A Cognitive Theory of Collective Consciousness

Joseph Woelfel

SUNY at Albany

Scott Danielsen

SUNY at Albany

June Ok Yum

Towson State College

Rah Press

The study of cognitive processes has been criticized for its individualistic and psychologistic approach. The present paper argues that society as a whole has global characteristics that are different from the psychological characteristics of its members, and that mass communication systems have important effects on society that are not detectable by analysis of its individual members.

This paper presents a theory which suggests that society as a whole may be considered an information processing system, which may itself have attitudes, beliefs, scripts, plans and goals, even though no individual or set of individuals within the society may be aware of them. Furthermore, the theory suggests mechanisms by which these collective cognitive structures may be directly and fundamentally influenced by mass communication systems in ways that are virtually undetectable by individual, psychological analysis.

The key question for analysis above the individual level is whether or not the group -- audience, society, or culture -- has group properties above and beyond the aggregate properties of its individual members.

Kincaid (1987) proposed a convergence theory of communication, self-organization, and cultural evolution which is consistent with the point of view elaborated here. Group-level boundaries are established by (and measured by) the flow of information through communication networks--both interpersonal and mass media linkages. The degree of cognitive, cultural convergence within a given group, organization, or society is determined by the extent to which its members share the same information over time. The mass media system of a given society and the diversity of its content is proposed to be a major factor in determining the degree to which its members share the same information.

One of the most extreme arguments for attributing group properties to intact social systems comes from Bateson (1972). His concept of an 'Ecology of Mind' rejects the conventional concept of the seperate, individual mind differentiated from the individual's environment. In fact, the ecology of mind implies that the 'mental characteristics of the system are immanent, not in some part, but in the system as a whole' (Bateson, 1972). Although this idea continues to intrigue Mass Media scholars, Bateson himself gave no indication of how such an ecology of mind could be measured or studied.

Although a genuinely sociological approach to mass communications effects is much less common, it is certainly not new. Perhaps the most prominent advocate of a collective approach to social data was Emile Durkheim.

Durkheim considers the collective consciousness not simply a repository or collection of the attitudes and beliefs of the members of a society, but as an active cognitive process "...by which a plurality of individual consciousnesses enter into communion and are fused into a common consciousness," Durkheim, 1960, p. 335). This "common consciousness" has attitudes and beliefs, and thinks and acts.

For Durkheim, the collective consciousness has foundational importance. Up until Durkheim, philosophers and other social thinkers had posited only two sources of concepts: either they were "built in" to the individual consciousness from historical, genetic or even mysterious sources, like the Ideas of Plato or the Categories of Kant, or they were the product of the individual human mind, following the inductive processes discussed by Aristotle. Durkheim, however, was among the first to give voice to a third possibility.

He suggests that the <u>collective consciousness</u> is the source of concepts: "In [<u>Elementary Forms...</u>] we have tried to demonstrate that concepts, the material of all logical thought, were originally collective representations" (ibid, p. 338). A function of the collective consciousness, then, is the <u>formation of concepts</u>. <u>This is at odds with those psychological approaches which consider concept formation to take place in the individual mind</u> -- probably the most commonly held view, but one which has never been satisfactorily defended by psychologists or philosophers, from Aristotle and Plato to the present.

Durkheim, however, could not provide much help in showing us how to observe (measure) the collective consciousness, except to tell us that "...the average [of rates of births, deaths, marriages, divorces, suicides, etc.] expresses a certain state of the group mind or collective consciousness (la conscience collectif'" (Durkheim, 1952,pp. 102).

The question of how the collective consciousness can create concepts by averaging has always presented a problem, since concepts have always been thought of as <u>categories</u> (following Plato, Aristotle and Kant, among others) in the "Classical View", which has dominated communication theories until now, and it is not clear how discrete categories are to be "averaged".

The Cognitive Revolution:

Recent convergences of lines of research particularly in cognitive psychology (especially Rosch and her coworkers; Johnson-Laird, and others) as well as work by computer scientists in massively parallel systems have led to new and exciting possibilities for carrying out Durkheim's program.

The "Cognitive Revolution" has revitalized the study of concept formation and categorization, and led to a new questioning of the "classical view" of classification. Gardner (1985) sees the classical view as holding to three premisses: 1) Categories are defined by attributes such that all objects belonging to a category possess the attributes and no nonmembers possess all of them; 2) Within the boundaries of a category, all objects are identical with regard to that category -- no members are "better" or "worse" members; 3) Categories are arbitrary, being defined by culture and language, rather than by the nature of stimuli or the structure of the nervous system.

The classical model of categorization also implies a syllogistic model of reasoning based on nesting of sharply defined categories (Johnson-Laird, 1983).

Each of the three premisses of the classical view, as well as the syllogistic reasoning model itself, has come under attack recently. Particularly Rosch and her colleagues have argued for a view of perception which is substantially at odds with this view. (Rosch, 1977, 1978; Mervin and Rosch, 1981; Heider, 1972; Rosch, 1973a; 1973b) They argue that categories are defined by <u>prototype members</u>, rather than by attributes, and that objects are members of categories insofar as they are seen to be similar to the prototype category. Categories are also seen to be <u>nested</u> or hierarchical, with categories nearest to "experience" being "basic", higher level concepts "superordinate", and lower level categories "subordinate".

Since objects "belong to" a category only insofar as they are similar to the prototype member, there are clearly grades of membership and even "fuzzy boundaries" around categories. Zadeh and his coworkers, for example, quantify the extent to which an object belongs to a category with a number between zero and one, and have studied extensively the mathematics by which such categories combine to produce conclusions. (Zadeh, 1974) Other approaches to "fuzzification" exist (Putnam, 1975; Lakoff, 1972; Halff, Ortony and Anderson, 1976), along with models of cognitive processes which are basically continuous rather than categorical, such as the "Galileo" model. (Woelfel and Fink, 1980)

The Galileo model describes the collective consciousness as a multidimensional space within which each concept is described as a labelled but diffuse region. Each concept gradually fades into its neighboring concepts without a sharp boundary. The further apart concepts in the space are from each other, the more different their meanings.

In fact Galileo models the collective consciousness as a composite of all the spaces of each individual member of a culture, none of which correspond exactly. The resulting aggregate space is a complex overlay of unbounded concepts quite consistent with the new view of Rosch and her colleagues. (Woelfel and Fink, 1980)

As the "categorical' character of classification has been called into question, so too has the traditional role of society and culture. Until recently, perhaps the most widely shared view of the effects of society and culture on perception and concept formation was some variant of the Whorf-Sapir hypothesis, which held that cultures established categories arbitrarily primarily by linguistic encoding, and that the categories built into the language either determined or substantially influenced perceptions. Specifically, the existence of a color term in a culture's lexicon was thought to make the color named by that term easier to recognize and recall. (Brown, 1956, 1975)

The logic of this assumption is categorical; it assumes a culture developes "slots" or "bins" which are labelled. When a perception is close to one of these bins, it is filed in that bin. Perceptions that are "between bins" are more difficult to categorize, and should thus take longer to recognize. Similarly, actual judgments should be shifted toward the bin even though they don't exactly correspond.

Particularly Rosch's work with color perception among the Dani, however, tends to indicate that, at least within the domain of color perception, certain cross-cultural invariants seem to emerge in fairly clear contradiction of what ought to be predicted by a strong version of cultural relativism or linguistic determinism. (Heider, 1972; Rosch, 1972a; 1972b) People from diverse language groups seem to make the same kinds of color confusions, for example, which indicates that the actual characteristics of the color chip override the effects of the speaker's native lexicon even for very different language systems.

While critics of the "new realism" can be found (Armstrong, Gleitman and Gleitman, 1983; Osherhorn and Smith, 1981; Sahlins, 1976), clearly the current trend of opinion among cognitive scientists probably would assign social and cultural factors a lesser role in perception and concept formation than the previous generation, at least with "basic" categories such as color terms.

At the same time, the new findings do not invalidate earlier work like Sherif's (1935) autokinetic effect experiments or Asch's (1951) social influence experiments, which show that there are clear and potent effects of other people on at least <u>reports</u> of judgments of stimuli.

The Asch and Sheriff experiments, unlike those just cited, deal with continuous, comparative measurements -- the length of lines and the distance a light point is perceived to move. The workers in the "cognitive revolution" have not shown, nor have they attempted to show, that social influence does not take place. They have shown, however, that the view which suggests culture or society provides distinct linguistic "bins" within which experiences must fall is untenable in its strongest form.

While the question of how culture and societal factors interact with perception and concept formation may still be quite open, therefore, few workers still hold easily to a model in which culture, particularly through language, provides a set of arbitrary "slots" and/or "bins" through which experience is filtered and recorded. At the least, some consideration of the effects of social and cultural factors on perception and concept formation formation which comes to grips with the new fuzzy or continuous characterization of concepts is clearly needed.

The Locus of Consciousness:

The "new view" of perception and concept formation has several characteristics:

o Concepts are not viewed as discrete or categorical, but rather continuous and unbounded or "fuzzily' bounded

o Concepts are not established by a finite set of defining attributes, but rather are based on degree of similarity to a prototype element or elements

o How similar to a prototype object any stimulus is perceived is not independent of its physical characteristics.

Thus, the "modern view" of concepts can be represented by a geometric pattern of points, with some archetypal object at or near the center, and with point representing other members of the category or exemplars of the concept surrounding it at various distances.

While this new view is indeed very different from the older classical view, it seems on the surface to have gained its new sophistication by lessening the role of culture over the individual. In fact, to this point, the new view is fundamentally psychological.

Other workers, particularly computer scientists, have suggested models which have a fundamentally social character. Some supporters of the "massively parallel" school of computer science, for example, have modeled the individual mind as a sort of assembly of individual "processors", each one of which is "linked" to others. If one hears the utterance "She threw a ball for the Princess", some of these nodes, linked to the "meaning" round object for throwing, "speak up", or "vote"; while others, connected to the meaning of a formal dance, also speak out. As more situational and contextual cues become available, one side or the other is usually "outvoted", and the meaning is chosen (Maase, Fink & Kaplowitz, 1984; Marrow, Fink and Kaplowitz, 1984).

The formal model on which this parallel view rests is that of a network of "nodes" which are interconnected by links of varying strength. In neurological models, these nodes are neurons; in computing models, they are typically memory storage locations or switches; in abstract mathematical models they may be abstract points in a mathematical space.

When any subset of nodes is activated by external stimuli, links between the activated set are strengthened. This processes is itself cumulative, so that repeated simultaneous activation of subsets of nodes strengthens the links among them still further.

When any subset of a pattern of interconnected nodes is activated by a set of stimuli, each of them transmits its state of excitation to all other nodes to which it is connected. Such signals are additive, so that the total signal received by any node is the sum of all signals transmitted to it through its various connections. If this signal exceeds a given threshold level, that node is itself activated, even though it was not impacted by the original stimulus.

While this analogy may result in useful computing architecture, it raises afresh the deep question of locus of consciousness, both at the individual and at the cultural levels. On the individual level, if, indeed, mind is a deliberative body of many nodes and not a single central processor, who or what, if anyone or anything, is the conscious subject?

While there may be a cultural tendency among particularly Western researchers to assume the locus of such networks lies inside either a single mind or a single computer, there is no mathematical reason why the set of nodes described in a massively parallel system should reside inside a single entity. Among the entities which might fit the completely abstract mathematical definition of a node are the individual human being and the individual computer. In fact, perhaps the single most significant communication process of the next several decades is the explosive development of the distributed networked system of computers and the individual people who interact with them.

Perhaps the closest mathematical analog to this network of people and computers is the Sparse Distributed Memory model (Kanerva, 1988).

In a conventional computer memory, a set of storage locations is indexed by an address for each location. When data are recorded in the memory, addresses are selected and the data to be stored are recorded in the location corresponding to the addresses. To retrieve information, the addresses of the storage locations are provided and the information recorded in them are read out.

In a SDM, a very large number of storage registers is assummed to be available. (In a human brain, for example, between 10^{11} and 10^{13} locations may be available.) To record information into the SDM, a location is chosen at random, and the information is recorded into <u>all storage locations within a radius D from the selected location</u>. (In the Kanerva model, this distance D is the Hamming distance, which is the number of bits at which two binary vectors differ. For the present analysis it may be considered an arbitrary number.)

To retrieve data from the SDM, the address of the desired data is provided, data from all storage locations with the radius D from that address is read, summed and thresholded to yield the output data. As long as not too many other words have been written into the memory, this output data will be the same as the original.

The parallelism between the SDM and the distributed network system of computers and persons using them now growing worldwide is straightforward. When any message or pattern is presented to a subset of people and computers in the network by whatever means (such as mass media, environmental effects or any means whatever), subsets of the 5 billion individuals currently alive are presented with patterns of information of arbitrary complexity.

Individuals who are "close" to each other in the social system, that is, people who occupy similar positions within the social network, are likely to receive the same input data insofar as they are close to each other. While any single individual may be prone to considerable random error in storage of the pattern, the averaging resulting from thresholding the outputs guarantees that, under specifiable conditions, the system as a whole will recall the pattern correctly even though no single individual or (small) subset of individuals recalls or ever knew the overall pattern.

Durkheim and the Cognitive Revolution:

While the new view of cognition may initially seem to lessen or confound the role of culture, in fact a more careful analysis shows it opens a powerful new avenue for understanding the role of culture in concept formation and human thought.

The "new view" of concepts, being continuous rather than categorical, can be averaged. Recall that Durkheim said that "the average, then...expresses a certain state of the group mind" (Durkheim,1951, p.102). But the older, categorical view of concepts, left us no clue as to how to "average" the discrete categories we considered concepts to be. Now, however, if we think of a concept as a set of culturally designated objects or stimuli more or less "distant" or "far apart" from some "prototype" object, it is quite easy to see how society can "average" the distances among many objects representing the views of many people to provide an "average concept":

Each "object" can be thought of as a point in space whose location is given by a set of coordinates. Different individuals may disagree as to the location of each object, and so their respective coordinates may differ. <u>But the "average" meaning of the concept is simply given by the "average" of the individual coordinates for the concept</u>.

This, in fact, is what we presume society does: acting as a loosely coupled set of massively parallel processors (individuals), <u>the society "averages" the concepts of its members on a moment-by-moment basis to provide an average prototypical concept.</u> To be sure, this average must be weighted in reality by frequencies of interactions governed by the social structure, but in the abstract the concept is quite straightforward even if its implementation in any concrete situation may be complicated by the sheer number of people and concepts involved.

It is well understood that the process of averaging is the fundamental process whereby signal can be extracted from noise -- that is, from random stimuli. This means that the collective consciousness, viewed in this light, is a powerful pattern recognition device, which captures and render definite patterns which are far too complicated for any individual, regardless of ability, to recognize or retain. When large numbers of individuals are involved, as they always are on a cultural level, the ratio of signal to noise within each individual need not be very high at all for the culture as a whole to sort out the signal from the easily averageable (because random) noise.

Our main argument, then, is this: the collective consciousness -- "...a plurality of individual consciousnesses...fused into a common consciousness" -- grasps patterns presented by mass media and quickly forges them into sharply defined concepts <u>even though no single individual in the society can see or recognize those patterns</u>. This "collective consciousness would appear to have all the characteristics Durkheim ascribed to his "superorganic" entity.

An example can help understand this: Consider a paragraph describing a hypothetical room:

> I have a very small bedroom with a window overlooking the heath. There is a single bed against the wall and opposite it a gas fire with a gas ring for boiling a kettle. The room is so small that I sit on the bed to cook. The only other furniture in the room is a bookcase in one side of the gas fire next to the window -- it's got all my books on it and my portable radio -- and a wardrobe. It stands against the wall just near to the door, which opens almost directly onto the head of my bed. (Johnson-Laird, 1983, pp. 162.)

Johnson-Laird considers this paragraph to be an example of indefinite or indeterminate language. By this he means that individuals are given the false impression that they have a picture of a scene in their minds, while in fact they really do not.

It is easy to show that, after having heard the Johnson-Laird paragraph read to them, individuals as individuals have virtually no conception of what the room is like. Not only can they not draw the room accurately, and not only do the rooms drawn by individuals differ markedly from individual to individual, but the same individuals laugh and joke when asked to draw the room and fill out questionnaires; when interviewed they consider the task ludicrous. Quizzes reveal that individuals as individuals retain virtually nothing of what they heard.

This may well turn out to be true for a single individual, but it is decidedly not true when a number of individuals are involved.

After reading this paragraph aloud to a group of 42 undergraduates, virtually none could remember what it said, since it is quite vaguely worded. When asked to draw pictures of the room, virtually no two individual's pictures agree. (All 42 were asked in a fairly unsystematic fashion to compare their pictures, then asked if they thought any two were alike. None thought their picture similar to any other.)

Yet it is easy to show that the set of all the individuals who heard paragraph, taken collectively, have a clear, cohesive and accurate picture of the room in their "collective consciousness".

To do this, we asked each person to estimate the (physical) distance between each pair of objects in the room, and averaged them over all individuals.

The result of this work is a matrix or grid of distances between each pair of objects. Since each distance is an average, and random differences in opinion among the people -- like the differences which result from random lapses of attention or forgetting of content -- will be averaged out.

This matrix is in exactly the same form as a set of intercity distances from a road map. As is well known, such distances can be represented geometrically and without loss as a geometric figure. In the present instance, we used the Galileo(tm) computer program to convert the interpoint distances into a spatial coordinate system, which represents the distances as a picture (Woelfel and Fink, 1980)

A picture of a room emerged. When the 42 students were randomly divided into two groups and averages taken within each random half, both pictures are the same.

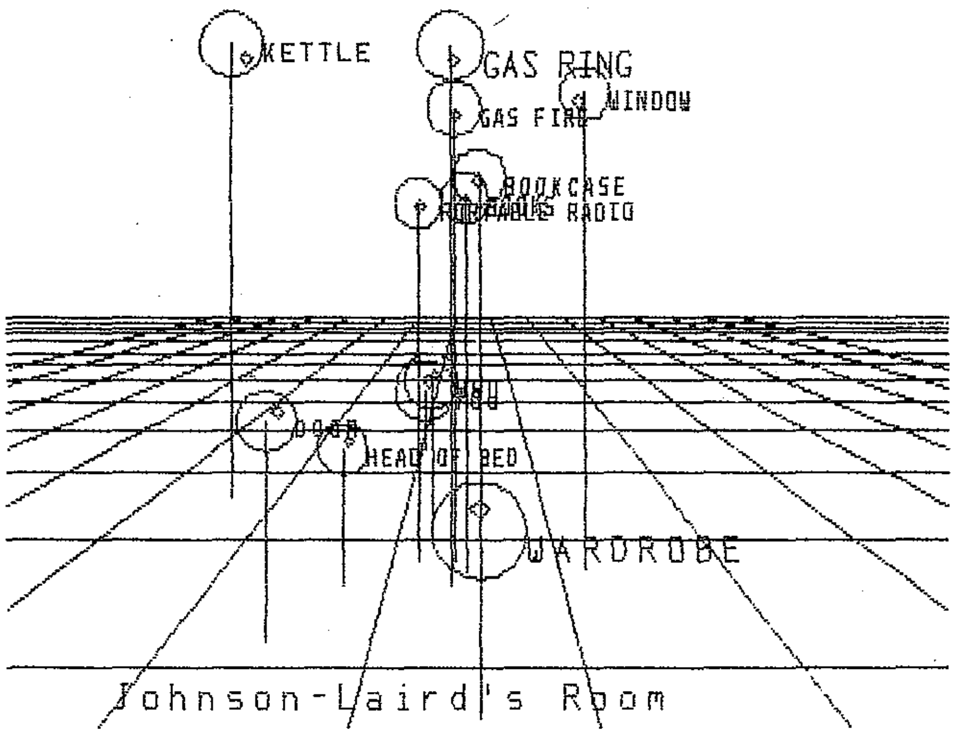


Figure 1: Johnson-Laird's "Indeterminate" Room for 42 Undergraduate Students

Figure 1 shows the first three dimensions of a Galileo(tm) representation of the average distances among all the objects in the room as reported by all 42 respondents. The circles give the standard errors of the positions of each object, while the "stems" are to help visualize the depth into the picture. The Heath, which was also included in the exercise, is to the right of the picture, too far away to be seen.

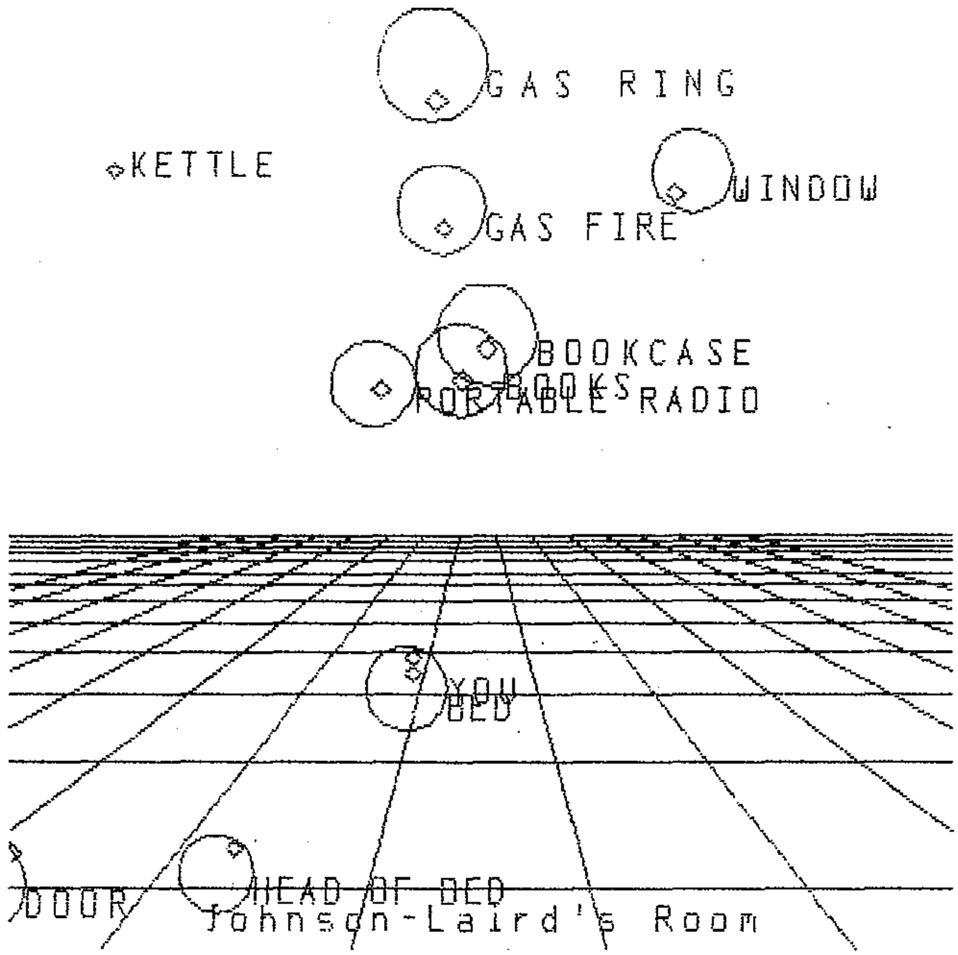
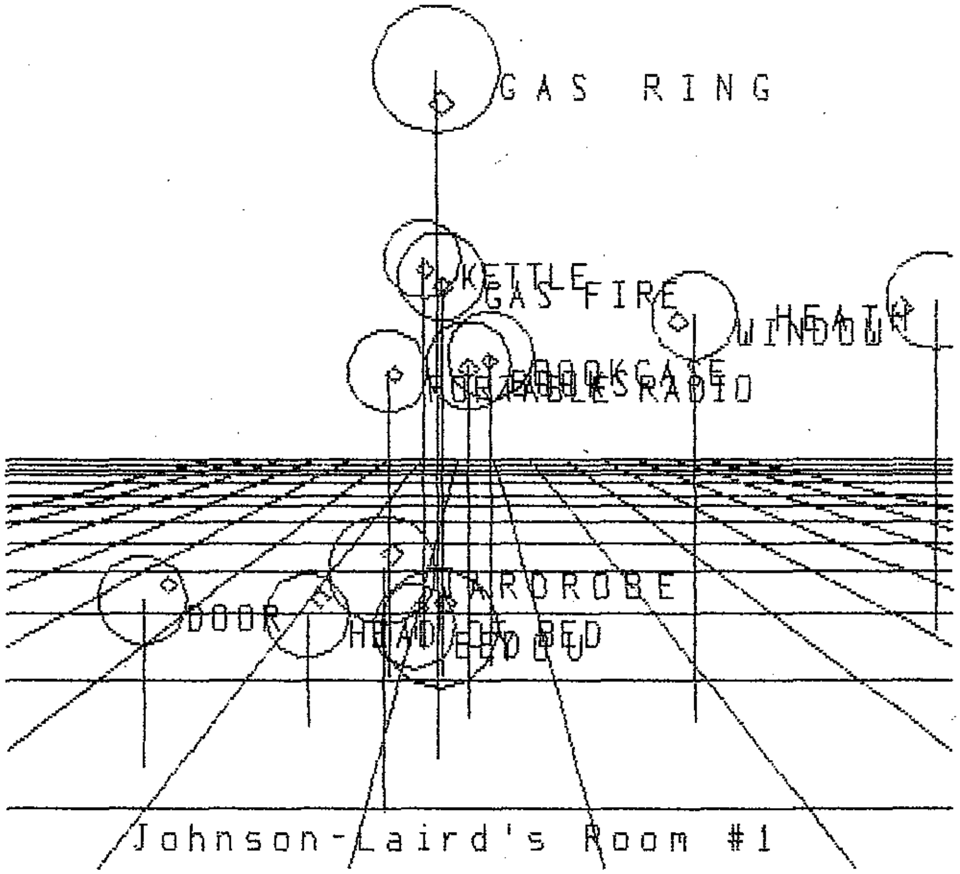


Figure 2: Close-up View of the Same Room

Figure 2 shows a close-up of the center of the room, showing the close correspondence of the bookcase, books and portable radio, which are too close together to be legible in Figure 1.



Johnson-Laird's Room #1

Figure 3: Johnson-Laird's Room as Seen by 1/2 the Students Chosen at Random

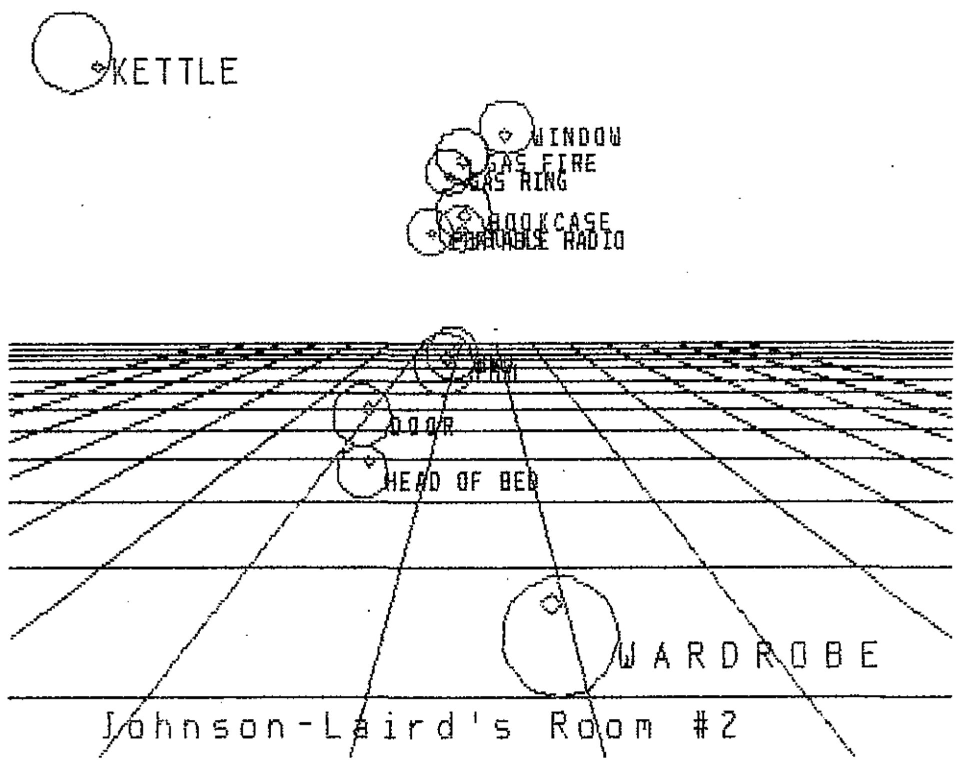


Figure 4: Johnson-Laird's Room for the Other Half

Figures 3 and 4 show the room as it appears for two random split halves of the sample. By checking each room against the written paragraph, it's easy to see that the pictures are quite good renderings of the room described by Johnson-Laird, and that, even at only 42 cases, the statistical uncertainty is quite small -- that is, the differences in location of the objects between the two samples is not statistically significant.

By comparing Figures 3 and 4 it is clear that, however indefinite Johnson-Laird may consider this language for the class as a whole, and for reasonably large subsets of the class, there is only one room, and its dimensions are indeed quite definite.

Moreover, the room exists in spite of the fact no single member of the class can remember the paragraph after a short interval.

Clearly, the group as a whole has a concept of the room, and attitudes toward and beliefs about it, even though none of the individuals may.

Of course, the physical picture of a room is the simplest example of this process, which works quite as well for any abstract concept, including emotions and feelings, people and things, real or imagined. The group as a whole can have understandings, beliefs, feelings shared by none of its members -- indeed, the members may be unaware of them.

These results are not unusual, nor are they difficult to produce. In another experiment, 64 students were read a lengthy paragraph about pianos and their attributes. To make the paragraph as challenging and unsystematic as possible, six pianos were named only with a letter from A through F, and assigned by a random process to have one of four levels of three attributes. The attributes were tone (very thin through very rich), size (very small through very large), and action (very even through very uneven). Tests show that, even immediately after reading the material, virtually none of it can be recalled (much like recall of the news).

When the dissimilarities among the objects in the material are averaged, however, a pattern emerges, which is, even at very small sample sizes, the same as that presented in the original material.

In the present experiment, each of the six pianos, along with each of the four levels of the three attributes was paired with each other piano and the self-referential term "yourself" level to produce the 171 paired comparisons among all 19 concepts in the standard Galileo format. This makes it possible to represent the entire pattern of relations among the pianos and the attribute levels without assumptions about the relations among the attributes or the levels of the attributes.

Figure 5 shows the relations among the levels of the size attribute for a random half of the sample. Clearly this attribute is not linear in at least two senses: first, the four levels from very small to very large do not lie on a line. Secondly, the distances between each of the levels is not constant. Figure 6 shows that the size attribute behaves similarly in the other random half of the cases.

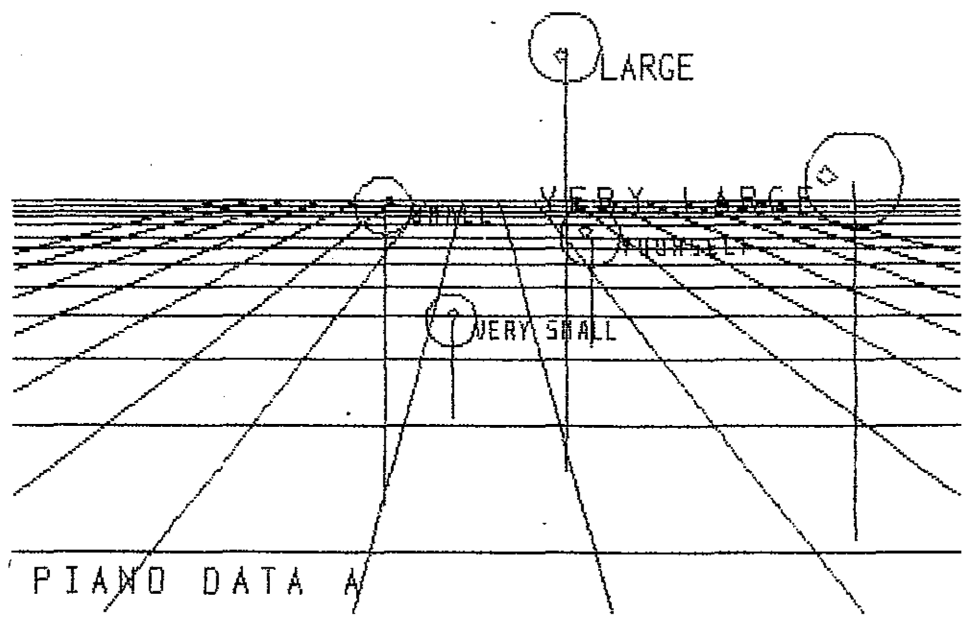


Figure 5: Distance Relations Among Four Levels of Size in a Space of Pianos (First Random Half)

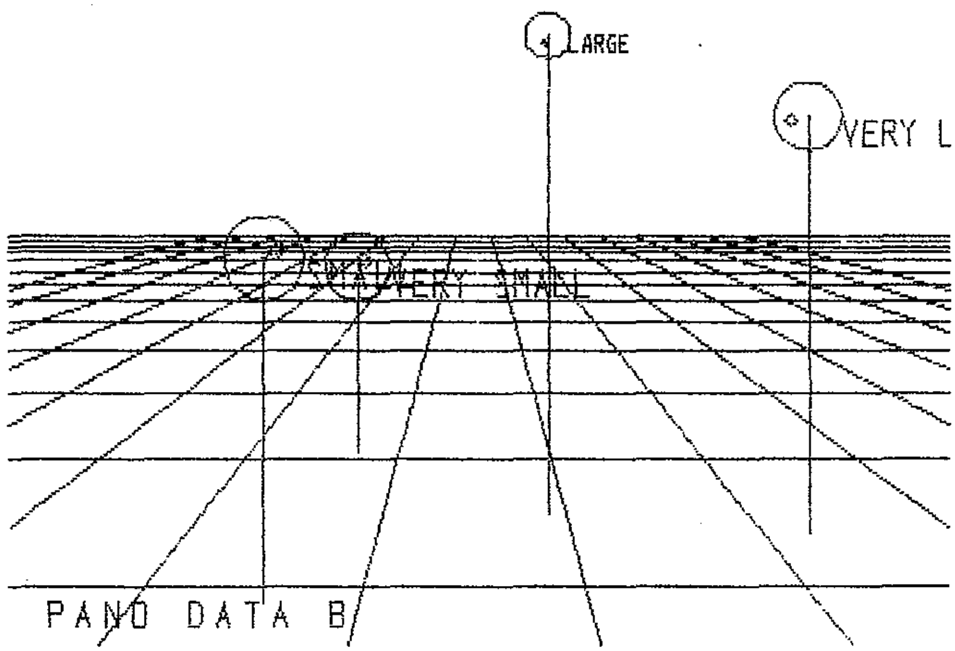


Figure 6: Distance Relations Among Four Levels of Size in a Space of Pianos (Second Random Half)

Figures 7 and 8 show that the pattern of the relations among the pianos is quite similar across the two random split halves, while Figure 9 shows the entire pattern among all pianos, attributes and levels. Although not shown here, the differences between the two random split halves of the total pattern are not statistically significant.

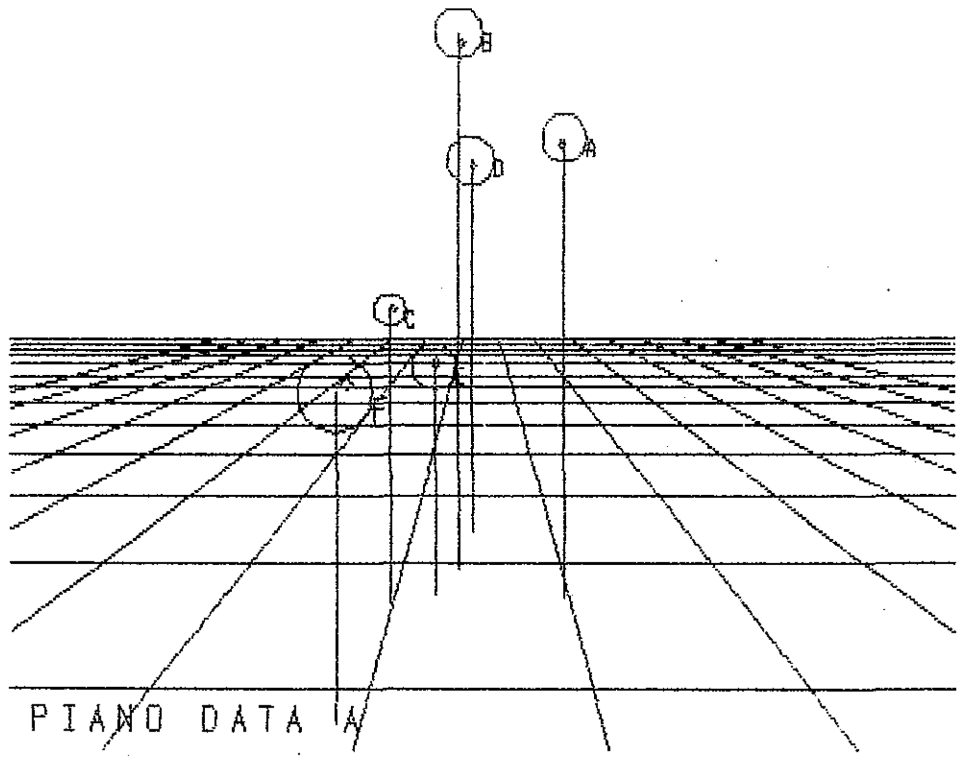

B
D
A
C
PIANO DATA A

Figure 7: Six Pianos (A through F) in a Space of Size, Tone and Action (First Random Half)

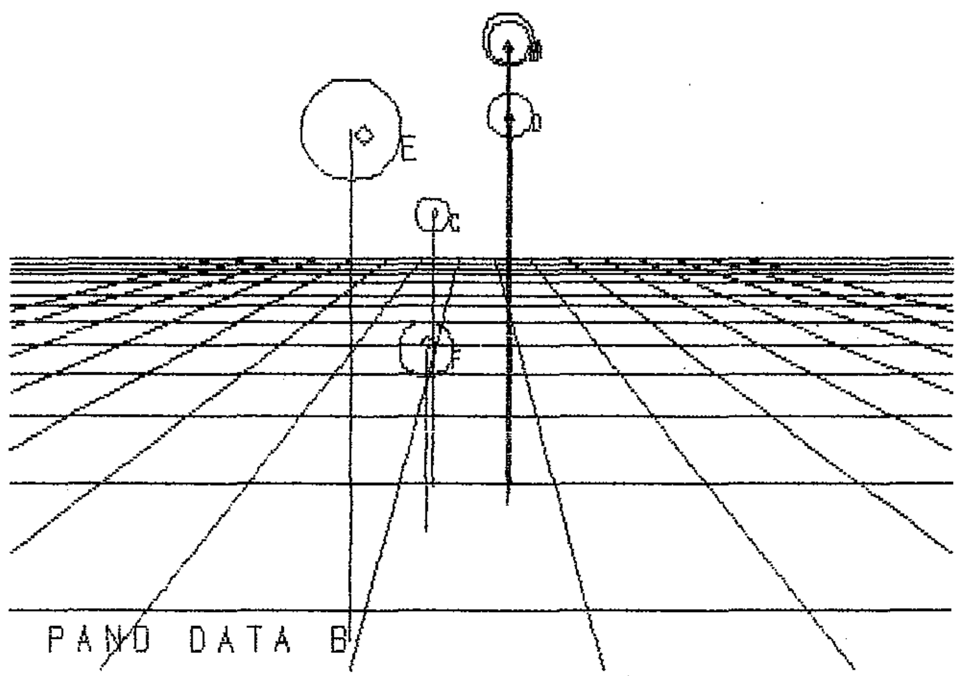


Figure 8: Six Pianos (A through F) in a Space of Size, Tone and Action (Second Random Half)

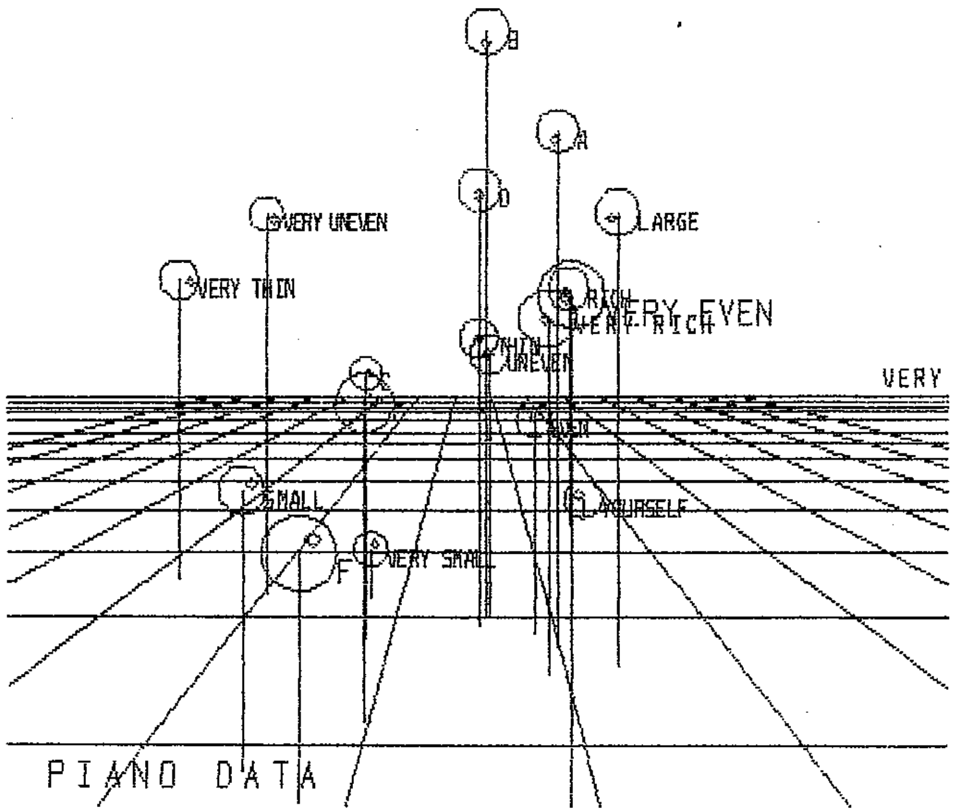


Figure 9: Six Pianos and their Attributes

The piano experiment differs from Johnson-Laird's room in only one way -- the room is obviously a visual pattern, with each object having a specific position in space relative to all other objects. In the piano experiment, the pattern is not visual (although the Galileo program of course can render it as a visual display). In both cases, however, the results are the same: <u>Individuals</u> cannot grasp this pattern in only a few hearings, and their recall of the individual elements of the pattern are little better than chance. But the <u>collective consciousness</u> -- that is, the "entity" made up of the set of individuals taken together, can recall the pattern after even a single hearing.

This is not to suggest that the process by which the collective consciousness incorporates a pattern is completely passive. Indeed, the system does filter the data in a systematic way. Table 1 indicates that the culture is apt to soften extreme values. When a piano is described as "large', for example, a majority of those hearing the description (65.6%) recall it correctly. But if a piano is described as "very even", more people (37.5%) recall it as "even" than recall it as "very even" (20.3%). This tendency to attenuate extremes results in more "errors" concerning extreme attributions than moderate attributions.

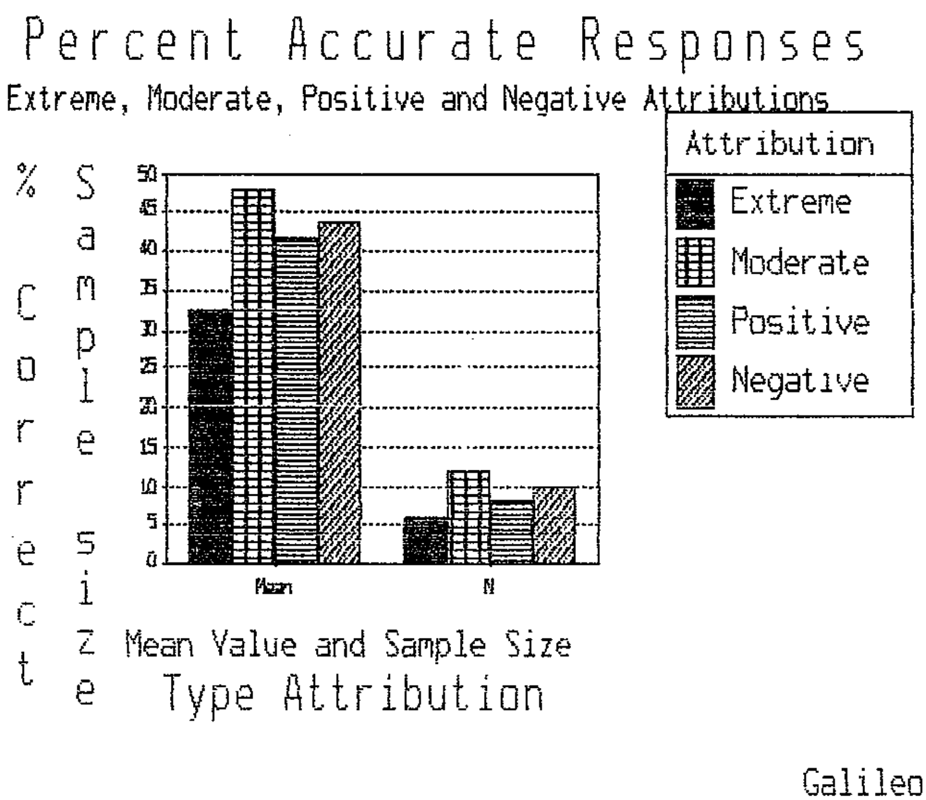


Table 1: Errors by Type Attribution

Table 1 also indicates that the "collective "consciousness" is about equally likely in the present study to classify positive (e.g., "large", "rich") responses correctly as they are negative (e.g., "uneven", "thin").

Conclusions

Until recently, models of collective cultural processes suffered from an individualistic approach, in which collective cognitive processes were modelled by analogy as if they were "superindividuals". Recent developments in psychology, computer science and neuroscience have modified our conception of the individual in a fundamental way, however.

The new picture models individuals as if they were indeed collectivities of individual "processors" rather than unitary consciousnesses. This new view lends itself well to a reconsideration of collective cognition along the same lines.

The present paper describes society as a quasi neural network. The cognitive properties of this society modelled this way derive not so much from the characteristics of each individual as to the configuration of the network as an organic whole. Information and concepts are viewed as patterns which are distributed throughout the network rather than being localized in individuals.

A perhaps oversimplified but nonetheless useful operationalization of this theory models each concept recognized by each individual member of a society as a point in a multidimensional space. The cultural meaning of any given concept at any given time is given by the average of the coordinates of the set of individual points which define the meanings of the concept for each individual in the culture.

The method applied in the present paper simply asks a sample of individuals drawn from the culture to report the pairwise dissimilarities among the set of concepts in quesion, averages the dissimilarities, and then extracts the eigenvectors from the centroid scalar products of the matrix of average dissimilarities. The result is a multidimensional space within which each concept is represented as a point; the meaning of each concept is given by its pattern of distance relations from all the other points.

Two simple experiments show that complex patterns of information can be stored in a set of individuals very quickly using this model, and further, that the patterns can be retrieved quite accurately by very simple methods even though none of the individuals in the samples can recall the patterns at much better than chance levels.

In the present operationalization, data tend to suggest that the model tends to attenuate extreme positions moderately, but on the whole can store and retrieve complex patterns in spite of very high levels of ambient random error.

Should further research support the results reported here, the present model may well provide a useful and simple method for representing and operationalizing complex cultural belief patterns quantitatively and visually. The model has the further advantage of being consistent with the most current theories of psychology, computer science and neuroscience.

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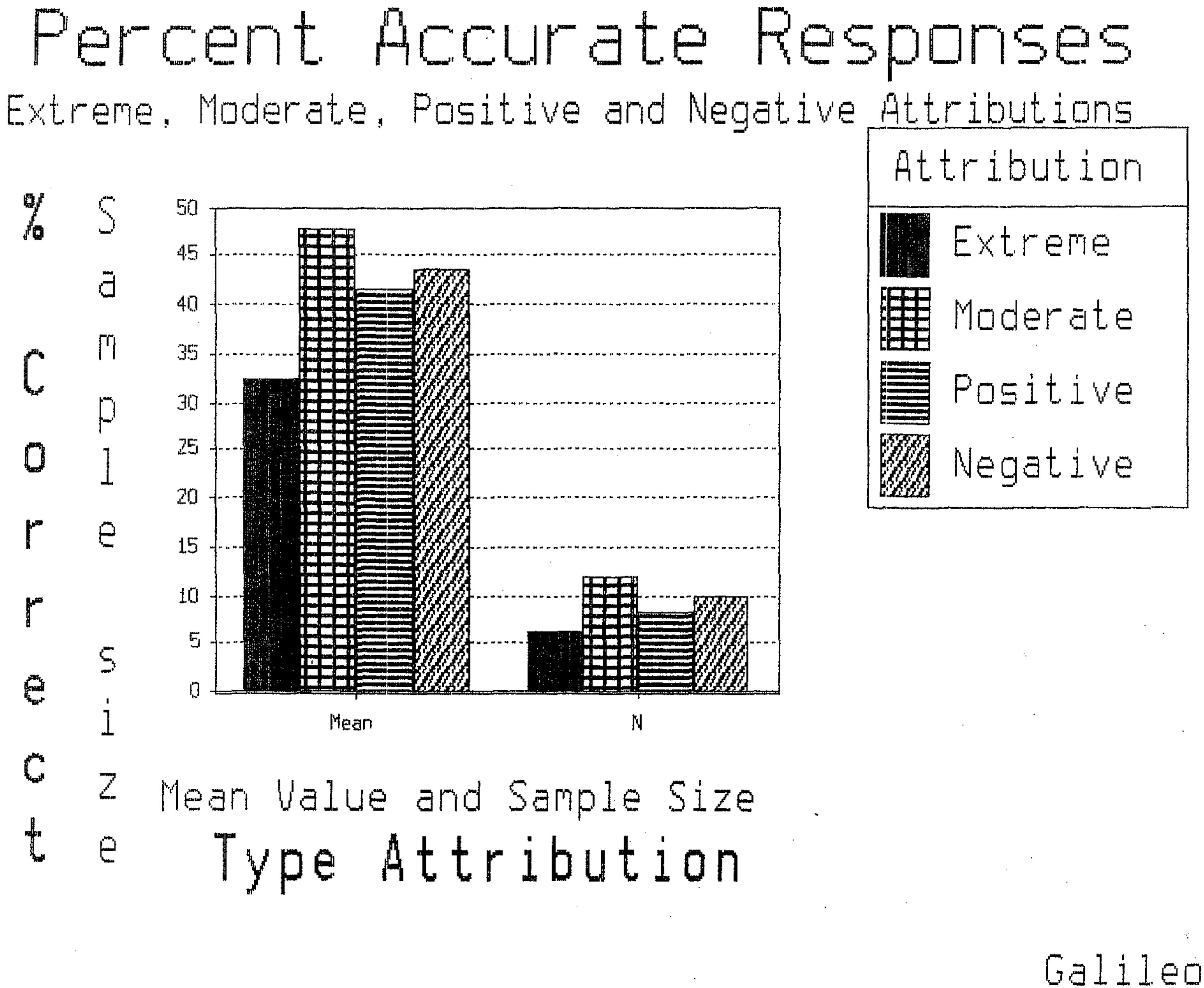
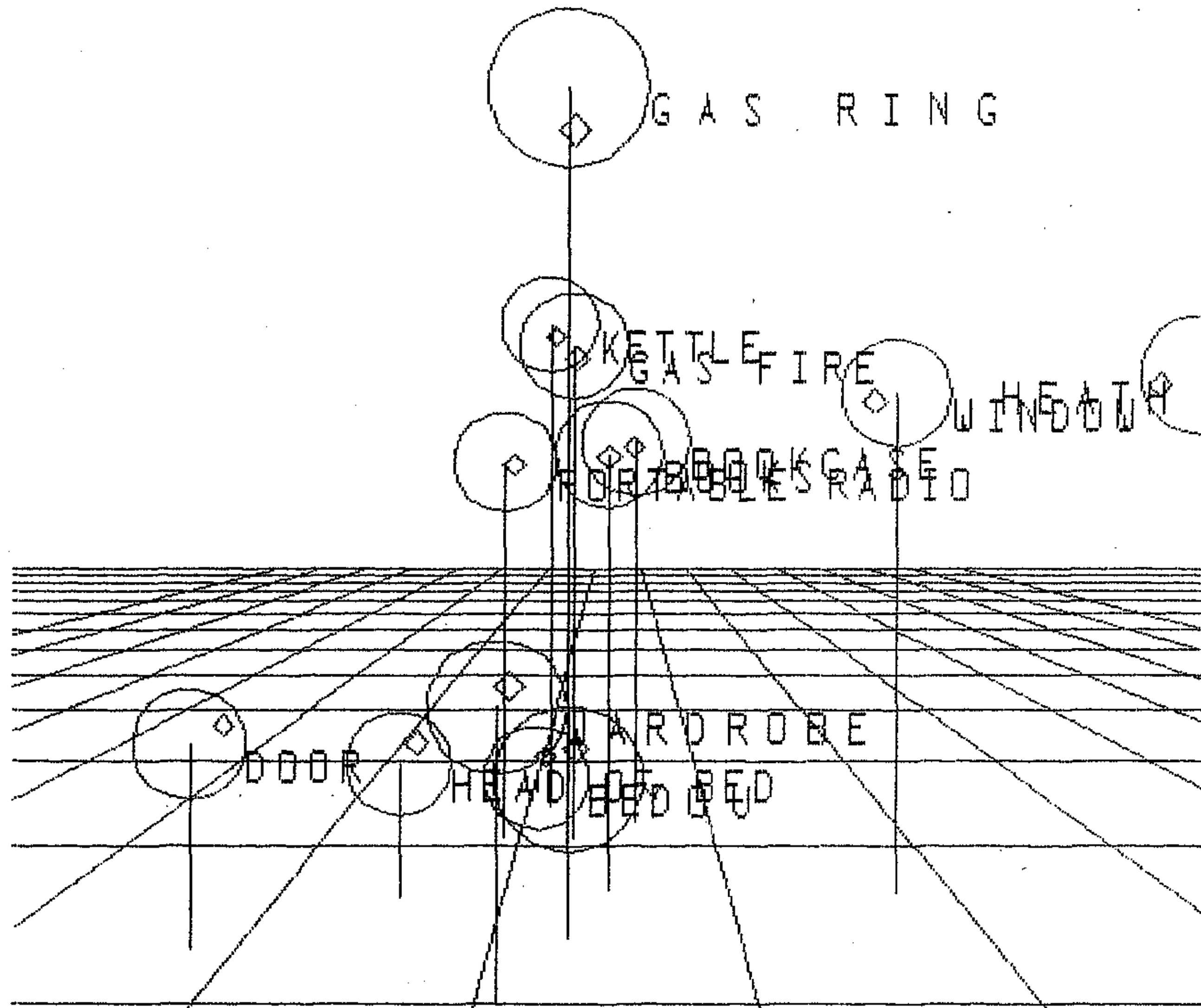
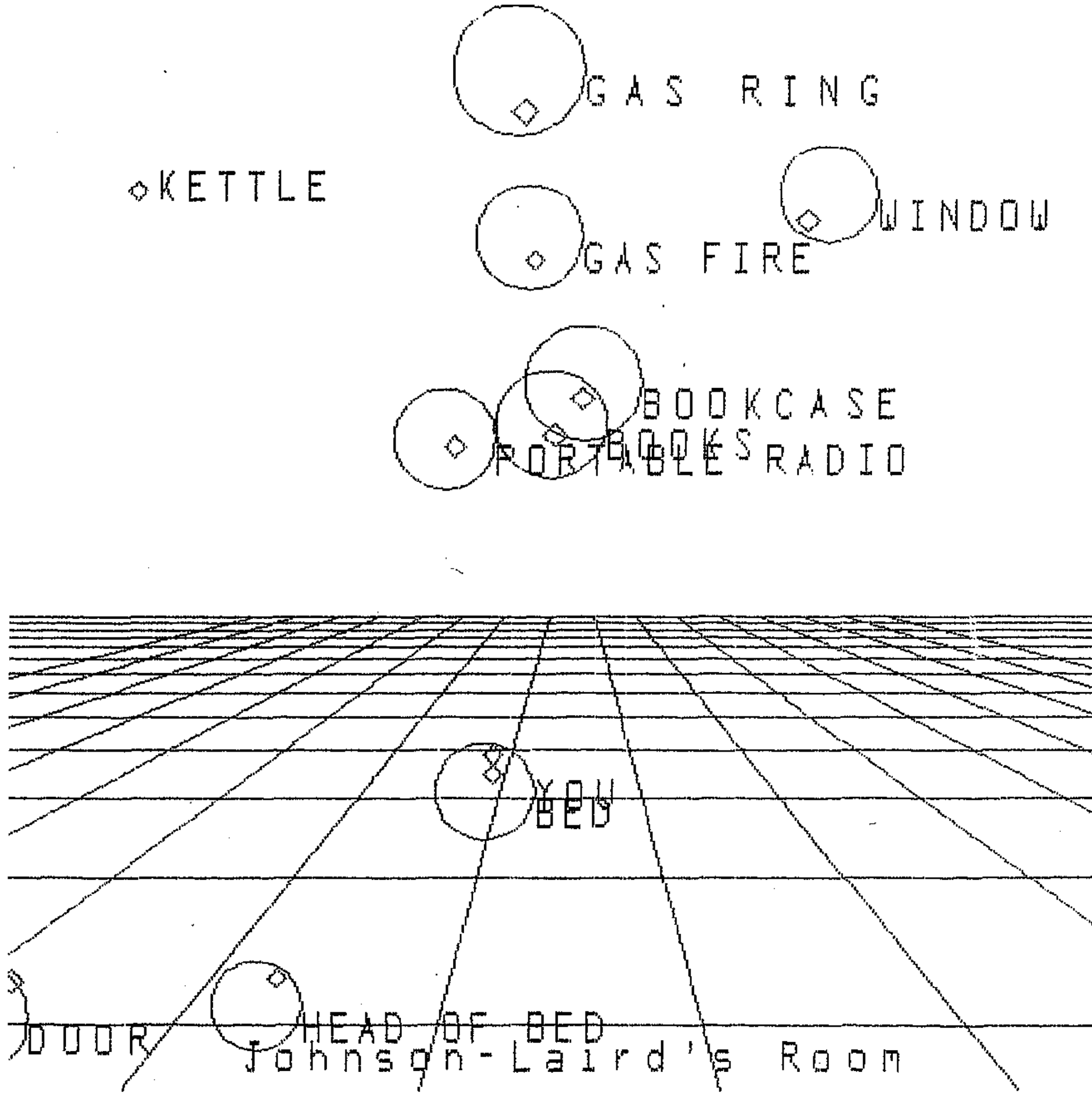

Percent Accurate Responses
Extreme, Moderate, Positive and Negative Attributions
Attribution
Extreme
Moderate
Positive
Negative
% Correct
Sample Size
50
45
40
35
30
25
20
15
10
5
0
Mean
N
Mean Value and Sample Size
Type Attribution
Galileo

I have a very small bedroom with a window overlooking the heath. There is a single bed against the wall and opposite it is a gas fire with a gas ring for boiling a kettle. The room is so small that I sit on the bed to cook. The only other furniture in the room is a bookcase on one side of the gas fire next to the window -- its

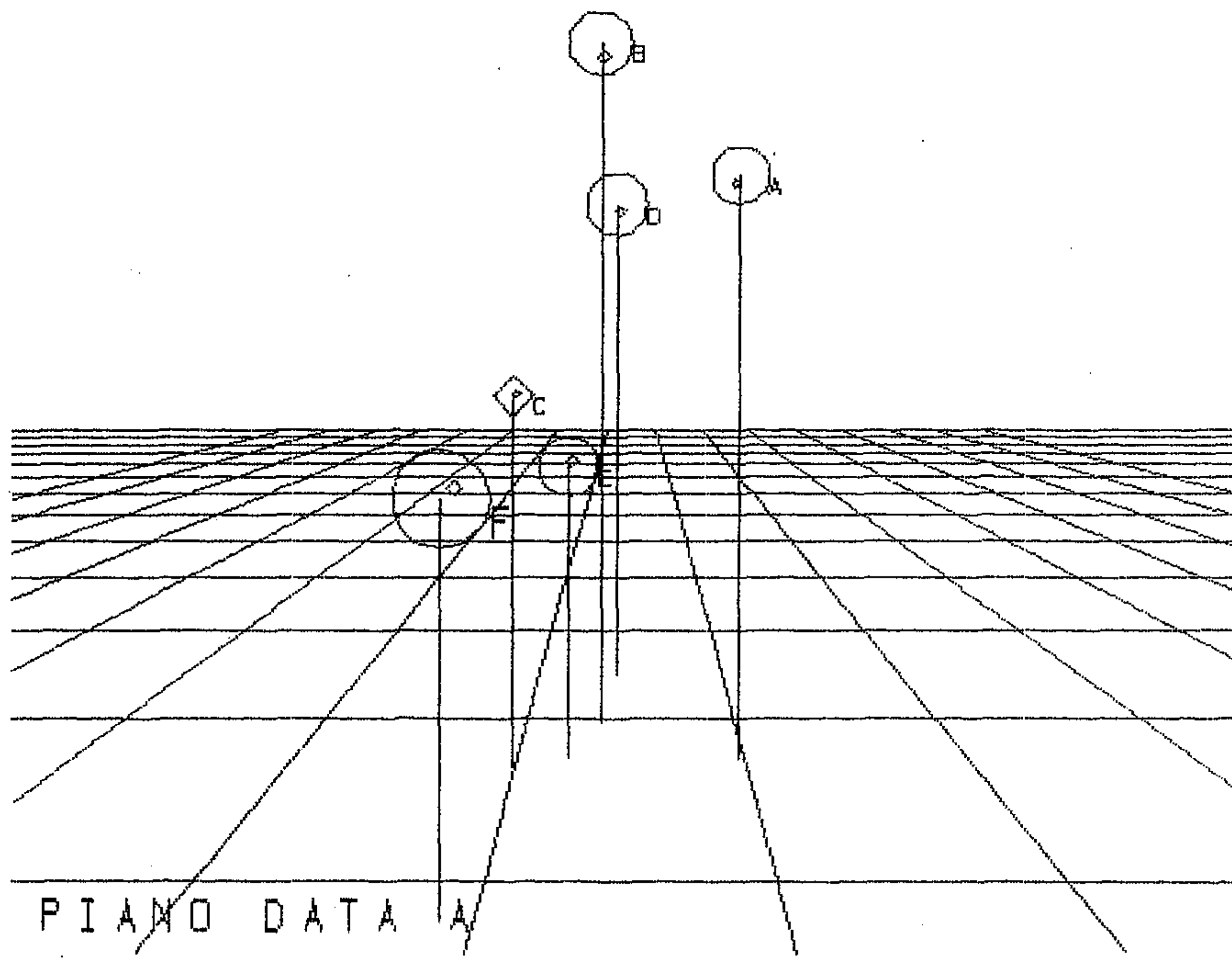


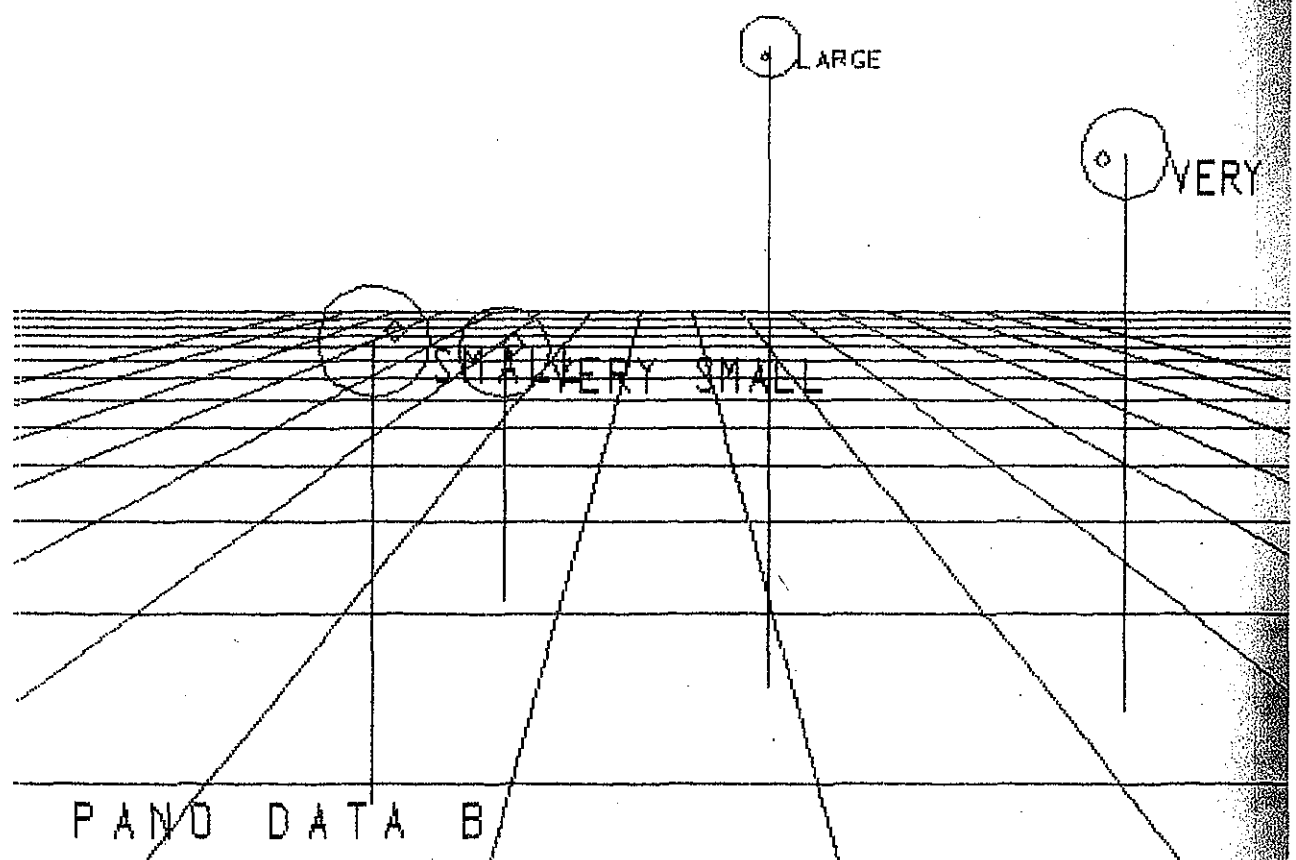
Johnson-Laird's Room #1

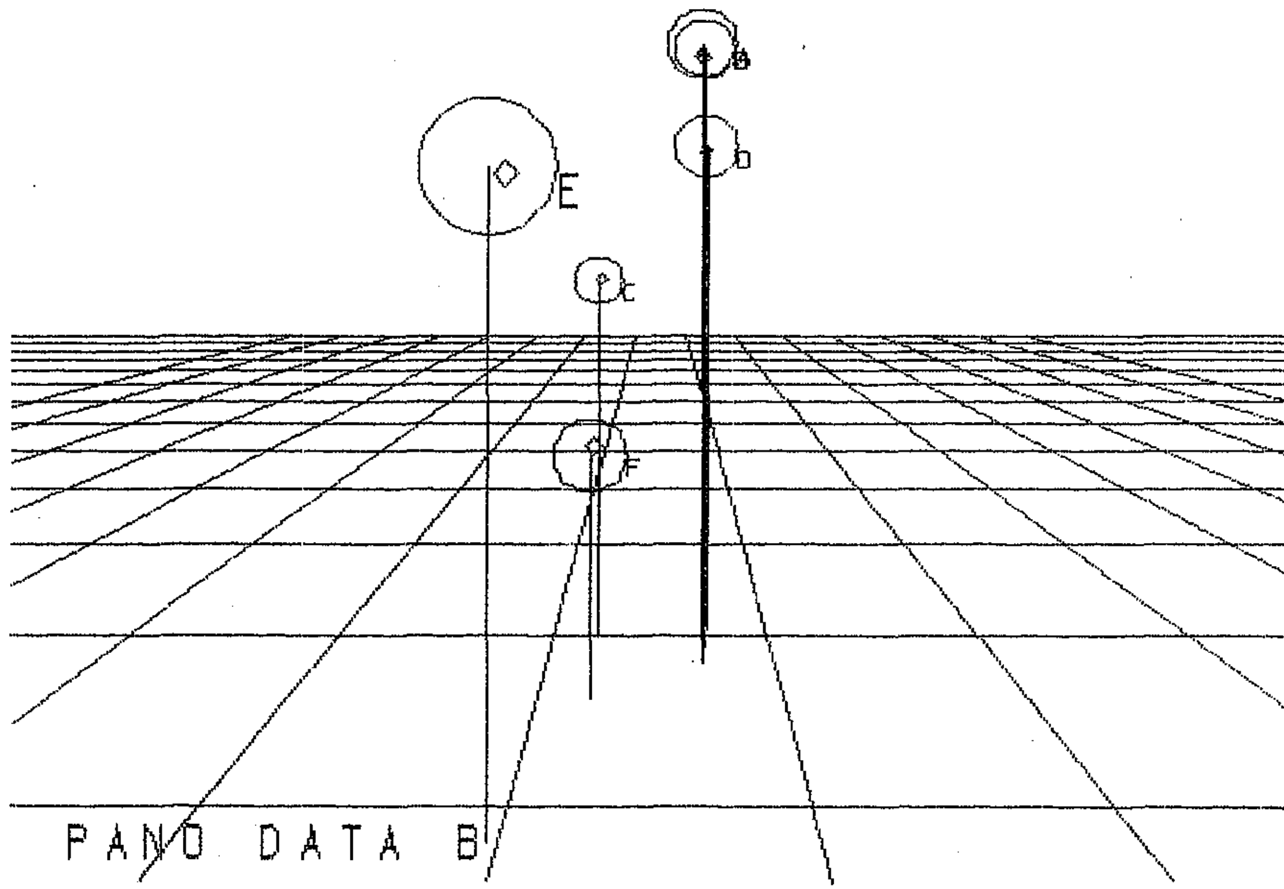

GAS RING
KETTLE
WINDOW
GAS FIRE
BOOKCASE
BOOKS
PORTABLE RADIO
YOU
BED
DOOR
HEAD OF BED
Johnson-Laird's Room

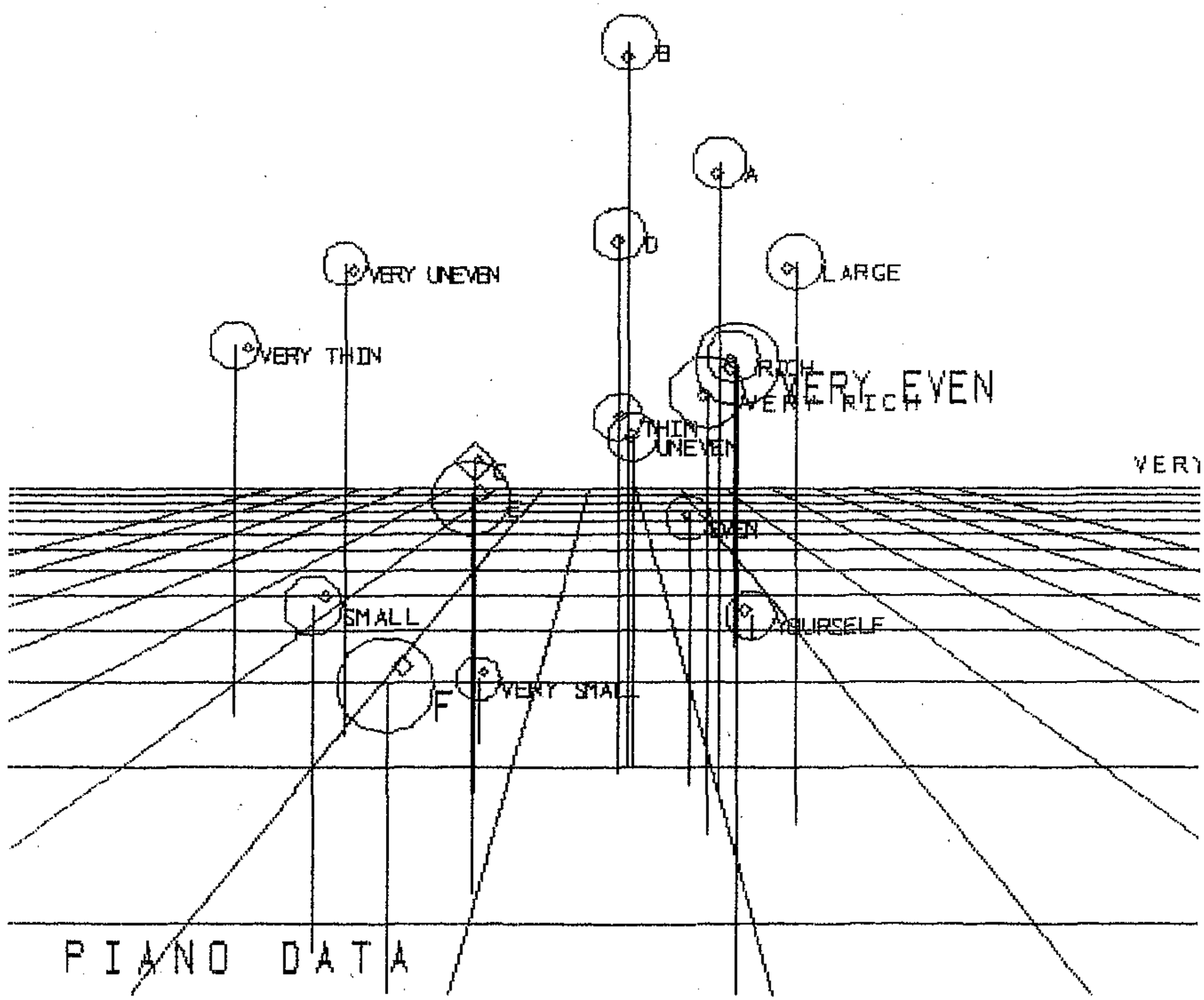
```
  -19.0339   -28.7805    -7.4133    20.3294     4.9167   -15.4029
    2.7608     5.2627      .4824     -.0749    -1.1195    12.2754
    3.8246
  -11.7726   -33.4282    40.7374   -24.4488     8.2092    -2.1189
   -1.2860    -1.4257     -.1461     -.0869      .3194     2.9300
    2.8051
WINDOW
HEATH
BED
GAS FIRE
GAS RING
KETTLE
BOOKCASE
BOOKS
PORTABLE RADIO
WARDROBE
DOOR
HEAD OF BED
YOU
 4.0027 9.2414 4.8823 4.1086 4.9546 7.1541 4.2079 3.6029 3.6546 5.4981 4.030
 3.8721 7.5691
```

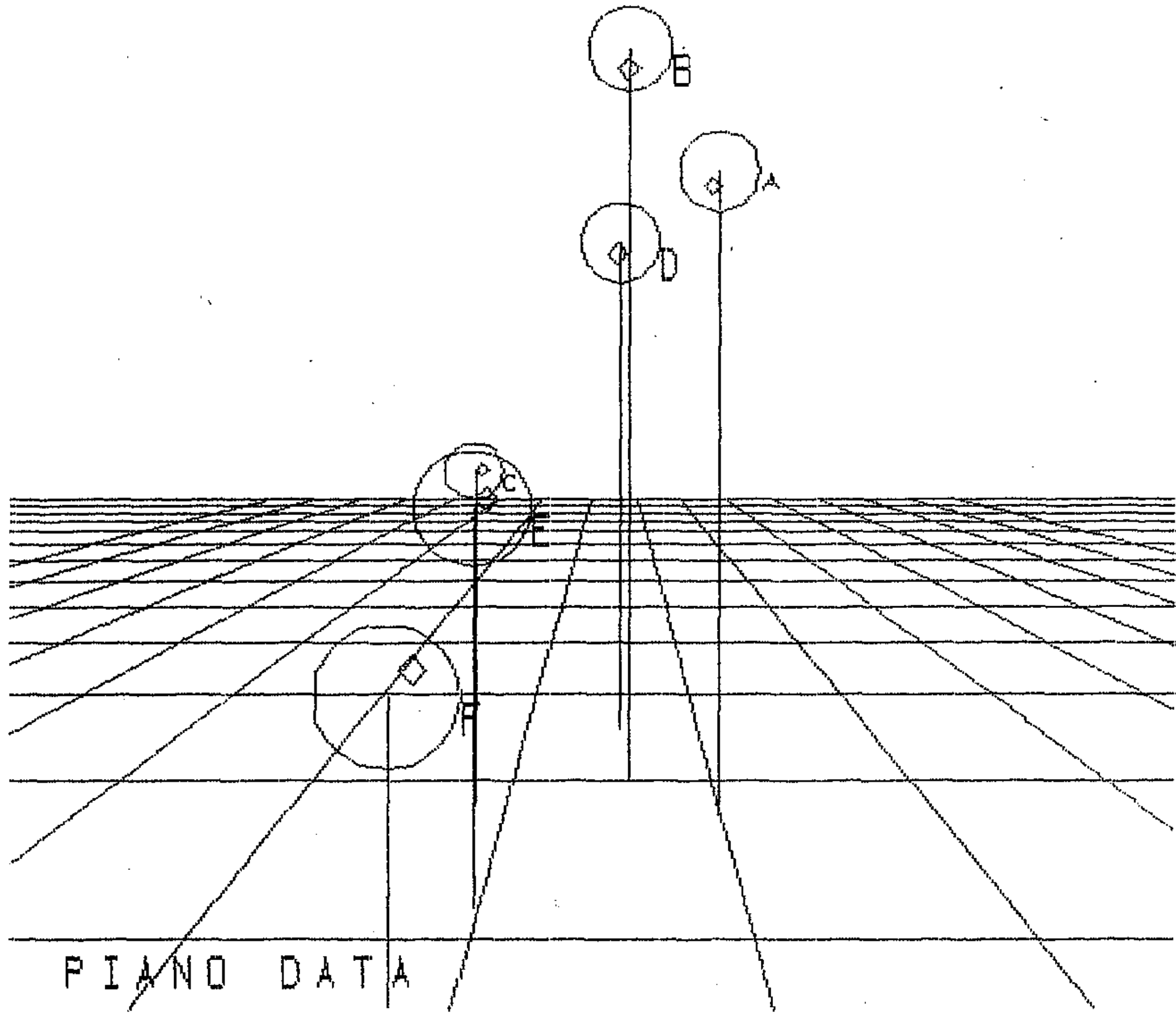
```
Education
Money
Security
Religion
People
Yourself
EOF:14
0:>


I'LL BE HERE.....
>@eof


BY YOUR COMMAND....
>@toced galileo*woelfel.
TOCED 5R4 SL74R1 12/19/86 16:03:24
0:>l piano
  PIANOS/TREATMENT(0)                ELT     SYM  03/12/86   09:55:08
113:>elt
  PIANOS/TREATMENT(0)                ELT     SYM  03/12/86   09:55:08
ENTER ELT MODE.
0E:>p 20
PIANOS
    PIANO A IS LARGE, WITH A VERY UNEVEN ACTION AND A THIN TONE.
 PIANO B IS LARGE, WITH A VERY EVEN ACTION AND A THIN TONE. PIANO
 C IS SMALL, WITH AN EVEN ACTION AND A THIN TONE. PIANO D IS
 VERY LARGE, WITH AN UNEVEN ACTION AND A VERY RICH TONE. PIANO E
 IS A VERY SMALL PIANO WITH AN EVEN ACTION AND A THIN TONE.
 PIANO F IS A SMALL PIANO WITH AN EVEN ACTION AND A VERY THIN TON
EOF:7
0E:>


I'LL BE HERE.....
>@eof
```


PIANO DATA A
A
B
C
D
E
F


LARGE
VERY
VERY SMALL
PANO DATA B


E
C
F
D
PANO DATA B


B
A
D
VERY UNEVEN
LARGE
VERY THIN
RICH
VERY EVEN
VERY RICH
THIN
UNEVEN
VERY
C
E
EVEN
SMALL
YOURSELF
VERY SMALL
F
PIANO DATA


B
A
D
C
E
F
PIANO DATA

PIANOS

	A	B	C	D	E	F	# Extremes	% corr
VERY LARGE	15.6	15.6	10.9	45.3	14.1	9.4		
LARGE	65.6	64.1	17.2	7.8	10.9	15.6	2	50.8
SMALL	3.1	6.3	53.1	14.1	25.0	39.1		
VERY SMALL	0	1.6	6.3	18.8	37.5	23.4		
MISSING	15.6	12.5	12.5	14.1	12.5	12.5		
VERY EVEN	4.7	20.3	6.3	7.8	20.3	17.2		
EVEN	17.2	37.5	39.1	21.9	34.4	32.8		
UNEVEN	53.1	20.3	37.5	40.6	25.0	17.2	2	30.0
VERY UNEVEN	12.5	9.4	4.7	15.6	7.8	20.3		
MISSING	12.5	12.5	12.5	14.1	12.5	12.5		
VERY RICH	3.1	1.6	6.3	29.7	10.9	12.5		
RICH	9.4	7.8	17.2	28.1	25.0	12.5	2	46.8
THIN	60.9	59.4	42.2	10.9	39.1	10.9		
VERY THIN	14.1	17.2	21.9	15.6	12.5	50.0		
MISSING	12.5	14.1	12.5	15.6	12.5	14.1		
# EXTREMES	1	1	0	2	1	1		
% RIGHT	46.3	47.9	44.8	38.5	37.0	40.6		

Correlation between % correct & # extremes = -.21

$\bar{X}$ Extreme = 32.55 N=6
$\bar{Y}$ Non Extreme = 47.62 N=12
$\bar{X}$ pos = 41.41 N=8
$\bar{X}$ neg = 43.44 N=10

X_{10} = AD current ?
X_{11} = AD last week ?
X_{12} = AD 2 wks ago ?

Y: SALES THIS WEEK

X_1 = Number of week. 1-52
X_2 = Number of month 1-12
~~X_3 = Mon 0 = n 1 = yes~~
~~X = ... 0 = ...~~

X_3 = ~~$~~ WINTER 0 = 1
X_5 SPRING 0 – 1
X_6 = ~~Summer~~
X_7 = FALL
X_8 = HOLIDAY THIS week 0 – 2
X_9 = Payday? 0/1