Galileo™

Galileo Manual

Generation 4

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Welcome to Galileo!

Everything you Know is False

Since you're reading this manual, the chances are good that you've been trained as a social scientist. And, if you have, it's nearly certain that you've been taught that human individuals and human societies are special, and require special methods of study that are different from those used by physical scientists. For example, while physical scientists measure comparatively (distance is comparison to the standard meter, weight a comparison to the standard kilogram, etc.), social scientists measure categorically (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree; age= under 30, 30-39,40-49, etc.).

Secondly, social scientists don't expect much precision in their results; most multivariate analysts are happy to explain 30% of the variance in whatever they're studying, and some path models published in reputable refereed social science journals explain as little as 5% of the variance in their dependent variable. Physical scientists, on the other hand, strive for ever greater precision of measure. Since its discovery, the level of precision of measure of the gravitational constant g, for example, has improved by more than four orders of magnitude. While modern social science measurement systems are only a little under a hundred years old, they show little or no improvement – the precision of the most commonly used scale in social science -- the five-point Likert type scale, developed in 1933, is today exactly what it was in 1933: ±20%. (This is considerably *less* precise than the Thurstone Scale it replaced.)

Another very important difference is the way physical and social scientists check their work. Physical scientists must communicate their results to others, who must check them. A result that has not been replicated by another independent team of scientists is considered a meaningless anomaly in physical science. In the social sciences, studies are virtually never repeated, and replications are virtually non-existent. Instead, social scientist look up the probability that they are correct in tables of the standard deviation, and "check" themselves.

A fair analysis of the progress – or lack thereof – of social science since its quantitative methodology was established in the early and mid 20th century would not be optimistic. Not only has no social science theory established itself as a "standard", but none of the hundreds or perhaps thousands of proposed theories has ever been decisively rejected on the basis of research. Too be sure, most social scientists accept this state of affairs with a sense of resignation as the "nature" of human individual and social phenomena. It is a core belief of Western culture that

human phenomena are fundamentally aleatory and subject to the caprice of human willfulness. Human phenomena can't be measured precisely because they are themselves essentially fuzzy and indefinite; they can't be completely understood because they are not causally determined.[1]

The Galileo System

No one here at The Galileo Company believes any of that. The Galileo System is not just a special kind of statistical or mathematical analysis. It is a fundamental rejection of and alternative to the standard social science model. We agree with Richard Feynman, Nobel laureate and one of the leading physicists of the 20th or any other century:

> Because of the success of science there is a kind of science -- I think a kind of a pseudoscience -- social science is an example of a science that is not a science. Now I may be quite wrong -- maybe they do, but I don't think I'm wrong… you see, I have the advantage of having found out how hard it is to get to really know something... how careful you have to be about checking the experiments... how easy it is to make mistakes and fool yourself... I know what it means to know something. And therefore I can't... I see how they get their information and I can't believe they know it -- they haven't done the work necessary, haven't done the checks necessary, haven't done the care necessary... I have a great suspicion that they don't know…. I don't know the world very well but that's what I think.

This is not to say that social scientists are charlatans. The best of them are exceedingly rigorous and highly skilled in following rigid procedures defined by early leaders like Karl Pearson, R. A. Fisher, Rensis Likert, S. S. Stevens, Karl Popper and others. These procedures are even more rigorously defended by peer review journal editors and referees, promotion and tenure committees and dedicated deans. It is rather to say that these procedures are *not science*, and they do not work.

The Galileo System is based on the belief that science is the most effective means of describing nature we have yet devised, and that human beings are a part of nature. It assumes that measurement means "comparison to some standard,' and that science is the process whereby we make measurements and communicate them to others, who must check them.

When we started 40 years ago, these ideas were very strange and radical. The are still radical, but after 40 years of experience, we know that cognitive and cultural structures and processes can be measured as comparisons to some

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[1] And yet, the most precise and successful scientific theory of all time, Quantum Electrodynamics, describes quantum phenomena which are "fundamentally aleatory … essentially fuzzy and indefinite…. not causally determined." Hmm.

standard with great precision, even if the standard social science methods textbooks don't yet know this.

We've accumulated well over 200 books, dissertations, theses, refereed journal articles and more to document that human cognitive and cultural structures and processes can be studied by the exact methods used by physical scientists – no special dispensations required. You can find them here.

Erwin Schrödinger, the great 20th century physicist whose wave equation lies at the root of quantum physics, said that the first prerequisite for science is the belief that *nature can be understood* without resort to supernatural phenomena. In order to understand and use the Galileo tools, you will need to be willing to suspend your judgment about whether human cognition and culture can be measured and understood in the same way as other structures and processes in nature. If you don't believe you can do it, you won't be able to do it.

Galileo Measurement

The foundation of all variables in science is the concept of space-time. All the variables of science are derived from this fundamental concept. Velocity is defined as the change of position divided by the change in time. Acceleration is defined as the change in acceleration divided by the change in time. Force is defined as the rate of acceleration of a unit of mass, while mass is defined as the inverse of the acceleration under a given force. Similarly work, energy and power are all ratios of these fundamental or "primitive" variables.

Time is well defined in social science – it is the same as it is in physical science, and can be measured with a clock or calendar (although we often just measure it as pre and post). But concepts of space in the social sciences are generally only metaphorical. Galileo, on the contrary, begins by establishing the concept of distance and space for cognitive and cultural phenomena. We do so in exactly the same way as distance and space are defined in physical science: we choose an arbitrary cognitive or cultural difference or "distance" and measure all other cognitive or cultural distances as ratio comparisons to this arbitrary standard.

If we want to map perceptions of the human emotions, for example, we might arbitrarily set the distance between *fear* and *anger* as 100 units, and then ask respondents to estimate how different all the other emotions are from each other compared to this original arbitrary standard. One of these questionnaires yields a square symmetric matrix of distances among the emotions, much like the table of distances among cities on a map. Galileo algorithms convert these distances into a space in which emotions that are similar to each other (love, happiness, joy, for example) are close to each other and emotions that are dissimilar (love and hate, joy and despair, for example) are far apart. Within this space, it is possible to calculate all the basic variables of science as combinations of distance and time.

Galileo Software

A Galileo questionnaire is unconventional and hard to make. And the standardized statistical packages written for the social sciences don't contain the algorithms needed to make Galileo spaces and make calculations based on them. Over the years, we've developed special software to make these things easier. As others developed an interest in Galileo research, we've made our software available to them, and have, over many years, improved and perfected it. Galileo software was not written as a commercial product – it was always intended for our own use, and the software we make available to you is exactly the software we use ourselves.

Installing Galileo

Galileo Software comes in a folder called galileo (now there's a surprise!) On your Mac, simply drag this folder into your Applications folder. On your PC, drag it into Program Files. That's it, you're done. Inside the galileo folder you will find a folder called help, which contains all the help files, a program called data, which contains sample data, and a folder called runner, which contains all the running programs. You will also find this manual.

None of the Galileo programs are point-and-click; all of them are designed to run from the command line with a conversational interface. This means that they will speak to you (or text you, to be more precise) and you will type in answers to their questions. Just click on a program's name to run it.

ELectronic **Q**uestionairre **M**aker (ELQM)

The first program you will use is ELQM. Since all the programs are conversational, we can let them describe themselves:

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. You can read the study.dat file with Notepad on the PC or TestEdit on the Mac.

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 in your study directory called quest003.dat, and I would tell SPED to append all responses to that question to quest003.dat.

Automate **Q**uestionnaire **M**aker (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 Pages, 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.

Simplified **P**rocess for **E**ntering **D**ata (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 post the responses to the correct files.

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.

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.

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 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 maximum value above which it will ignore data, the location of the labels file (the file were 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.

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.

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 candidate. 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 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.[2]

Intergal

Galileo Version 5.7 (V57) is the current version of the original mainframe Galileo program. Designed in the 1970's, V57'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 V57 work. I'll ask you a series of questions, then write a command file that executes a V57 run. Crude, but effective.

V5.7 is very versatile, and I can't design every possible job V57 might do. Often more advanced work with V57 will require me to make a run stream like this one which you will then edit with an ASCII editor like Notepad on the PC or TextEdit on the Mac.

Galileo Version 5.7

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). You can find it on the Galileo Literature Database.

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[2] 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.

Galileo Version 5.7 is a powerful and sophisticated program for the advanced user. While a complete mastery of V5.7 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 5.7 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, V5.7 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, V5.7 will also flag values beyond a user-supplied maximum (EXVAL) and eliminate values beyond another user-set value (MAXVAL). (When eliminating extreme values, we recommend using Chauvenet's Criterion.) Cell with the largest value and the smallest values are also flagged. V5.7 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.)

Cells that 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, V57 calculates the complete eigenstructure for the data. This means that Galileo Version 5.7 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. V57 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 eigenvectors. If this ratio is 1.0, the space is completely Euclidean; greater values indicate greater degrees of warp.

***A**utomatic **M**essage **G**enerator (A.M.G.)*

In a typical perceptual map, the positions of objects and their attributes are determined only within very course 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 other objects and attributes 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, V5.7 refers to it as the target. The object you wish to reposition is called the start concept.

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.

V57 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. V57 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.

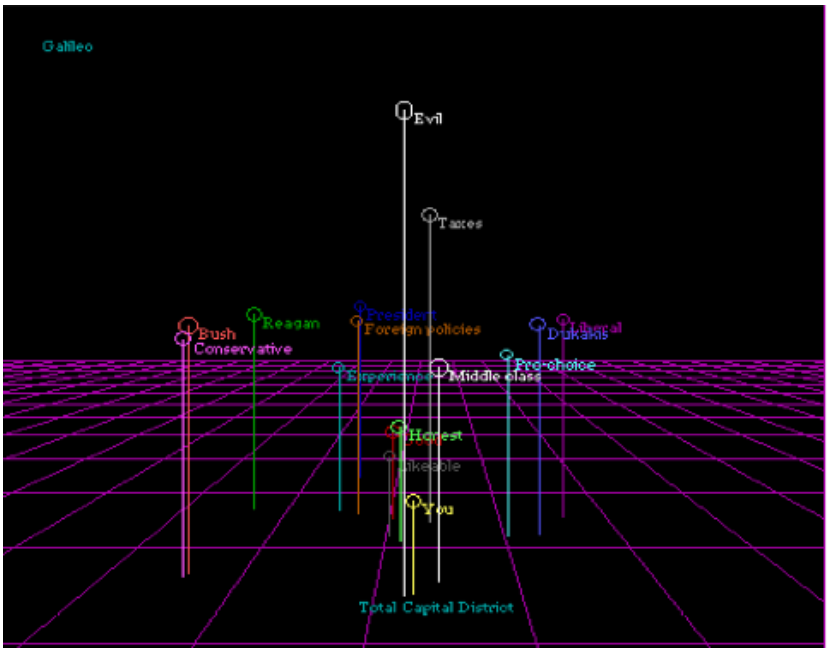

Figure 1: Map of All Voters

Figure 1 shows 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.) On the other hand, Figure 2 shows the decision the program made when it examined only Democrats in the same region: Notice that, for the

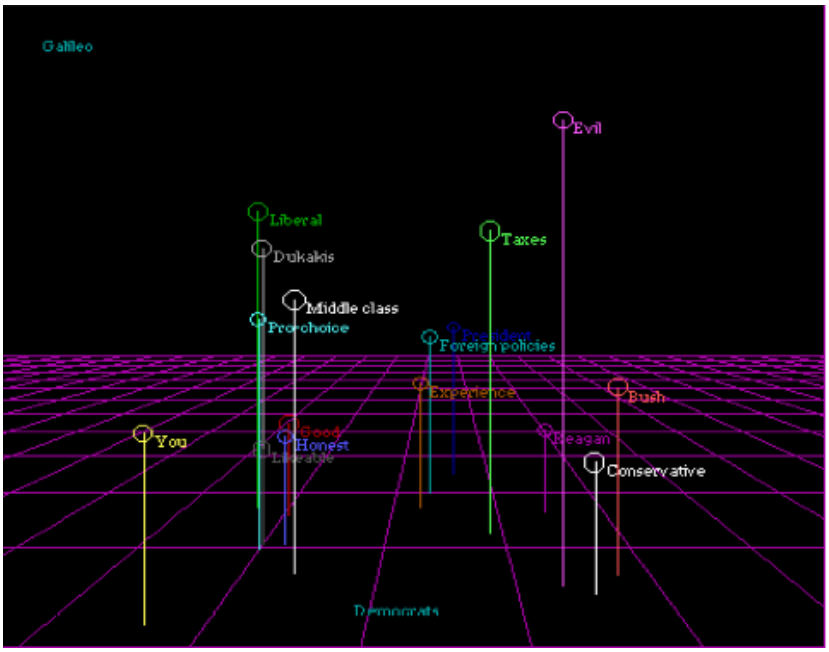

Figure 2: Unrotated Map of Democrats

Democrats, the software "decided" to place "liberal" 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 orientation. V5.7 is able to do away with artifactual differences due solely to the orientation of the maps.

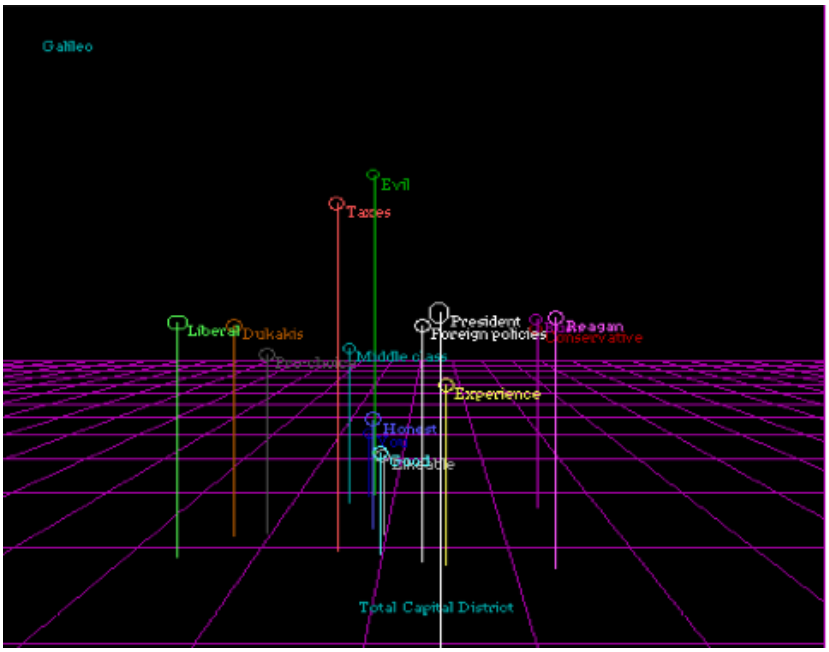

Figure 3: Rotated Map of All Voters

V5.7 can rotate the map of Democrats to match the map of the general population as closely as possible. It is important to understand that V5.7 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 2 and 3 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.

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 required when different maps are to be compared.

Free Concepts

When V5.7 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*V5.7 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 V5.7 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 V5.7 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, V57 writes out the complete eigenstructure of the spaces after rotation. In addition to the coordinates, V57 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:

Galileo*V5.7 is an advanced technology, and requires more skill than most of the other programs in the Galileo system. After a little practice, however, it can become quite easy.

V57 runs usually begin by running the program INTERGAL. INTERGAL asks a series of questions which set up the V5.7 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 V5.7 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. V5.7 will produce every possible strategy using one, two, three and four attributes. It will also list the ten best strategies. Remember, though, V5.7 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 Richard Nixon.)

C*omparison of Spaces*

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. V5.7 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. 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.

Or not. When this option was designed, computers were a lot slower than they are now. It's almost certainly easier just to start over from the paired comparison data than to enter coordinates already made in another run.

Running Galileo Version 5.7

After you have set up your runstream, you only need to say "V57" (./v57 on a Mac) or click on the program 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!) Help, however, is always just an email away.

A Last Word

If you are new to Galileo, there are some lessons we've learned in the last 40 years that can save you a lot of grief. The most important of these is that concepts are real, material things: they are clusters of interconnected neurons in living brains. They are not spiritual or immaterial, and they do not behave capriciously. Concepts that have grown up over decades are very hard to change – they exhibit a great deal of inertial mass.

This is certainly the case with our concepts of the human mind, which we have been taught from birth is an immaterial thing capable of caprice, immune to the laws of thermodynamics. And it is also so with those who have grown up in a culture where social scientists have told us human attitudes and beliefs can only be measured on five point categorical scales, people can only give their age to the nearest five years or so and the like.

This means that, when one used to common social science practice sees a Galileo questionnaire, they assume that the person who made it didn't know how to make questionnaires. Don't argue with them – their attitude is too massive to change in a few moments of conversation. Just say it's a special kind of questionnaire, and ask them to try to do their best. Even though they think it's wrong or even stupid, most intelligent people can still do it. (One dairy farmer wrote in the margin of a Galileo questionnaire "What college educated idiot wrote this questionnaire? How far apart are this questionnaire and common sense? 1000 units!" So he could clearly do it.)

Respondents are not experts on measurement theory, any more than cancer victims are experts on cancer. We know that some people can't figure out how to do it. We know that some people fill them out backwards. We know that, in a random sample, a percentage of the respondents are drunk when they fill out the questionnaire. We know that some respondents lie, and others write random numbers. If some respondents tell you the questionnaire is useless, don't worry. They don't know how it works.

It works because all the mistakes and deliberate falsifications we just discussed are essentially random, and average out. The only way to check the precision and accuracy of the measurements is by calculating the standard errors around the means (which v5.7 will do for you). If these errors are small, the mean scores are precise. If the resulting spaces are meaningful and fit with experience, then they are accurate and useful.

After you practice a bit, you'll find it very quick and easy to make Galileo questionnaires, enter the data and run analyses. We make quick little Galileos all the time just for fun. We strongly believe science should be fun.

Finally, remember that using Galileo methods is an act of rebellion against the cultural beliefs we have about ourselves. Our collective concepts of who and what human beings are are very, very massive. Changing them requires huge amounts of energy, and the expenditure of large amounts of energy into any system can generate lots of heat. Unless you enjoy conflict, you might want to tread cautiously. Journal reviewers and editors are very reluctant to approve papers they don't understand, particularly if they make revolutionary claims. We've found it's best to describe Galileo methods as just another multivariate technique, and to cite some of the very extensive literature to indicate that it is indeed a legitimate way to do business. Emphasizing Galileo's radical nature is a sure way to rejection.

And don't forget, there's a journal that warmly welcomes Galileo research – Communication & Science. We hope to see some of your work there soon!