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Galileo System Manual:

System Overview and Program Descriptions

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The Galileo System

Galileo™ is a set of procedures which model thought processes. Although it is widely used by the scientific community, by far the most common use of the **Galileo** system is modeling the beliefs and attitudes of markets and market segments toward products and services. For nearly two decades, **Galileo** has been available to the scientific community via special license on mainframe computers, and to leading corporations worldwide on a consulting basis. Now, for the first time, this powerful set of procedures is available for the personal computer.

Technically, **Galileo** may be considered as a *fuzzy logic artificial neural network*.

A natural neural network (like the brain) consists of neurons, each of which may be connected to many other neurons. (In a human brain, there are about 100 billion neurons, each of which is connected, on the average, to about a thousand other neurons.) When a neuron is stimulated, it becomes "active", and sends signals to all the other neurons to which it is connected.

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Neural networks store information as patterns in the same way that a TV screen or theater marquee or electronic scoreboard does: By activating some of the dots or light bulbs and leaving others off, any pattern can be displayed. But because the neurons in a neural network are connected to each other, the neural network can do more than simply display patterns of information: it can store and retrieve those patterns, and recognize patterns it has stored even if they are distorted or incomplete.

Although the actual functioning of a neural network like the human brain can be so complicated as to be beyond comprehension, in principle the way a neural network works is very simple and easy to understand. A neural network learns by connecting together the neurons which represent any particular pattern. Since they are connected together, *when some of them are activated, they spread their activation to the others connected to them, which turns on the rest of the pattern.* Thus, when a network sees part of a pattern, it can recall the rest of the pattern, even in spite of incomplete or erroneous information, as long as enough of the pattern is there to activate the rest.

Galileo is an artificial neural network in which products, attributes and people are represented as neurons. Each of these products, attributes and people may be more or less tightly connected to each other. Products that are similar may be tightly connected, so that activating "Coke" in the network will probably activate "Pepsi" as well. Products will be tightly connected to their attributes as well, so that activating "sweet", "brown", "carbonated" will probably activate Pepsi and Coke. Attributes can also be connected to each other, so that activating attributes like "sweet", "satisfying", "filling" and the like may well also activate other attributes like "delicious" or "fattening."

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Galileo also represents people as neurons. People can be connected to both attributes and products; they are tightly connected to attributes that make a difference to them, and they are more tightly connected to products and services that they buy and use than to those that they don't buy or use. All product development, advertising and marketing strategies can be seen as efforts to connect a product or service more tightly to people.

Galileo doesn't represent neurons as simply "connected" or "not connected" to each other, but instead measures the precise *degree* of each connection. This means that **Galileo** includes not only information about whether a car, for example, is smooth riding, but also represents precisely how smooth riding it is. **Galileo** does not simply say a product, service or object belongs to a category, but instead says *to what degree* it belongs to that category.

A system which quantifies the degree to which objects belong to categories is called a "fuzzy logic."

In a natural neural network, neurons that are tightly connected are typically located close to one another. **Galileo** provides diagrams based on this principle in the form of "maps," which can help give an intuitive picture of the structure of the

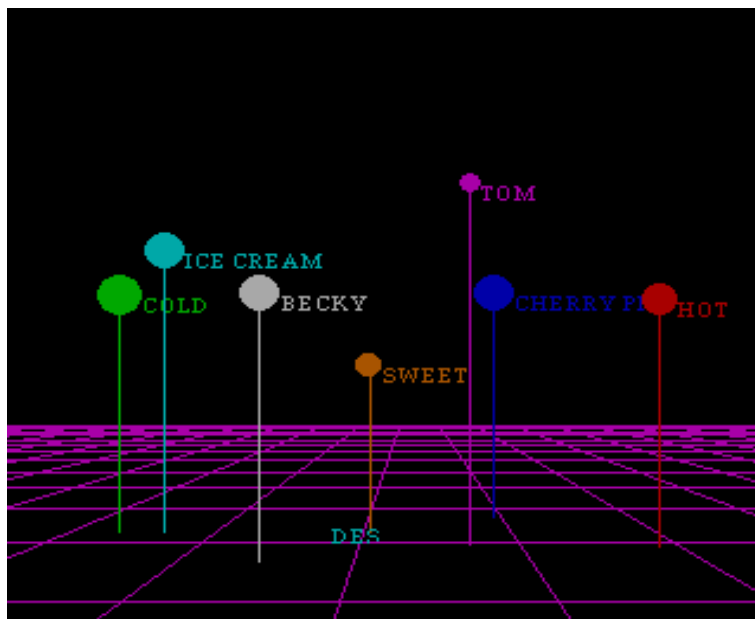


Figure 1 Dessert Preferences

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network. Figure 1 shows a map of Dessert Preferences for Tom and Becky. It shows that "Ice Cream" is closer to cold than "Cherry Pie", which is closer to "Hot." Both are about the same distance from "Sweet."

Tom prefers a hot dessert, and the map shows him closer to "Hot" than "Cold." Becky prefers a cold dessert, and is closer to "Cold" in the map. She's also closer to "Ice Cream" than Tom, who is closer to "Cherry Pie" than Becky. We should expect Tom to choose Cherry Pie more often than Becky, while Becky would be expected to choose Ice Cream more often than Tom. We'd also expect Tom to choose Cherry Pie more often than Ice Cream, and Becky to choose Ice Cream more often than Cherry Pie.

While the map is useful for getting an intuitive feel for the structure of the network, more precise information is always available. **Galileo** can write out any distances desired in a simple format, as Table 1 shows.

One of the major reasons **Galileo** has been so widely used in advertising and market research is its ability to calculate optimum strategies for strengthening and weakening connections between the neurons. Using **Galileo's** strategic planning abilities, it's possible to find strategies which will strengthen the connection of a product or service with its potential customers.

MEAN GALILEO DISTANCES		
Tom and Becky's Desert Preferences		
	CHERRY PIE	
Attribute	Distance	N
HOT	16.50	
COLD	76.50	
SWEET	32.00	
TOM	24.00	
BECKY	56.00	
	ICE CREAM	
HOT	98.50	
COLD	8.50	
SWEET	41.00	
TOM	55.00	
BECKY	19.00	

Table 1: Tom and Becky's Desert Preferences

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In order to design an effective strategy for repositioning a product or service in the customers' minds, it is only necessary to specify what position in the market the product or service is meant to fill. **Galileo** software will automatically calculate what connections need to be strengthened and which weakened to achieve the desired positioning.

Table 2 gives several examples of strategies developed by **Galileo** to reposition Ice Cream closer to Tom. The first strategy **Galileo** suggests tightens the connection between Ice Cream and both "Hot" and "Cherry Pie", while weakening the connection between Ice Cream and "Sweet." The second strategy suggests tightening the connections between Ice Cream and "Hot," "Cherry Pie", and Becky. The third suggests weakening the connection between Ice Cream and "Sweet", while tightening the connections to "Cherry Pie" and Becky.

		ICE CREAM ASSOCIATED WITH	

		13.667 PERCENT = HOT	
		-15.667 PERCENT = SWEET	
		70.667 PERCENT = CHERRY	
PIE			
		VALUE OF MINIMUM =	1.060
		ICE CREAM ASSOCIATED WITH	

		32.333 PERCENT = HOT	
		31.583 PERCENT = CHERRY	
		36.083 PERCENT = BECKY	
PIE			
		VALUE OF MINIMUM =	14.395
		ICE CREAM ASSOCIATED WITH	

		-21.167 PERCENT = SWEET	
		73.917 PERCENT = CHERRY	
		4.917 PERCENT = BECKY	
PIE			
		VALUE OF MINIMUM =	13.664

Table 2: Strategies to Reposition Ice Cream Closer to Tom

There are as many ways of strengthening and weakening connections as human imagination can devise, but the most common are advertising and

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actually changing the product or service. However one proceeds to implement the strategies, **Galileo** provides a convenient way to track the progress of the repositioning.

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Installing Galileo

- Place the diskette in the A: or B: drive.
- Type **INSTALL <diskette drive> <target drive>** and press Enter.

For example to install the system on your C: drive with the diskette in the A: drive you would type:

INSTALL A: C:

That's it. The install program will take care of everything.

The following directories will be created:

\GALILEO\RUNNER	Contains the executable programs
\GALILEO\HELP	Contains the help files
\GALILEO\DOC	Contains all available Galileo Documentation in WordPerfect 5.0 format
\GALILEO\DATA	Contains sample data sets
\GALILEO\TOOLS	Contains a text editor and several utility programs

You will need an IBM PC or compatible computer with a 486DX chip, or a 486SX, 386 or equivalent with a co-processor. The Galileo System will take up about 5 megabytes on your hard drive. The Galileo system assumes your hard drive is called "C", or that you have a section of the hard drive named "C". If this is not

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so, please call The Galileo Company for assistance.

Setting your path:

All your GALILEO software resides on a directory called C:\galileo\runner. Your life will be greatly simplified if you insert this directory into your path. Please consult your DOS manual for instructions on inserting the GALILEO directory into your path. If you don't set your path to c:\galileo\runner, you will only be able to run your Galileo software after setting C:\galileo\runner as your default directory.

Running the Software:

All Galileo programs are designed to be run interactively, and have context sensitive help online. The best strategy for learning the system is simply to type "GALILEO" and ask questions as needed. At first this may seem bewildering, but after a short time, the online help will serve as an interactive training course.

Setting your Expectations:

Galileo Software is very easy to run -- you only need to select a number from the menu on the screen and press the **[ENTER]** key. But, at the same time, the technology that's controlled by this software is quite advanced, and not every analyst, even very advanced analysts, can be expected to know what Galileo can do. If you have no background in Galileo technology, you'd probably be well advised to spend at least a day or more training with a qualified consultant from The Galileo Company. There is also a very extensive scientific literature concerning Galileo techniques. For more information about special training and for bibliographic advice, contact your Galileo Company Representative.

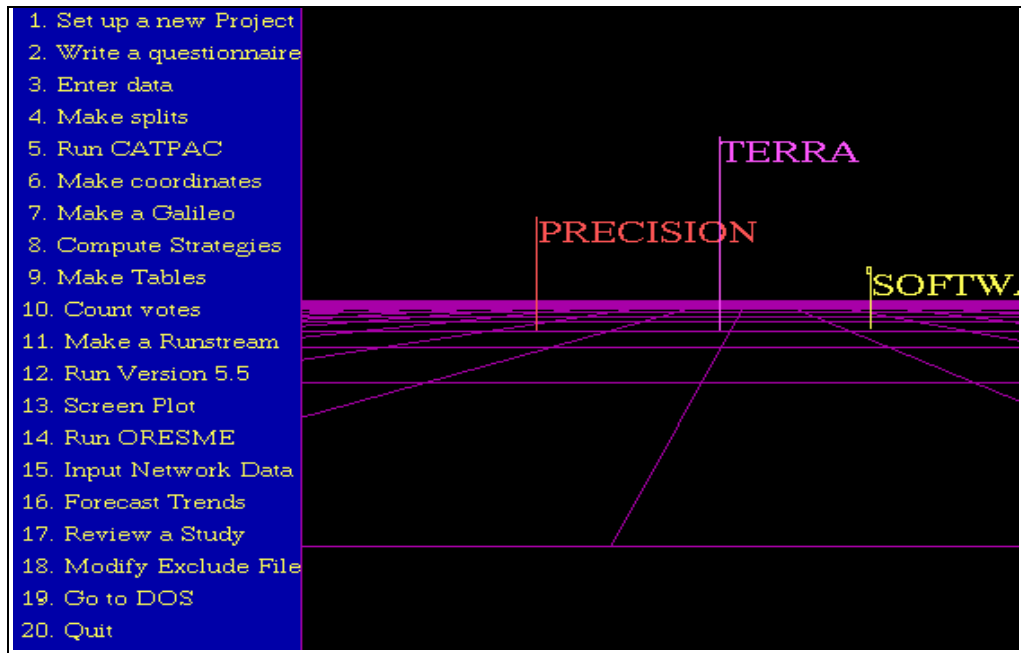
Galileo

Good Luck!

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The Software

After you've typed GALILEO, the Galileo Menu will appear on the screen.



The menu has 20 options from which to choose. To select any option, type its corresponding number and then press the **[ENTER]** key. Eighteen of these options will execute one of the 18 programs in the Galileo System. Option 19 suspends the Galileo system and returns to DOS, while option 20 terminates the Galileo session. (Expert users will want to know that the GALILEO program shell is not needed to run the programs -- each of the 18 Galileo programs can be run independently just by entering its name.)

We'll see what program each option calls up, and let each program describe itself and its uses:

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Option 1: Set up a new Project: Galileo*ELQM

I'm ELQM (Electronic Questionnaire Maker), and I'm the program that can let you build a CATI system especially designed to work with Galileo software. I'll ask you a series of questions, and then build a filing system, write an electronic questionnaire, and coordinate the other programs in the system. I need only know the name of a directory on which you want the study to reside.

If you are going to have several different versions of a questionnaire, then a separate directory will be required for each questionnaire. (You might find it useful in such cases to create a master directory for the study as a whole, with a sub directory for each questionnaire version.) I can make four kinds of question (which is all there are, I think.) First, I can make a complete Galileo(tm) type magnitude estimation paired comparisons instrument. I can also make magnitude estimation scales, category scales (like male=0, female=1) and Likert-type scales, and open-ended or in-depth questions. Once I've made your electronic questionnaire, you or your agents run SPED (the Simplified Process for Entering Data), and SPED will prompt you with the questions. When you (or your respondent) answers, the answers will be directed automatically to the correct files. I always create 3 files on the study directory: study.dat, study.lbl, and galileo.dat. Study.dat is the master control file, and contains all the information about the study, including the exact wording of every question and the file handling information. Study.lbl contains a list of the concept labels for the Galileo questionnaire, which are needed for subsequent processes. Galileo.dat contains all numerical data, including the paired-comparison responses and responses to all quantitative and categorical questions. The Galileo paired comparison data and the other questions are interspersed in this file in an obvious way; the exact format of these files is stored in study.dat.

Study.dat is read by a program called Read. Just run Read and name the study directory; Read will write out the information there, including all relevant

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formats. In addition to these files, I will create a file for each open-ended or qualitative question, named after the ordinal position of the question. If the third question were, for example,

3.) Discuss your summer vacation. Be brief.

I would create a file called quest003.dat, and I would tell SPED to append all responses to that question to quest003.dat.

Option 2: Write a questionnaire: Galileo*AQM

ELQM (the Electronic Questionnaire Maker) makes an electronic questionnaire that can be administered online or by phone through a skilled interviewer who enters data live onto the computer using SPED (The Simplified Process for Entering Data). But every now and then, as in mailed questionnaires, mall intercepts and the like, there comes the need for that primitive technology, the paper and pencil questionnaire. I make these. (Actually, I only make the Galileo paired comparison parts of it, along with a few standard questions scientists at The Galileo Company always use.) That's because paired comparison questionnaires are very difficult to make using a word processor. The rest of the questionnaire is easier to make using a word processor like Microsoft Word or WordPerfect, so I don't do that. I'll write out the Galileo questionnaire on a file you choose. You can edit it as you like and print the questionnaires then.

Option 3: Enter data: Galileo*SPED

I'm the chief data entry program in Galileo*CATS. All I need to know from you is the name of the directory on which the study resides (the "study directory"). After that, I'll prompt you for all the questions and automatically

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post the responses to the correct files.

Option 4: Make splits: Galileo*ALLSPLIT

I'm a general purpose splitting utility. You can just tell me what columns you want to split on, and where you want the split files, and I'll do it. I can split on values or ranges. I can read the study.dat file made by ELQM, and so I know where your variables are and can help you during the split run. I can write out a list of the variables, and I can split by variable name as well as by column. I can write out all of a case or any subset of it; you tell me what you want written out. (Some Galileo processors don't want to see anything but paired comparison data in their files; you can get rid of all the other data using this option.)It may take a while to master me, but it's well worth it. I'm very versatile.

Option 5: Run CATPAC: Galileo*CATPAC

I'm a self-organizing neural network optimized to read and understand text. I can read any ASCII text and determine its underlying conceptual structure. Technically this means that I can learn the patterns of association among the various words in the text, and perform a diameter method hierarchical cluster analysis of these relations. I also write out the matrix of interrelations in a file with the appendix .win (weight input network). This square matrix represents the pattern of interrelationships among the top N words in the text (you have to tell me what N you desire). You can input this matrix to other programs (such as your favorite statistics package), or to other neural networks, particularly ORESME.

I also make .CRD files which contain Galileo coordinates. These can then be plotted by PLOT. Perceptual maps from text is a Galileo exclusive! (You not only saw it here first, you can't see it anywhere else!)

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Option 6: Make coordinates: Galileo*GALNET

I make metric coordinates for generalized input data. I will read either a square matrix of dissimilarities, similarities, covariances, correlations, connections among neurons or other user supplied input, and project the concepts or variables corresponding to the rows of that matrix onto coordinates which retain the metric of the input matrix. Alternately, you may input a rectangular objects by attributes matrix in which each row represents some object and each column represents some attribute. Cell entries represent the numerical value of the attribute for the corresponding object. In this second case, the labels file must contain the names of the endpoints of the attributes following the names of the objects scaled. In the following example, several people and a cat are rated according to their height, weight and age:

SALLY
BOB
JOE
ROSS
GEORGE
RALPH
FELIX
LEON
SHORT
TALL
LIGHT
HEAVY
YOUNG
OLD

The data matrix for this example is as follows:

(8f10.0)

64.	112.	26.
68.	148.	44.
55.	90.	12.
65.	135.	18.
67.	120.	17.
65.	110.	17.
21.	12.	2.

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66. 145. 23.

Each of the people (and the cat) are rated according to their height in inches, their weight in pounds, and their age in years. These labels can be found in \galileo\data\us.lbl and the data can be found in \galileo\data\us.dat.

I am also useful for taking .WIN matrices made by CATPAC or ORESME and converting them into Galileo-type coordinates which can then be displayed using PLOT, or may serve as inputs into ASG. To use me to convert ORESME outputs into a form that can be read by PLOT and ASG, simply run me (GALNET), and name the .WIN file made by CATPAC or ORESME when I ask where your data are. When I ask if this is a real Galileo, say "yes", and when I ask if this is a CENTROID SCALAR PRODUCTS MATRIX, say 'yes.'

Option 7: Make a Galileo: Galileo*MICROGAL

I am the PC version of the mainframe Galileo computer program. I expect to read raw data in standard Galileo paired comparison format. This is the format which SPED writes. For a detailed description of standard Galileo formats, consult Woelfel and Fink, (1980) *The Measurement of Communication Processes: Galileo Theory and Method*, New York, Academic Press. (An example of complete paired comparison data is provided on your \galileo\data directory in the file AUTOS.DAT. The corresponding labels file for these data are in the file AUTOS.LBL.) I calculate the coordinates of the concepts in Galileo space. These coordinates may be plotted to produce a graphic picture of the data, or they may serve as input to other Galileo programs, such as Strategy and Compare.

I also calculate the standard error for each of the points. These standard errors can serve as an estimate of the uncertainty around the location of the points. In graphic representations, the standard error or some multiple usually serves as the diameter of the circle or sphere which represents the

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concept in Galileo space. If all standard sampling distribution assumptions are correct (which, of course, they never are) there will be about a 67% likelihood that the concept is actually located within plus or minus one standard error of the location given by its Galileo coordinates.

I ask for the number of concepts, the maximum value above which it will ignore data, the location of the labels file (the file where the names of the concepts are kept), the name (and complete path) of the file where the data are kept. I will also ask whether a logarithmic transformation of the data are desired, and what you want to name the output file and the coordinates file. The output file is the place where an output file suitable for printing is written, and the coordinates file is where coordinates for plotting or input into other Galileo programs are stored. You should supply the complete path for each of these files, otherwise I will write them into your current directory.

Option 8: Compute Strategies: Galileo*ASG

I'm the Automated Strategy Generator (ASG). I can read Galileo Coordinates made by Microgal, V55, or Galnet, and calculate the likely effects of every possible strategy for repositioning any concept in the Galileo space. In doing this, I follow the theory of Woelfel and Fink, *The Measurement of Communication Processes:Galileo Theory and Method*, Academic Press, New York, 1980. Unlike the model in V55, I provide weighted strategies; that is,I can tell you my best guess as to how much to emphasize each element of a strategy. I can even consider negative strategies(such as "I am not a crook") and mixed strategies, such as"Luxurious, but not expensive."

To be candid, however, the practical differences between weighted strategies and unweighted strategies is fairly small relative to today's (1991) ability to measure. Improved measurement precision (sure to come) will make these differences crucial, however, so it's not OK to put the question out of mind. I can only make strategies if I know what your goals are, though, and I'll

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ask you a series of questions to find out what you want to accomplish. If you don't know what to do at any point, just enter a '?'.

Option 9: Make tables: Galileo*TABLES

I make tables out of pair comparison data. Most brand managers (and most social scientists, for that matter) follow Aristotle in dividing up their experience into objects and attributes. In this model, objects are defined by their attributes, so that a ball might be round, yellow and soft, or a car might be economical, reliable and stylish. In more advanced models, objects may have differential amounts of each attribute (every quality exists in some quantity).

In paired comparison dissimilarities data typical of Galileo data, objects are arrayed at various distances from various attributes, so that an economical car can be close to the attribute "economical", but a more economical car can be even closer, and so forth. I'll ask you for Galileo data in standard format (that is, the paired comparison format described above in the description of Microgal), and I'll ask you to tell me which of your concepts are objects and which are attributes. Then I'll make tables which give the mean distances between each object and each attribute. I'll also make tables of Z for each pair of objects, which shows how they differ in their scores on each attribute. The difference is given in standard units (z-scores), and a mark ('S') is made if the differences are significant at the 80% level.

Option 10: Count votes: Galileo*BALLOT

I am a variation of TABLES. I'm particularly useful when the topic you are studying involves discrete choices. Elections are examples of discrete choices, since voters may either vote for a candidate or not. Expensive products such as automobiles usually may be considered discrete choices as well, but inexpensive products typically are not, since you can buy variable

quantities of them.

My main function, curiously, is to "ruin" perfectly good data. Professional market or election researchers, for example, may make very precise measurements about *how much* respondents like or prefer a specific candidate or product. But elections don't let you express a degree of preference; you can either vote for or against a candidate¹. The same is true for most big ticket products; customers don't tell dealers, for example, how much they like a car; they either buy it or they don't. My job is to make good quality numerical scales into simple dichotomous choices.

I read complete paired comparison datasets, in which each product, candidate and attribute is compared to each other product, candidate and attribute on a numerical scale, which is probably the most precise measurement format known to the market researcher. I make the same inquiries as TABLES: I ask how many concepts there are, on what file the concept names or labels are to be found, whether or not you want a logarithmic transformation of the data, what the name of your data segment is (this becomes the title of your table), where your data (in standard GALILEO raw data format) may be found, and on what file you'd like the output written. I also ask you to identify two or more "candidates" or products and a "self-concept", which represents a self-point or ideal point.

I then divide up the cases into several piles: the first pile contains those cases closer to the first candidate or product; the second contains those closer

¹ This is an interesting point of public policy. Whenever a political poll fails to predict an election outcome accurately, we routinely say the poll was inaccurate. It's much more likely, however, that the *election* is inaccurate as a gauge of the public's actual opinions. After all, in an election the sampling is non-random, the polling method is cumbersome and incredibly expensive, biases are known to be extreme, and the scaling method is simply dichotomous choice. If any young market researcher were asked to design a survey to measure people's opinions toward a set of issues, and recommended that polling stations be established, the public be invited to come to them and fill out a questionnaire consisting of 2 point scales, he or she would be fired. And rightfully so. But the election process was established by the constitution before scientific polling was invented, and is "accurate" by legal definition, not by scientific merit.

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to the second candidate or product; the third contains those closest to the third candidate or product, and so on for **n** piles for **n** candidates of products. The second last pile contains those equidistant from all candidates or products (the "undecided"), and the last contains those for which the crucial data are missing.

The results are displayed on the screen and written to the file you named in a standard ASCII format ready to print. The result is my best guess as to how the share of vote or share of market would come out, assuming respondents were only allowed to make dichotomous choices.

Option 11: Make a Runstream: Galileo*INTERGAL

Galileo Version 5.5 (V55) is the current version of the original mainframe Galileo program. Designed in the 1970's, V55's architecture is antiquated, but, like the dinosaurs it resembles, it's still quite powerful and can do several things that have not yet been ported to the PC platform. For that reason, it remains alive and is still supported. I write a runstream that makes V55 work. I'll ask you a series of questions, then write a command file that executes a V55 run. Crude, but effective.

```
AUTOS.PRT
AUTOSR.CRD
RUN NAME          A TEST OF V55 FORMATS
N-CONCEPTS      18
N-DATASETS        2
CRITERION PAIR I  I DON'T RECALL
CONLABELS
                  SPORTY LOOKING
                  FUN TO DRIVE
                  FAMILY CAR
                  GOOD VALUE
                  PRACTICAL
                  AFFORDABLE
                  EXCITING
                  APPEALS TO OLDER PEO
                  LUXURIOUS
                  RELIABLE
```

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```
HONDA ACCORD
MAZDA 626
FORD TEMPO
TOYOTA CAMRY
NISSAN STANZA
CHRYSLER LEBARON GTS
PONTIAC GRAND AM
YOURSELF
OPERATIONS      COMPARISONS
SPECIFICATIONS
MAXVAL          999
MAinspace       1
FCONS           18
END OF SPECIFICATIONS
OPTIONS         1,23,24,22,18,8,9,12,13,14,15,16
READ DATA
AUTOS1.DAT
AUTOS2.DAT
```

V55 is very versatile, and I can't design every possible job V55 might do. Often more advanced work with V55 will require me to make a run stream like this one which you will then edit with an ASCII editor. If you don't already have a favorite of your own, you can use EDWIN supplied with the Galileo System.

Option 12: Run Version 5.5: Galileo*V5.5

I'm a PC version of the original Galileo mainframe computer program. I'm a general purpose program that can do a huge variety of things. Learning what I can do is beyond the scope of this manual, and I should really only be used by advanced analysts. A good introduction to what I can do, along with a manual illustrating how to get me to do a wide variety of things is *The Measurement of Communication Processes: Galileo Theory and Method*, by Joseph Woelfel and Edward L. Fink (Academic Press, NY, 1980). If you have trouble finding this volume, please contact The Galileo Company.

Galileo Version 5.5 (V55 on the Galileo Menu) is a powerful and sophisticated program for the advanced user. While a complete mastery of V5.5

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requires advanced understanding of Galileo technology, the typical advanced user will use it for three primary functions: to provide comprehensive statistical analysis of the raw data, to generate unweighted message strategies, and to compare multiple Galileo spaces.

Statistics

Galileo Version 5.5 provides a much more extensive statistical analysis of raw paired comparison data than is provided by the more convenient Microgal. In a normal Galileo analysis, the dissimilarities among all possible pairs of a set of concepts (typically products and their attributes) are measured on a ratio-scaled questionnaire. For N objects, this will produce

$$n(n-1)/2$$

paired comparisons. For each of these paired comparisons, V5.5 will compute the mean, standard deviation, standard error, index of skewness, index of kurtosis, maximum value, minimum value, count and percent relative error.

In addition to these local statistics, V5.5 will also flag values beyond a user-supplied maximum (EXVAL) and eliminate values beyond another user-set value (MAXVAL). Cell with the largest value and the smallest values are also flagged. V5.5 will also search for illegal keypunches in the data and eliminate them, and will produce warning messages for cells (paired comparisons) with sample sizes under 30. (In certain cases, sample sizes under 30 might be perfectly acceptable, but you should be aware of them in those cases where statistical inference to a larger population is required.)

```
A TEST OF V55 FORMATS                               Raw data set number 1
DISTANCE GT MAXVAL      33100201 ADDRESS 5 1POSITION 4 DISTANCE 1000.
CELL ADDRESS ERROR      33100221 ADDRESS 25 4POSITION 3
Cell with an N of .LT.30 2 1Count is 23.
Cell with an N of .LT.30 3 1Count is 24.
61 errors detected in data set 2

Statistics for A TEST OF V55 FORMATS                 Set number 1
ROW COL      MEAN  STAN. DEV.  STD ERR  SKEWNESS  KURTOSIS  COUNT  MIN. VAL  MAX. VAL  ERROR
1 2      36.913  52.320  10.909  1.732  2.258  23  .0  200.0  29.6
1 3     153.542  138.178  28.205  1.461  1.543  24  .0  541.0  18.4
```


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```
Average observations per cell 22.9804
Count of all non-zero cells 153
Mean of all non-zero cells 83.2763
Cell with maximum distance is 8 1 Distance is 173.3636
Cell with minimum distance is 6 5 Distance is 20.0435
```

Cells which have no values at all will be estimated by the program, which will insert the grand mean of all non-zero cells in each empty cell. This may or may not make sense in your particular case. It is not good practice to leave any cells unmeasured unless you are very confident on theoretical grounds that this will not adversely affect the geometry of the neighborhood. Cell adjustment is provided solely because it is usually better to do something moderately wrong than to do nothing when circumstances beyond your control have left you with incomplete data.

Normal Coordinates

In addition to complete statistical information about the original paired comparison measurements, V55 calculates the *complete eigenstructure* for the data. This means that Galileo Version 5.5 calculates all eigenvectors, both real and imaginary, which are needed to represent the original pairwise dissimilarities *exactly*. If any of the original dissimilarities violate triangle inequalities constraints, at least some of the eigenvectors will be imaginary, and their corresponding eigenroots will be negative. V55 provides all these eigenvectors and eigenroots, along with a complete analysis of any non-euclidean aspects which the space may incorporate. A simple summary measure of the degree to which the space is non euclidean is given by the Warp Factor, which is the ratio of the sum of positive eigenvalues to the total sum of eigenvalues. If this ratio is 1.0, the space is completely euclidean; greater values indicate greater degrees of warp.

```
GALILEO Coordinates of 18 Variables in Riemann Space for Data Set 1
0                                     Normal Solution
1                                     4
2                                     5
3                                     6
4                                     7
5                                     8
1 SPORTY L      81.581    -29.796    15.491    19.250    - .307    -12.650    -5.877    -14.337
2 FUN TO D      68.880    -12.055    -15.928    14.624     5.430     -2.295    -7.588     13.274
3 FAMILY C     -62.677     36.077     12.025     22.710    -7.156    -26.582    -4.296     -6.625
```

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4	GOOD VAL	-43.567	-17.890	17.070	-18.162	-2.508	9.102	-6.590	22.681
5	PRACTICA	-52.675	-25.301	11.887	4.492	5.881	1.526	13.052	.027
6	AFFORDAB	-55.396	-33.485	14.169	-17.403	-3.042	1.443	-8.400	-18.929
7	EXCITING	64.175	2.628	.240	-12.578	-15.193	10.551	-17.789	8.042
8	APPEALS	-65.520	39.026	-23.459	-32.140	-2.567	11.096	-2.130	-1.990
9	LUXURIOU	49.476	67.742	-30.893	-18.798	-6.157	2.260	7.804	-14.856
10	RELIABLE	-17.249	-10.854	13.669	3.357	14.772	-15.763	.706	-6.558
11	HONDA AC	-7.735	-38.072	-33.782	-9.889	-24.725	-29.815	-14.972	-4.805
12	MAZDA 62	-.396	-10.120	-11.974	18.225	-34.460	10.483	25.005	8.269
13	FORD TEM	-28.322	12.332	5.379	44.264	-13.210	36.389	-20.004	-1.400
14	TOYOTA C	-16.502	4.054	-24.307	11.752	20.082	-19.374	11.885	27.098
15	NISSAN S	-1.971	-12.472	-27.404	21.618	37.752	16.084	14.089	-15.640
16	CHRYSLER	21.734	59.769	34.079	-2.127	21.041	-8.451	-15.387	6.773
17	PONTIAC	37.961	9.178	42.078	-13.223	-15.681	-.444	33.002	-1.950
18	YOURSELF	28.202	-40.761	1.659	-35.973	20.051	16.441	-2.512	.925
Eigenvalues (roots) of eigenvector matrix--									
	38073.530	17846.850	8553.307	7777.015	5516.946	4746.127	3698.842	2753.560	
Percentage of variance accounted for by individual factors--									
	56.617	26.539	12.719	11.565	8.204	7.058	5.500	4.095	
Percentage of variance accounted for by individual factors in their own spaces--									
	40.690	19.073	9.141	8.311	5.896	5.072	3.953	2.943	
	Sum of Roots	67247.770	*****	WARP FACTOR =	1.3914	*****			
	Number of dimensions in real space 11								
	Number of dimensions in imaginary space 7								

Automatic Message Generator (A.M.G.)

In a typical perceptual map, the positions of objects and their attributes are determined only within very coarse limits. One can get a crude overall "feel" for the structure of a market or market segment, but confidence intervals around the location of each product and attribute are typically as wide as the entire picture -- or wider. This means that objects and attributes location cannot even be guaranteed to be in the correct quadrant using typical perceptual mapping techniques. Moreover, since the computation of the configuration requires that the majority of the values be estimated rather than measured, the results are highly dependent on (typically unstated) assumptions about the geometry of the space which spans the market or market segment.

In a Galileo ratio-scaled complete paired comparison design, however, results are typically much more precise. Moreover, since *all* non-redundant pairwise dissimilarities are measured, Galileo does not need to make as many strong simplifying assumptions about the geometry of the neighborhood in order to calculate the coordinates of the objects and attributes.

As a result, it is possible to produce Galileo maps within which the positions of the objects and attributes is sufficiently precise to allow the program to calculate the most likely effects of possible *message strategies* on *relocating* objects in the space. In Galileo theory, a *message strategy* is *anything that can be done to change the relation of an object or product toward the attributes*

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in the neighborhood. (This usually involves either associating the object with certain attributes in advertising, or changing the actual product in manufacturing.)

To develop a message strategy, you must first decide where in the market you wish to reposition the object. Most Galileo users include either an *ideal point* or a *self point* (yourself) in their original concept list, and either of these can serve as a useful target for repositioning. Ideal points can work well with low cost products, such as most consumables, (e.g., the ideal dessert) but don't usually work well with big ticket items like automobiles, because most consumers consider ideal automobiles to be too expensive for them. The self point is usually a good choice regardless of product category. Whichever you choose, V5.5 refers to it as the *target*. The object you wish to reposition is called the *start concept*.

The A.M.G. in V5.5 differs from the algorithm in the Automatic Strategy Generator (ASG) in several ways. In many ways, ASG is the more sophisticated tool, since it allows the choice of multiple target points. This can allow you to reposition an object *in the middle of several other objects*. This can be useful when you wish to attack a particular product by positioning between it and the self point of its market segment. Or it can be useful if you wish to reposition a product in the vicinity of several attributes. ASG also produces *weighted strategies*, which can tell you not only what attributes to emphasize in advertising or remanufacturing, but *how much of each to use*. ASG also allows the calculation of *negative strategies*, that is, attributes which you can claim your product does not exhibit (e.g., not harsh).

On the other hand, ASG pays a certain price for its sophistication. It can be slow in computing strategies for a large number of concepts, since it involves complicated non-linear iterative procedures. And often, weighted advertising strategies are beyond the budgeting capabilities of many clients. Moreover, the understanding of negative strategies is not well developed and probably ought to be considered experimental. A.M.G. in V5.5, on the other hand, is quite fast,

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provides strategies that are easier to implement, and in general are not very much less powerful than the best weighted strategies produced by ASG.

A. M. G.		1-PAIR Message Solutions				Target is 18	Distance to Target is 72.83			
		Start IS 11								
01-	THETA	CORR.	ST-R	TG-R	TG-CAP	ST-CAP	PCT			
02-	38.6	.782	87.39	54.70	45.42	56.92	75.10			
	30.6	.860	67.13	37.39	37.12	62.65	51.34			
A. M. G.		2-PAIR Message Solutions				Target is 18	Distance to Target is 72.83			
		Start IS 11								
01-02-	THETA	CORR.	ST-R	TG-R	TG-CAP	ST-CAP	PCT			
01-04-	33.6	.833	75.70	43.06	40.34	60.63	59.13			
	1	-67.36								
A. M. G.		3-PAIR Message Solutions				Target is 18	Distance to Target is 72.83			
		Start IS 11								
01-02-03-	THETA	CORR.	ST-R	TG-R	TG-CAP	ST-CAP	PCT			
01-02-04-	48.5	.663	38.65	55.39	54.55	48.25	76.06			
	1	-57.06								
A. M. G.		4-PAIR Message Solutions				Target is 18	Distance to Target is 72.83			
		Start IS 11								
01-02-09-13	THETA	CORR.	ST-R	TG-R	TG-CAP	ST-CAP	PCT			
01-02-10-11	39.7	.769	74.29	50.01	46.55	56.01	68.67			
	5.9	.995	43.24	30.15	7.50	72.44	41.39			

And the winners are.....

Message	Concepts	% Remaining	Distance Remaining
1	SPORTY LOOKING FUN TO DRIVE AFFORDABLE PONTIAC GRAND AM	1.54	1.12
2	FUN TO DRIVE PRACTICAL EXCITING HONDA ACCORD	2.44	1.78
3	SPORTY LOOKING GOOD VALUE APPEALS TO OLDER PEO	2.48	-1.81
4	SPORTY LOOKING PRACTICAL EXCITING NISSAN STANZA	2.73	1.99
5	FUN TO DRIVE AFFORDABLE PONTIAC GRAND AM	4.95	-3.60
6	FUN TO DRIVE PRACTICAL EXCITING TOYOTA CAMRY	5.81	-4.23
7	FUN TO DRIVE AFFORDABLE EXCITING PONTIAC GRAND AM	6.77	4.93
8	FUN TO DRIVE AFFORDABLE NISSAN STANZA	7.01	5.11
9	SPORTY LOOKING GOOD VALUE	7.11	-5.18

	RELIABLE NISSAN STANZA		
10	SPORTY LOOKING FUN TO DRIVE PRACTICAL TOYOTA CAMRY	7.62	5.55

Notice that some of the message distances are marked with an "i", which means that these distances are imaginary. Some analysts believe that imaginary distances ought to be interpreted in the same way as real distances, but a more conservative approach would assume that imaginary distances are not yet well understood among market researchers. In the conservative view, which we recommend, messages involving imaginary distances ought probably not be considered for commercial practice until further research clarifies their applicability.

Notice that V55 calculates *all* possible message strategies, but prints only those which actually improve the position, that is, result in the START concept moving closer to the TARGET. V55 also rank orders the message strategies and prints out the ten best strategies. This can be very helpful, since the number of possible strategies is equal to the number of combinations of concepts taken one, two three and four at a time -- a very large number for large spaces.

Comparison of Spaces

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Look at Figure 4. Figure 4 shows the Galileo map of a sample of all households in the Capital District of New York State prior to the 1988 presidential election.

Notice that the map does not realize we

like to place "liberal" to the left of our political representations and "conservative" to the right. (There is, of course, no way it could, since this is simply a popular convention and not a fact of nature.)

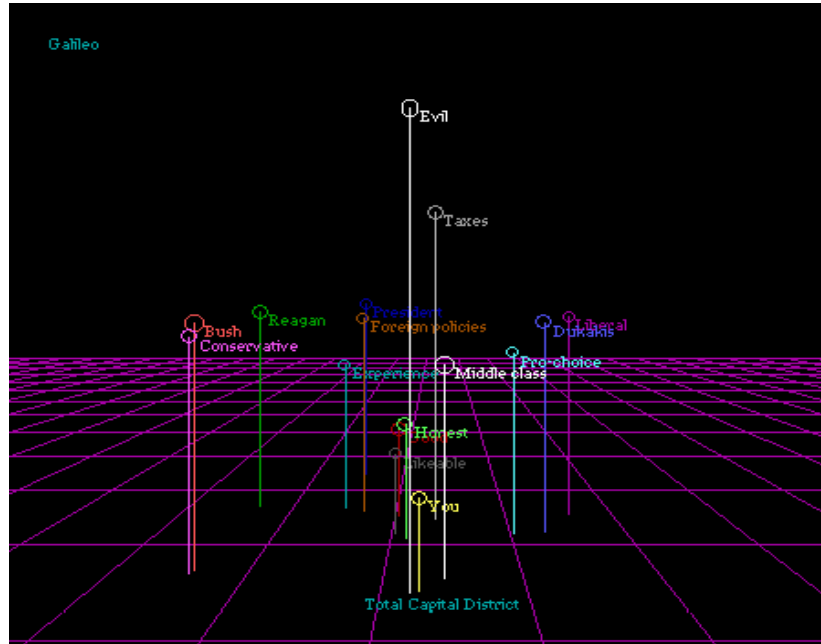


Figure 4: Map of All Voters

On the other hand, Figure 5 shows the decision the program made when it examined only Democrats in the same region:

Notice that, for the Democrats, the software "decided" to place "liberal"

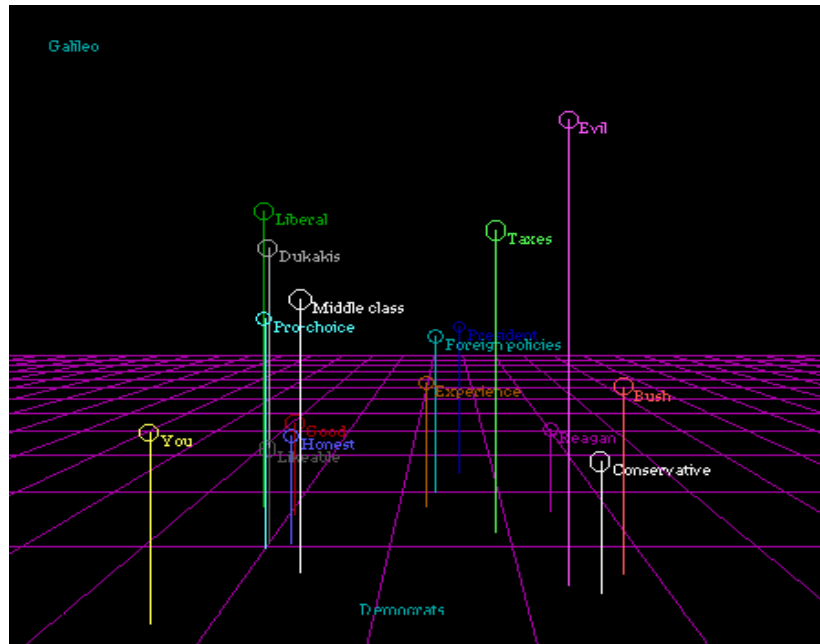


Figure 5: Unrotated Map of Democrats

to the left of the plot and "conservative" to the right. There is, once again, no logic to this decision, but it is simply a mathematical artifact of the way the points lie in space. If you have only one map, this is of no consequence. But if you have several maps representing several different segments of the population (as in the present case) or representing the same population over successive points in time, comparisons can be next to impossible. You should convince yourself that the map of the Democrats and the map of the total sample look *very different*.

These are not real differences.

Although Democratic voters differ from the total population by a certain amount, they do not differ by as much as these maps seem to show, since the largest part of the apparent differences are due to the artifactual differences of

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orientation.

V5.5 is able to do away with artifactual differences due solely to the orientation of the maps.

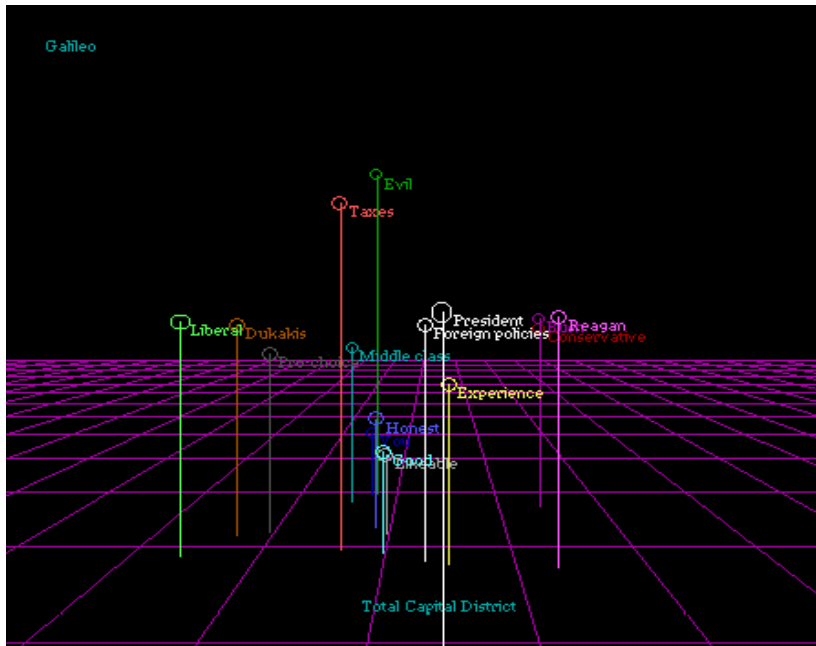


Figure 6: Rotated Map of All Voters

Figure 6 shows the map of all voters after V5.5 has rotated it to match the map of Democrats as closely as possible. It is important to understand that V5.5 has not distorted the map or

changed it in any way whatever. All the distances or dissimilarities in the rotated map are identical with those in the unrotated map.

But all artifactual differences of orientation have been removed, enabling us to see the true differences between the Democrats and the general population. As examination of Figures 5 and 6 reveal, both Democrats and the general population agree substantially about where the attributes lie, and they agree on their perceptions of the candidates. They differ, however, in where they position *themselves*, with the Democrats placing themselves more to the left or liberal side of the map, while the general population lies much closer to the center.

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Maps of the 1988 election were chosen for this demonstration because most people are familiar with the structure of the political domain, and you might have been able to figure out for yourself that the maps were more similar than they first appeared after some careful study. But in neighborhoods with which you are unfamiliar it can be virtually impossible to distinguish real differences from artifacts of orientation, so rotation is always recommended when different maps are to be compared.

Free Concepts

When V5.5 matches two or more maps, it rotates one of them until the location of all of the concepts in one map is as close to the location of the same concept in the target map as possible without changing any distances in either map. But sometimes such a complete match is not desirable. If you have conducted an experiment, for example, where different groups of respondents were exposed to alternative message strategies, you may have very good reason to believe that some of the experimental (treated) concepts *have changed their locations due to your intervention*.

If this is so, it is obviously not wise to try to match them from one space to another. In that case, Galileo*V5.5 allows you to name the concepts you believe have moved, and it will try to match only the remaining concepts. In this way it is possible for you to determine whether, where and how far the treated concepts have moved.

In essence, when you specify free concepts (FCONS) in a V5.5 comparison of spaces, you are telling the program: "Rotate this map onto the target map, but do not use the free concepts as part of the criteria by which you judge how well they fit." Galileo V5.5 will then compare one space to another, but will only use the stable concepts (SCONS) to determine when the fit is as close as it can be.

Regardless of the set of options chosen, V55 writes out the complete eigenstructure of the spaces after rotation. In addition to the coordinates, V55

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also provides extensive information about the differences between pairs of spaces, including the correlations among the concepts' position (row) vectors, correlations among the dimensions themselves (column vectors), various lengths and angles, and distances from each concept in one space to its counterpart in the other:

The Rotated Coordinates of Space Number 2

	9	10	11	12	13	14
15						
1 SPORSPOR	9.830	9.683	15.203	.090	-15.596	2.487
-14.601	-.057					
2 FUN FUN	12.072	-2.232	-12.118	.050	8.071	-2.213
32.831	-13.901					
3 FAMIFAMI	40.077	15.576	-.754	-.112	-4.435	7.058
-8.670	-3.721					
4 GOODGOOD	31.874	-.177	6.604	.055	-.924	-7.290
-21.563	24.808					
5 PRACPRAC	-6.524	-17.636	10.756	.087	14.863	5.673
9.828	-2.025					
6 AFFOAFFO	-.812	-11.554	-35.795	.068	-18.846	-6.786
-1.099	-15.019					
7 EXCIEXCI	8.555	6.260	-1.072	.065	-.215	-11.272
-4.002	-13.368					
8 APPEAPPE	-6.690	8.230	19.258	-.062	8.899	2.622
19.818	11.835					
9 LUXULUXU	-3.229	-.843	.214	.065	10.698	6.433
-2.123	9.643					
10 RELIRELI	-.457	13.444	28.254	.097	-14.131	-16.658
9.126	-28.102					
11 HONDHOND	-21.721	-15.114	3.524	-.088	19.204	13.704
11.499	7.847					
12 MAZDMAZD	-19.161	-22.745	12.223	-.116	-11.352	2.263
-15.233	3.042					
13 FORDFORD	-24.368	9.715	-17.060	.037	1.156	-7.042
-8.321	3.831					
14 TOYOTOYO	-11.429	20.822	-16.415	-.020	-7.359	6.487
-10.994	-3.512					
15 NISSNISS	18.217	-12.661	-3.788	-.058	5.737	-1.243
9.262	.388					
16 CHRYCHRY	-28.000	-18.960	2.891	-.075	-15.489	3.227
-16.386	-8.495					
17 PONTPONT	1.766	18.192	-11.925	-.084	19.718	2.549
10.628	26.807					
18 YOURYOUR	27.086	20.543	1.075	-.122	.188	18.080
-.293	-11.615					

Distances moved in the interval between time 1 and time 2

Concept 1 (SPORTY LOOKING	) moved	10.866i units.
Concept 2 (FUN TO DRIVE	) moved	51.601 units.
Concept 3 (FAMILY CAR	) moved	12.350 units.
Concept 4 (GOOD VALUE	) moved	10.365 units.
Concept 5 (PRACTICAL	) moved	14.886 units.
Concept 6 (AFFORDABLE	) moved	21.579 units.
Concept 7 (EXCITING	) moved	3.082i units.
Concept 8 (APPEALS TO OLDER PEO	) moved	36.906 units.
Concept 9 (LUXURIOUS	) moved	25.758 units.
Concept 10 (RELIABLE	) moved	23.303 units.
Concept 11 (HONDA ACCORD	) moved	50.483 units.
Concept 12 (MAZDA 626	) moved	31.124 units.
Concept 13 (FORD TEMPO	) moved	15.741 units.
Concept 14 (TOYOTA CAMRY	) moved	17.587 units.
Concept 15 (NISSAN STANZA	) moved	15.646 units.
Concept 16 (CHRYSLER LEBARON GTS	) moved	15.377 units.
Concept 17 (PONTIAC GRAND AM	) moved	25.251 units.
Concept 18 (YOURSELF	) moved	71.347 units.

The Mean Distance Between All Points in Space 1 and their Counterparts in Space 2 is 25.181

2Row Vector Correlations Between Time 1 and Time 2	Concept	T 1 Magnitude	T 2 Magnitude	Scalar Product
-	Concept			
Correlation	Angle			
	1	85.14	70.86	6193.67
.973300	13.3			

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.666048	48.2	2	69.09	48.57	2235.24
.980955	11.2	3	63.56	61.99	3864.74
.981652	11.0	4	44.27	58.50	2637.38
.964011	15.4	5	47.25	53.53	2438.37
.945922	18.9	6	66.24	60.67	3801.35
.995577	5.4	7	67.63	62.35	4235.35
.858484	30.9	8	64.55	71.73	3975.06
.944591	19.2	9	77.70	77.00	5650.95
.566235	55.5	10	19.78	27.85	311.94
.735754	42.6	11	55.50	74.53	3043.80
.934637	20.8	12	49.13	71.68	3291.32
.992399	7.1	13	64.36	77.48	4948.50
.970548	13.9	14	50.29	61.55	3004.20
.968503	14.4	15	62.79	60.22	3662.39
.989400	8.3	16	67.35	86.31	5874.76
.977154	12.3	17	66.49	85.90	5580.75
.073492	85.8	18	50.12	54.60	201.09
2Col Vector Correlations Between Time 1 and Time 2					
			T 1 Magnitude	T 2 Magnitude	Scalar Product
Correlation	Angle				
.928148	21.9	1	195.25	175.27	31762.25
.913699	24.0	2	133.98	115.83	14178.94
.736367	42.6	3	92.49	100.58	6849.51
.868421	29.7	4	88.64	86.11	6628.34
.805446	36.3	5	74.44	97.46	5843.60
.879610	28.4	6	69.01	95.15	5776.27
.828018	34.1	7	60.82	92.25	4645.92
.859884	30.7	8	52.47	66.77	3012.72
.488869	60.7	9	50.09	80.33	1967.02
.368248	68.4	10	32.58	60.17	721.85
.727375	43.3	11	32.28	62.27	1462.09
.129603	82.6	12	.47	.34	.02
.777226	39.0	13	13.18	50.13	513.45
.536489	57.6	14	43.30	35.71	829.47
.452336	63.1	15	49.93	58.71	1326.01
.563065	55.7	16	56.61	57.25	1824.82
.621029	51.6	17	90.08	81.80	4576.32
.814261	35.5	18	102.99	105.26	8827.56

Using Galileo*V5.5

Galileo

Galileo*V5.5 is an advanced product, and requires more skill than most of the other programs in the Galileo system. After a little practice, however, it can become quite easy.

V55 runs usually begin by running the program INTERGAL ("Make a Runstream" on the GALILEO menu). INTERGAL asks a series of questions which set up the V5.5 run. INTERGAL has complete online context sensitive help, and so it's easiest to learn to use it by using it. But some specialized runs can be tricky.

Statistics

Statistics is a default option in INTERGAL, so you get them automatically when you use V5.5 to analyze your paired comparisons. Option 18 on the option control line specifies that statistics are to be calculated.

A.M.G.

To get the Automatic Message Generator to run, it is only necessary to answer "yes" when INTERGAL asks if you have any specifications. Then say yes when it asks if you want messages. It will then ask you to specify the start and target concepts. After that, message strategies will be calculated. V5.5 will produce every possible strategy using one, two, three and four attributes. It will also list the ten best strategies. Remember, though, V5.5 only knows what strategies will be most effective; it has no way of knowing whether they're true or not -- that's up to you. (In the 1972 election, A.M.G. found that one of George McGovern's most effective strategies to win the election was to claim he was Nixon.)

Comparison of Spaces

Galileo

To rotate raw paired comparison data, simply run INTERGAL, answer "yes" when asked if you have any specifications, and "yes" for comparison of spaces. You will also need to tell it whether there are any free concepts, and, if there are, which ones they are. INTERGAL will also ask if this is a time series. (That means a set of datasets from the same population collected at multiple points in time.) If you say yes, it will automatically compare each dataset to the one which immediately preceded it in time, (that is, 2 to 1, 3 to 2, 4 to 3, etc.) If you say "no", it will ask you for a "MAinspace." A MAINSPACE is one space to which you wish to compare all the others. Typically, you might have a total sample which has been broken down into subsamples; you might want to compare each subsample to the main sample. Usually, spaces which have all been rotate to a single common space can then be compared (visually) to each other without further rotation.

If you need to rotate coordinates you already made, *you must append them to the runstream file.* V5.5 can't read them directly from their own file. You must also change the first "1" on the OPTIONS line of the runstream file to "3". ("1" is the option for paired comparison input data; "3" is the option for coordinates input.) You can make these changes with any ASCII file editor. If you don't have a favorite ASCII editor, you can use the EDWIN editor provided in the TOOLS directory. Then 1) change the "1" on the options line to "3"; remove the file names from the end of the runstream file, and append the coordinates to the runstream file.

Conversion of Coordinates

Note: *V55 cannot read coordinate files made by Microgal, Catpac, or Galnet without editing.* You will have to use your ASCII editor to delete the concept labels and standard errors (if any) from the coordinate file before input to V55. You will also have to edit the format statements on the header line. Galileo V5.5

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expects to see, in columns 10-12,13-14 and 15-16, respectively, the number of concepts, the number of real dimensions, and the total number of dimensions in the solution. MICROGAL, CATPAC, and GALNET provide these numbers, but in columns 10-13, 14-16 and 17-19 respectively.

Similarly, *coordinate files made by V55 cannot be read by ASG or Galileo*PLOT. If you wish to plot coordinate files made by V55, you will have to append the concept labels to those files using your ASCII editor.* If you have also calculated standard errors using Galileo*MICROGAL, you can append these errors to the file following the concept labels. You will not, however, have to edit the header line, since PLOT and ASG can read the V55 formats. See the formatting requirements of Galileo*PLOT for more information on plotting formats.

Running Galileo*V5.5

After you have set up your runstream, you only need to say "V55" or choose option 12 **Run V55** from the Galileo menu) and the program will ask you where your runstream is. The program will then automatically execute, using the instructions in the runstream file. There will, of course, be no problems at all. (If you believe that, you are new to computing!)

V5.5 is an expert's program. You may have some trouble at first, but, if you take notes on what you are doing (and what has gone wrong) you will soon find it quite simple. And if you have difficulty, please call The Galileo Company.

Option 13: Screen Plot: Galileo*PLOT

I read coordinates made by Microgal, V55, or Galnet and plot them

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graphically on the screen. Only the first three dimensions are plotted. The first dimension is the horizontal axis, the second dimension is the vertical axis, and depth is the third dimension. Each concept is represented as a sphere whose size is a function of the uncertainty of measure. The radii of the spheres representing the concepts is one standard error. (Measurement of the uncertainty of location of the concepts depends on a complete measurement of all pairwise distances among the concepts.) Among the Galileo programs, only MICROGAL and V55 provide complete pair comparison measures, and only Microgal computes the standard errors from which these spheres are made. GALNET allows producing ordinary perceptual maps from object-attribute data. When standard errors cannot be calculated, radii are defaulted to a convenient number which allows easy visualization, but may underestimate or overestimate the actual error of measure. (I'll warn you when the errors are missing and I have to use the default radii.)

I correct for parallel perspective according to distance from the eyepoint, as does the human eye. This means that objects close to the viewer will appear much larger than those far from the viewer, just as they do in real life. (Put your thumb in front of your eye as you read the screen and you can see how this happens.)

You can interact with the plot. You can rotate the space up, down, left and right any arbitrary number of degrees. This is not as easy as it sounds, and rookies frequently become hopelessly lost after a few rotations. If this happens to you, just press **[F8] (RESET)**; no harm can be done by experimenting.

I'm also able to help you evaluate potential strategies. You provide me with a goal (that is, the position you want to take in the market place, or where you want to go). You also tell me what concept (product, candidate, etc.) you want to move to that position. Then you can suggest various combinations of

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other concepts, attributes, and the like, that you think might form an effective strategy for moving the desired concept to the desired position. I will tell you how far are from that position at the start, how close this strategy is capable of bringing you, and what percentage of the original distance this would be. (Zero, of course, would be a perfect strategy which could take you exactly to the position you wish to occupy.)

While the typical procedure is to move one concept to the position of another single concept (e.g., to move a product to the point where most people in the market can be found, or to another ideal point), I am able to evaluate strategies of any degree of complexity. You may try to move one concept to the middle of any number of others; or you may try to move several concepts toward one other, or several concepts to the center of several others. As with any other simulator, my accuracy depends on the tested strategy being fully implemented, and on the fact that outside forces such as competitor's strategies don't change the situation beyond my existing knowledge. No strategy can ever be perfectly implemented, and outside circumstances never stand still. A wise analyst will always assume each strategy will be somewhat less effective than its simulation. But it is appropriate to compare strategies to each other.

I currently don't support printing, but you can capture the PLOT image using a screen capture utility, and insert it into word processing documents in the standard way. The plot can then be printed with the document, using the print facility of your word processor. If you currently do not have a screen capture utility, contact your Galileo representative who can help you select one that's right for your applications.

I'm a very powerful program, and have my own User Manual and Tutorial, which is included in the documentation. Please consult this document for further information about how to use me effectively.

Option 14: Run Oresme: Galileo*ORESME

I'm a self-organizing neural network like CATPAC. (we're related). I'm optimized for conversation, however. You can type words to me, and I respond with the words I associate with those words. What's more, I'm self-organizing, which means I can learn from the conversation and change the patterns of associations by paying attention to our conversations. I can also read .win matrices made by CATPAC, MICROGAL, GALNET and V55, so that all the patterns of association they learned are instantly available to me. (Don't you wish you could do that with YOUR relatives?)

This means that I can talk to you about some text CATPAC has read, and I'll know the things it discovered. You might think of me as a non-hierarchical clustering system. I read the word or words you give to me, and I find out what other words go with them; this set of words can be thought of as a cluster or category. But I don't assign each word into only one category, as does a hierarchical clustering scheme, and a word can belong to many categories for me, as for you. (Marketers find this helpful when they are trying to develop a product that can exist in, and compete in, several segments at once.)

Like Galileo*PLOT and Galileo* CATPAC, I'm a very powerful program and have my own manual, which you should consult for further information about how to use me effectively.

Option 15: Input Network Data: Galileo*NETIN

Perhaps the most important mathematical form in all multivariate analysis is the square matrix. I'm a simple utility that allows you to enter any arbitrary square matrix and normalize it in one or more useful ways. I'm called

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NETIN because the most general theoretical form that is used to describe such matrices is network. Each row or column of the network is called a node, and the cell entries represent the relationships (or connections or weights) among the nodes. I was created originally to deal with switching data, such as brand loyalty and the like.

There are two kinds of switching data: loyalty and source of sales. Loyalty data tells the percentage of users of brand x that switch to brands y, z, and so forth. Source of sales data tells the percentage of those who switch to brand x that come from brands y, z and so on. I can make either type for you, but it's up to you to know which kind you want.

Option 16: Forecast Trends: Galileo*FORECAST

I can project future sales and installed base from loyalty data. By loyalty data I mean a square products X products matrix whose entries give the percentage of those who use product x that switch to product y during the period the matrix represents. I also need to know the percentage of the entire installed base that is represented by each of the products in the matrix, the percentage of each of the products that is traded during the period, and the rate at which each product (or its users) goes out of service during the period. (A car which has gone to the junk yard, for example, can't be traded in.)

As you go through the program, I can help you with files, formats and the like. Just enter '?' whenever you don't know what to do next. By the way, NETIN is just the ticket for making the loyalty matrix I need. Tell NETIN that FORECAST sent you!

Option 17: Review a study: Galileo*READ

ELQM (The Electronic Questionnaire Maker) sets up the Galileo*CATS

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system, makes the files, and automatically controls access to data. If you need to review a particular study after you've set it up with ELQM, you need me. Just tell me the name of the directory on which the study resides and I'll find the relevant information and write it out on the screen for you. (If you have a favorite file editor, you can read the information file with that. The file is always called STUDY.DAT, and it resides on the study directory. Don't modify this file, however, since SPED depends on it to work properly.

Option 18: Modify exclude file: Galileo*EXCLUDE

Whenever CATPAC reads text, it automatically skips certain words that most people don't care to examine (such as a, the, if, because, and so on.) You may have some additional words in your text you'd like to ignore, or, you may want to remove some words from the exclude list. I help you add or delete words from the exclude list.

Option 19: Go to DOS

I'm actually not a program at all. When you choose me, I just suspend the Galileo system and return you to DOS. To return to Galileo Control, simply enter a blank line.

Option 20: Quit

Choose me and I shut down the Galileo system and relax. Phew!

Galileo

Appendix 1: Tools

Your Galileo installation includes a directory called GALILEO\TOOLS. On this directory The Galileo Company has supplied three helpful DOS tools. First is a simple read only editor called **LOOK**. **LOOK** is a public-domain program which allows you to examine the contents of any file interactively. It is convenient since you can page up and down or scroll up, down, left and right in the file using the cursor control keys. You can also easily read the 132 column format files that V55 writes. And, since **LOOK** is a read only editor, you don't run the risk of altering important files.

To use **LOOK**, simply enter the command

```
LOOK [filename]
```

at the DOS prompt. To leave **LOOK**, press [ESC].

Also included is a very powerful ASCII editor, **EDWIN**. **EDWIN** is a public domain program which follows the formats of WORDSTAR, and can be very helpful in modifying files produced by V55 for use in the other Galileo programs and vice versa. **EDWIN** has complete online help, accessed by pressing **F2** once in the program. To start EDWIN, simply enter the command

EDWIN

at the DOS prompt. You can also enter a file directly with EDWIN by entering the command

```
EDWIN [filename] .
```

If you already have an ASCII editor you favor, you may use that instead

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of **EDWIN**. For more information on installing and using EDWIN, consult the documentation provided on the \GALILEO\TOOLS directory.

The last tool provided is called **UP**. Up lets you climb up your directory tree in only three keystrokes. If your default directory, for example, is GALILEO\DATA, then issuing the command

UP

at the DOS prompt will set your default directory to \GALILEO. Issuing the command again will move you to the root directory.

All three of these utilities are public domain software and are neither warranted nor supported by The Galileo. They are provided at no charge as a convenience for the user.

Note that authors of public domain software sometimes request voluntary payments from users for the use of their programs. No such payments have been made on your behalf by Galileo or any of their representatives.