file name>

(Note: This file must have been previously defined.)

If either file mentioned in this section which is being written is SCIOS write protected, the MERCURY System is programmed to abort. SCI feels a stern responsibility that its software shall never clear write protect flags. This takes an overt act of the User.

The Report Generator has a work space of 138 characters which the User may fill with fixed text, attribute values, or other information given by the system. Reports are programmed a line at a time using the commands listed in the accompanying table. The philosophy of programming is the same as that described in the accompanying CHAPROLA Language Manual so it is not repeated here. When reports are required the programming for which cannot be expressed by the line by line production method, this report generator should not be used, rather a CHAPROLA program will give all of the programming complexity that any User could wish.

The MERCURY Report Generator (HGREGEN) Commands

A <start> <MERCURY attribute name> { / <format> } $\begin{bmatrix} C \\ L \\ R \end{bmatrix}$

causes a retrieval of the attribute which is moved to character position <start>, or if the attribute is numeric and the optional format is given, the attribute is encoded into the print line by the FORTRAN format specified, eg F10.2, I5, E12.4, D8.2, etc.

C = close up justification (i.e. move characters to within one nonblank character in the print buffer [to the left])

R = right justification [within the attribute field]

L = left justification [within the attribute field]

T <start> "<text>" $\begin{bmatrix} C \\ L \\ R \end{bmatrix}$ causes the characters contained within the quotation marks to be moved to character position <start>

N <start> $\begin{bmatrix} C \\ L \\ R \end{bmatrix}$ causes the implicit page counter to be encoded in an I4 format starting in character position <start>.

D <start> opens the file "TODAY" and paints the first twenty characters in this file into the one line print buffer starting in character position <start>. Obviously, 1 <start> 118.

causes the contents of the print buffer to be written to the output file. The number of characters actually written depends upon the fourth word of the REPORT command. The print line buffer is filled with blanks.

P causes a form feed character to be written to the output file and the print buffer is cleared and the page counter is incremented.

S <number> resets the implicit page number to have the value <number>. Please note that this is a compiler command, only; i.e., it is not an executable command. Rather the compiler initializes the page value.

F <function number><value> sets the value of the named function to <value>.

IF <MERCURY logical expression> <any sequence of HGREPGEN commands> ;

The logical expression is evaluated during execution and if TRUE, all HGREPGEN commands up to the required command ";" are executed. If the expression is FALSE, these HGREPGEN commands are skipped.

IF EOF <any sequence of HGREPGEN commands> :

The report generator is called once after all data records have been scanned. At this time, only, EOF is true and the sequence of commands up to the required ":" are executed, otherwise the instructions are skipped. The symbol ":" is used thater than ";" as used in other IF statements so that a number of normal IF statements may be imbedded in the command sequence.

IF TOF <any sequence of HGREPGEN commands> ;

If, because of the previously executed commands, the printing device is prepared to print the first line of a page, all of the sequence of HGREPGEN commands up to the required ";" are executed; otherwise this sequence is skipped. The commands in the sequence may contain other IF commands. Unnecessary (i.e. redundant) ":" and ";" symbols are ignored.

As is true with all MERCURY commands, an isolated period terminates the scan of an input command file.