



SURVO 84C

Application areas:

- Text processing
- Numerical computing
- Matrix operations
- Data base management
- Statistical analysis
- Graphics
- Desktop publishing
- Development of expert applications
- Teaching

User groups:

- Universities and high schools
- Vocational training institutions
- Banking and insurance companies
- Institutions for economic research
- Marketing research companies
- Industrial research departments
- State and communal organizations

Technical properties:

- SURVO 84C (Version 1) consists of about 100 program modules.
- An open system: The users can make their own modules.
- The modules are automatically called by the user's activations.
- Also other programs and MS-DOS commands available during the session.
- A uniform **editorial** user interface based on text processing
- Programmed in C (Microsoft C Compiler, Ver.4)

Documentation:

- **SURVO 84 User's Guide** (335 pages, made as a SURVO 84C application)
- A help system covering all the functions available during the session
- A separate document **Programming SURVO 84 in C** for developers

Installation requirements:

- MS-DOS computers, memory 640 KB, math coprocessor as an option
- Hard disk at least 20 MB (SURVO 84C needs about 6 MB)
- Screen graphics modes: EGA, VGA, CGA, Hercules
- Printers: PostScript (Desktop publishing)
Epson, IBM Proprinter etc. (Standard printouts)
- Plotters: HP 7475A etc.

Future development:

- More statistical operations
- New types of graphical presentations
- Management of texts and tables read by an image scanner
- Move to OS/2 environment

Responsibility:

- **SURVO 84C development:**
Professor Seppo Mustonen, University of Helsinki, Department of Statistics
- **Sales and marketing:**
Inter Marketing Co., Tietäjäntie 12,
02130 Espoo, FINLAND, Tel. 358-0-4552455



SURVO 84C

S.Mustonen Feb 1988

1

SURVO 84 is an integrated interactive system for statistical analysis, computing, graphics, report generating and desktop publishing. It also includes unique features related to spreadsheet computing, matrix algebra and computer aided teaching. It provides tools for making application programs in various special areas. All functions of SURVO 84 are based on the **editorial approach** developed by S.Mustonen in 1979. The center of the activities in SURVO 84 is an **edit field** which is, at all times, partially visible on the screen. The edit field is maintained by the **SURVO 84 Editor**.

The user works with SURVO 84 by typing text in the edit field and by activating various operations and commands written among the text. In many applications, it is convenient to create **work schemes** including several extra **specifications**, also written in the text in arbitrary order.

The data and the results of various operations and application schemes (like plotting schemes and matrix programs) are displayed in the same edit field when required. For more extensive data sets and tables of results, SURVO 84 provides its own file representations. SURVO 84 can also communicate with text (ASCII) files.

From the user's point of view, SURVO 84 is one huge program which is controlled along certain general principles. The truth is, however, that SURVO 84 is a collection of several technically independent programs (modules) which are called by the SURVO 84 editor according to the user's activations. The user hardly notices the shifting of programs, but sees the system as one integrated world without any need to know its internal structure.

As a collection of programs, SURVO 84 is open for additional modules made by experienced users according to certain rules. These rules and different tools for making modules are described in a separate document "*Programming SURVO 84 modules in C*". After a new module has been programmed and compiled, the commands and operations defined in it can be used as any standard SURVO 84 operations.

The open structure of SURVO 84 allows the calling of any other program and using it while staying in SURVO 84. After finishing the job with the other program, we shall be back in our current SURVO 84 session again.

Because the commands of the operating system can also be employed in this way, SURVO 84 can be considered an extension of the operating system.

The SURVO 84 system may be compared to any extensive text processing program. However, when using SURVO 84 as a word processor, we have all other activities readily available, too.

SURVO 84 is also a tool for making new application programs. It provides several ready-made structures and user-friendly "languages" for such tasks. The SURVO 84 **matrix interpreter** and working modes like **tutorial** and **touch mode** are examples of such an approach.

SURVO 84 is, to a great extent, a selfcontained system providing different working modes needed e.g. in statistical research and planning. Naturally it cannot do everything, but it will be continuously extended to new areas of application.

Basically SURVO 84 is intended for professional users, but it is an easy system even for a beginner, since everything is based on simple text editing. Speaking about "ease" in this context may be misleading. If a system is made easy and friendly just for a beginner, after a short learning period it may turn out to be very frustrating for a user who already knows its characteristics.

A good system should be like a musical instrument that requires a lot from its player before yielding its best. If, for example, the violin were invented in recent days, many people would object to its poor "user interface". However, the violin is far more advanced than the mechanical, simple musical instruments since it gives scope for true skills and even for virtuosity.

If one knows the main ideas and working methods of SURVO 84, there is no need to read manuals and user's guides. The best and always up-to-date source of information is the system's own inquiry and help facility, which is readily available during any SURVO 84 session.

Another way to get acquainted with the system is to watch tutorials recorded during normal SURVO 84 sessions. One can produce such teaching programs on any topic during the work by turning on the **tutorial mode**. This permits saving of all actions selected by the user. Furthermore, ready-made SURVO 84 work schemes have been collected on separate diskettes.

Background of the SURVO systems

Many of the ideas and principles appearing in SURVO 84C have been adopted from the earlier versions. The first in line was SURVO 66 originated by the author in 1966 and implemented on Elliott 803. One explanation for the name SURVO is the word "survey", since the first SURVO was primarily planned for analysis of survey data. It can also be derived from the Finnish verb "*survoa*" which means "*compress*". The SURVO 66 jobs were controlled by a simple command language. The original SURVO 66 was further developed at the University of Tampere and is now known by the name of SURVO/71.

In 1976, the first interactive version SURVO 76 was initiated by the author. It was completed in 1984 by him and his research group (Department of Statistics, University of Helsinki). Originally SURVO 76 was made in conversational (menu-based) form. The editorial approach was introduced in 1979. SURVO 76 runs on the Wang 2200 minicomputer.

The work on SURVO 84 started in 1984 on the basis of SURVO 76 by using the interpretative Basic language. This was the the first microcomputer version and could be run on the Wang PC only.

The current SURVO 84C system was originated in 1985. From the user's viewpoint, it is much like SURVO 84, and it is also highly compatible with SURVO 76. But the latest version is far more efficient and it allows wider applications, since it is programmed in the C language. SURVO 84C can be run on MS-DOS microcomputers.

The main stream of SURVO's history has flown parallel with the general trends of personal computing. However, the fundamental idea of editorial computing has arisen quite independently. For example, when planning SURVO 76, we could not have known anything about the concept of spreadsheet computing, since *Visicalc* and other pioneers of this field were still under construction at that time. From the current point of view, separation from the common spreadsheet idea is a good thing. The editorial approach provides a far more general solution, not only to spreadsheet computing, but also simultaneously for so many other areas of data processing.

When we say that the current SURVO 84C system is an *integrated* system, we mean much more than this term usually implies in other applications. The SURVO 84C Editor is a host for all functions of the system and enables a smooth link between all parts of the system. The user has the feeling that all the activities are available on the same level and he/she sees the entire system as one integrated world. After the user has become familiar with certain basic working methods, the uniformity of the system guarantees that it is easy to learn more. The user has the right

to expect the new operations to work along the principles encountered in earlier applications.

There are endless possibilities for extending SURVO 84C to new areas of application on the basis of the editorial approach. In fact, the idea did not emerge in 1979 in connection with statistical computing or text processing, but the first version of my editor was created for input and editing of *musical manuscripts*. At that time, I was planning a plotting program for musical scores and felt that a good editor would be necessary for this project. When making this editor, I soon noticed that there might be other applications, too...

SURVO 84C operations

The current version of SURVO 84 covers about 200 different operations (commands) and other functions. The list below is only a general account of those activities and does not give any details. Typical keywords and operation names are given in parentheses. The functions indicated by '+' are optional and do not belong to the standard version.

More information can be found in "*SURVO 84 User's Guide*" (335 pp.) produced as a SURVO 84C application. During a SURVO 84C session the on-line help system is often the best source of information.

1. Control operations

- Redimensioning of the edit field (REDIM)
- Selecting the data disk (DISK)
- Selecting the output device/file (OUTPUT)
- Code conversions (CONVERT, CODES)
- Calling other programs/systems from SURVO 84 (CHILD)
- General file management (by MS-DOS commands)
- Time (TIME, WAIT)
- Moving the cursor in operation sequences (GOTO)
- Changing the system parameters (SETUP)
- Screen colors (COLOR)
- Changing the inquiry system (QPATH)

2. Text and table management

- Clearing the edit field (CLEAR, SCRATCH, ERASE)
- Text typing, editing and saving/loading (Function keys, SAVE, LOAD)
- Text management
(INSERT, DELETE, TRIM, MOVE, COPY, CHANGE, SHOW, and keys like BLOCK)
- Report management and printing (PRINT)
- Desktop publishing (on PostScript and Canon laser printers)
- Searches in edit fields (FIND, REPLACE)
- Moving data between text files and the edit field (LOADP, SAVEP, SHOW)

- Table management (FORM, SORT, SET, COUNT)
- Table arithmetics (C ja L operations;
see also mathematical operations!)

3. Data file management (FILE operations)

- Creating a data file (FILE CREATE)
- Data activation and protection
(FILE ACTIVATE, FILE_ACT key)
- Data saving and editing by filling a form on the screen
(FILE EDIT)
- Searches in data files (FILE EDIT)
- Loading the structure of the data file to the edit field
(FILE STATUS)
- Updating the data file structure (FILE UPDATE)
- Copying parts of data files to the edit field and to text
files or to the printer (FILE LOAD)
- Moving tables in text files to data files (FILE SAVE)
- Moving a data file (or a data set in the edit field)
to another data file (FILE COPY)
- Data sorting (FILE SORT)
- Aggregation of observations (FILE AGGRE)
- Data transformations by formulas and rules given by the
user (VAR, CLASSIFY)
- Generating data by simulation (VAR)

4. Statistical computing and analysis (STATIS)

- Variable transformations (VAR)
- Standardized and normalized variables (VAR)
- Simulated data (VAR)
- Conditional processing (VARS, MASK, IND, CASES)
- Scale type checking (SCALES)
- Basic statistics and univariate summaries (STAT)
mean, standard deviation, skewness, kurtosis,
order statistics, autocorrelation, entropy,
frequency distribution with automatic classification
- Means, standard deviations and correlations (CORR)
- Frequency distributions, histograms and fitting univariate
distributions (standard and user-defined), Chi²-test (HISTO)
- Multiway tables of frequencies, means and standard deviations (TAB)
- Editing of multiway tables (TAB operations)
- Log-linear models for frequency data (TABFIT)
- Sample statistics and comparison tests (COMPARE)
ex. t test, F test, Mann-Whitney, Kruskal-Wallis, Wilcoxon
rank correlations (Spearman, Kendall)
tests for normality (Shapiro-Wilk, D'Agostino etc.)
Fisher's randomization principle applied by simulation
- Linear regression analysis (LINREG)
- Nonlinear regression analysis (ESTIMATE)
- Regression diagnostics (REGDIAG)
- Multivariate analysis by the matrix interpreter (MAT, MATRUN)
- Canonical analysis (CANON)
- Linear combinations of variables (LINCO)

- Maximum likelihood and other related solutions for factor analysis (FACTA)
- Rotation in factor analysis (ROTATE)
 - orthogonal and oblique solutions,
 - interactive graphical and analytic methods
- Semiparametric data smoothing (SMOOTH)
- Auto- and cross-correlations (XCORR)
- Time series forecasting (FORECAST)
- + ARMA and SARMA models by means of the Kalman filter (by *J.Boucelham*)
- + Multiple comparisons of means, general ANOVA and ANCOVA (by *M.Korhonen*)

5. Graphics (PLOT, GPLOT)

- Bar charts (8 different types)
- Pie charts
- Histograms (HISTO)
- Correlation diagrams
- Time series, line graphs
- Scale transformations, probability plots
- Analytic curves, families of curves
- Integral functions

6. Mathematical operations (MATH)

- Editorial arithmetics
- Arithmetics in touch mode
- Functions related to probability and statistics
- Spreadsheet computing (C,L operations, touch mode)
- Operations on polynomials with real and complex coefficients, roots of algebraic equations (POL operations)
- Symbolic derivatives of functions (DER)

7. Matrix interpreter (MAT operations)

- Saving matrices to matrix files (MAT SAVE)
- Loading matrix files to the edit field (MAT LOAD, LOADM)
- Basic arithmetics with matrices (+,-,*,',INV etc.)
- Normalizations
- Column sums, sums of squares etc.
- Element by element transformations
- Scalars in matrix operations
- Matrix decompositions (Cholesky, Gram-Schmidt, eigenvalues and -vectors, singular values)
- Linear equations (MAT SOLVE)
- Least squares problems (MAT SOLVE)
- Partitioned matrices
- Super matrices (+,-,*,',INV)
- Automatic control for matrix names, column and row labels
- Matrix programs (MATRUN)

8. Teaching and user support

- Inquiry system (HELP)
- Tutorial mode (TUTOR, TUTSAVE, TUTLOAD)