Chapter 5

Computer Support of A Conversation-Theoretic Methodology

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Abstract

Two types of information may be elicited from people about a particular topic, the distinctions made between entities relevant to that topic, and the terms used for these distinctions. When a group of people with differing perspectives on a topic interact, making this information explicit promotes the development of mutual understanding. When the same term is used to label differing concepts, apparent agreement over an understanding may be reached at a linguistic level while hiding substantial lack of mutual understanding in practice. Conversely, when differing terms are used for similar concepts, available agreement over an understanding may never be reached due to linguistic differences. This paper reports on experiments with a computer system which elicits from each person the distinctions that he or she makes between overt entities agreed by the group to characterize a topic, together with the terms the person applies to these distinctions. The system then compares the systems of distinctions across people and feeds back the comparisons for discussion by the group. This is very effective in involving the group in a level of discussion of their own discourse which goes beyond that normally achieved by synectics or focus group techniques. The computer is perceived as being more neutral in its data collection and analysis than a human participant observer and people are less defensive in commenting on the computer output than on human commentary.

5.1 Introduction

This paper reports on experiments with a computer system to support the development of mutual understanding in discourse between collaborating agents with differing specialities in a domain. The objective is to support and analyze natural discourse without introducing distortion from observers or their tools. The theoretical perspective is Pask's (1975) "conversation theory" with its emphasis on individuals communicating to reach an "agreement over an understanding." This perspective is also found in Habermas' (1981) definition of "communicative action" and leads naturally to Grice's (1975) systemic analysis of speech acts in terms of a "co-operative principle."

The design principle has been that the computer system should act as a "participant observer", with all that this entails in both involvement in the discourse process and analysis of the values introduced through observation. That is, the computer system is seen as affecting the discourse but its operation is made as simple, overt and as non-distorting as possible at each stage.

The experimental work to date has focused on the relation between concepts and terminology in communities of interacting individuals. When the same term is used to label differing concepts, apparent agreement over an understanding may be reached at a linguistic level while hiding substantial lack of mutual understanding in practice. Conversely, when differing terms are used for similar concepts, available agreement over an understanding may never be reached due to linguistic differences.

The research methodology takes account of the indexicality which Garfinkel (1967) noted in the use of language and attempts to ground concepts in the way in which they are used, rather than in abstract descriptions. The computer system elicits from each person the distinctions that he or she makes between overt entities agreed by the group to characterize the domain, together with the terms the person applies to these distinctions. The system then compares the systems of distinctions across people and feeds back the comparisons for discussion by the group.

The system is only one in a range of methodologies and tools for conversation analysis and is not intended to play a dominant role. It has been found to be very effective in involving the group in a level of discussion of their own discourse which goes beyond that normally achieved by synectics or focus group techniques. The computer is perceived as being more neutral in its data collection and analysis than a human participant observer and people are less defensive in commenting on the computer output than on human commentary. However, what is most significant in terms of the objectives is that the computer system is seen as playing an open role fully involving the participants, rather than a "privileged observer."

5.2 Distinctions and terminology

A theoretical framework for conversation theory can be based on a single fundamental primitive, what Brown in his *Laws of Form* terms "making a distinction."

> "The theme of this book is that a universe comes into being when a space is severed or taken apart... By tracing the way we represent such a severance, we can begin to reconstruct, with an accuracy and coverage that appear almost uncanny, the basic forms underlying linguistic, mathematical, physical and biological science, and can begin to see how the familiar laws of our own experience follow inexorably from the original act of severance." (Brown, 1969 p.v)

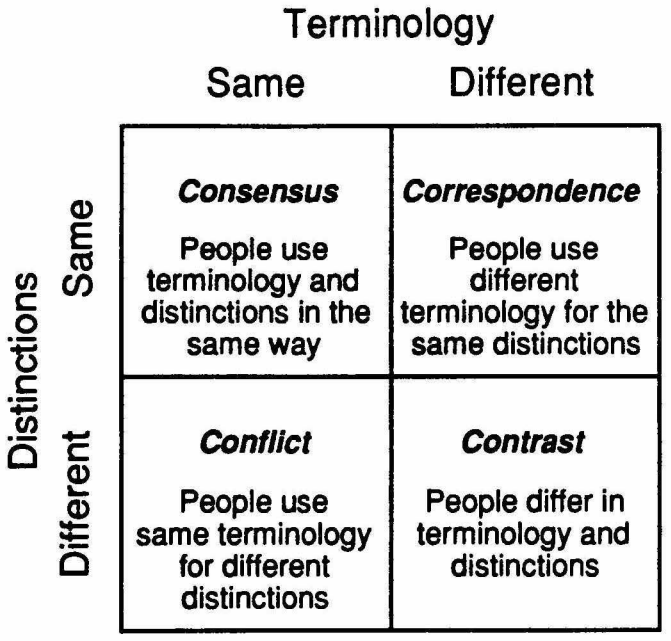


Figure 5.1: Consensus, correspondence, conflict and contrast between conceptual systems

We have shown that a wide range of psychological and philosophical frameworks are characterized by the systems of distinctions underlying them, and that there are a number of basic distinctions common to such systems (Gaines & Shaw, 1984).

The other major variable to be considered is the terminology used in labeling a distinction. Different people may make very similar distinctions but use completely different terms for them, make different distinctions but use the same terms for them, use the same terms for the same distinctions, or use different terms and have different distinctions. In a well-established domain it is reasonable to suppose that there will be consensus as to relevant distinctions and terms—that is, objective knowledge independent of individuals (Popper, 1968). For a domain where a consensus has not yet been reached, it is important to be able to compare and contrast the conceptual structures of those seeking to communicate about it.

Figure 1 illustrates some of the phenomena that can arise by considering the mappings from the concepts of people to the relevant *distinctions* in the domain and the *terms* used for those distinction:

- *consensus* arises if the conceptual systems assign the same term to the same distinction.
- *conflict* arises if the conceptual systems assign the same term to different distinctions.
- *correspondence* arises if the conceptual systems assign different terms to the same distinction.
- *contrast* arises if the conceptual systems assign different terms to different distinctions.

Consensus shows a shared conceptual sub-system. *Conflict* shows possible dissent over the application of a concept in a domain since the same term is being used in different

ways. *Correspondence* shows possible dissent over the appropriate term to be used for a concept. *Contrast* shows conceptual sub-systems that are not shared, and cannot lead to direct dissent.

The following section describes a computer-based methodology that derives this classification.

5.3 Comparing conceptual systems

Any comparison of conceptual systems necessarily involves approximation since a complete conceptual system may involve indefinitely complex relations, and different concepts will never be identical in all respects. However, highlighting gross similarities and differences is itself valuable in promoting directed discussion that can lead to the exposure of more subtle relationships. As a start one wishes to elicit the major distinctions that each individual uses in a domain, the terminology used for them, and the relation of such distinctions and terminology to those of others.

Repertory grid elicitation is an effective method for eliciting major distinctions and terminology in a domain (Shaw, 1980). It is an extensional approach in which individuals are asked to specify a set of entities in a domain, then make distinctions among them, naming the distinctions and classifying all the specified entities in terms of them. The extension of a distinction determined in this way is only an approximation to the underlying concept since critical entities may be missing in the classification. However, both manual and computer-based elicitation techniques attempt to prompt the individual for additional entities to discriminate between extensionally related distinctions (that is making the same, or similar, classifications). Group comparisons, as discussed in this paper, have similar dynamics—an extensionally apparent consensus or correspondence may be accepted or rejected, and the rejection may be based on the specification of additional entities as counter-examples.

A common set of entities must first be established in the domain and an effort made to ensure, as far as possible, that each individual in the group is defining the entities in the same way. This appears straightforward if the entities are well-defined, named concrete objects in the world. However, the concept of an entity turns out to have its own difficulties in practice—if the entities are people, is it important in what mood and what role they are?—if the entities are tools, is it important who is using them and to what purpose? Again, entity definitions are part of the ongoing negotiation process of mutual understanding, and tacit disagreement over them can be a source of dissent.

For the sake of simplicity, we will phrase the following in terms of comparisons between pairs of individuals. The methodology extends simply to a group as discussed later. The measurement of consensus and conflict requires a common terminology for the distinctions and is based on the exchange of grids. One individual is given the grid elicited from the other with distinctions and entities specified, but not the values, and asked to rate the entities on the distinctions. The measure can then be used to determine how well the distinctions made by the second individual match with those made by the first. Distinctions which match above an upper threshold are in consensus and those that match below a lower threshold are in conflict—those matching between the thresholds are ambiguously related.

Correspondence and contrast between two conceptual systems may be measured by eliciting independent grids from the two individuals and determining for each distinction in one grid the best matching distinction in the other. Distinctions which match above an upper threshold are in correspondence and those that match below a lower threshold are in contrast—those matching between the thresholds are ambiguously related.

The results are presented to the individuals in such a way that they readily visualize the

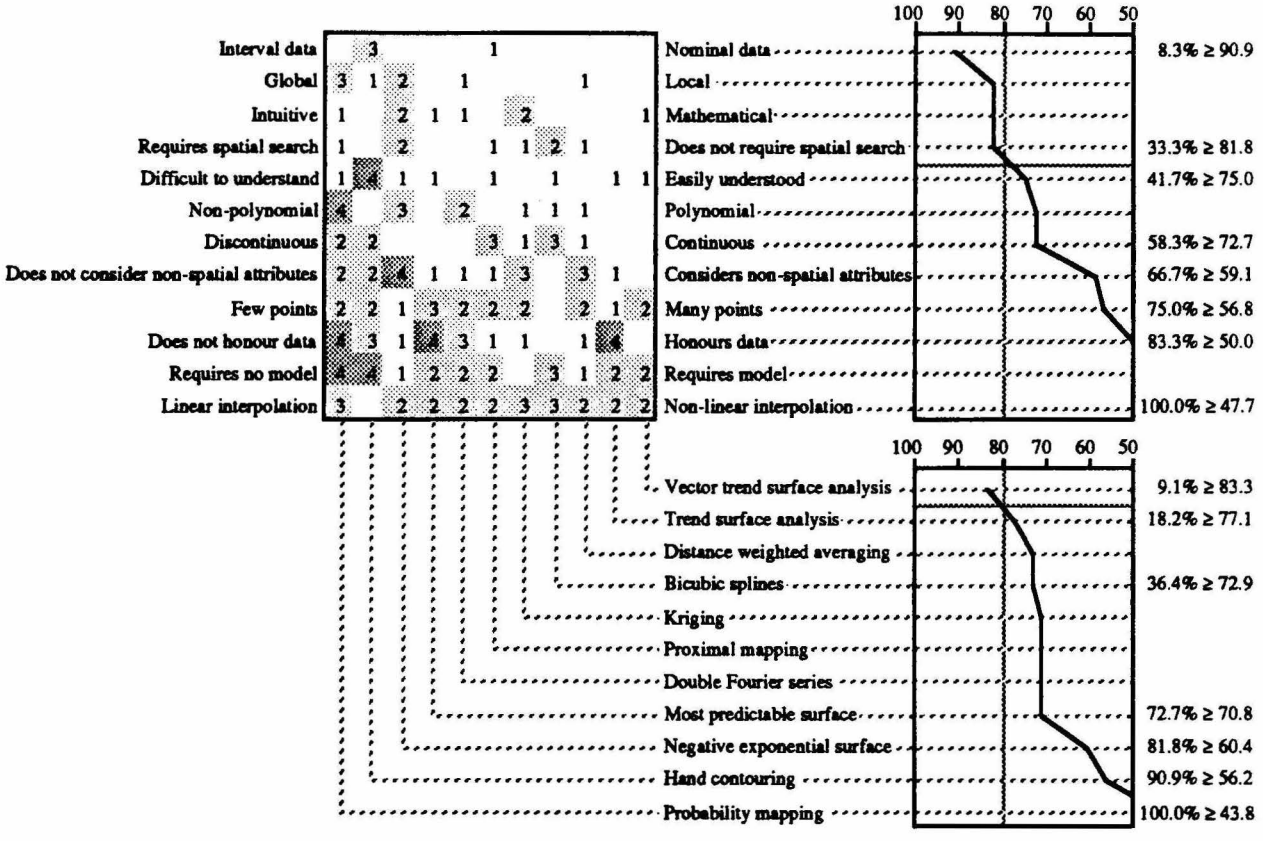


Figure 5.2: Presentation of measured consensus and conflict

areas of potential dissent and their sources. Figure 2 is a graphic presentation of a consensus and conflict analysis from a grid exchanged between two specialists in geographic mapping techniques (Shaw and Woodward, 1988). The differences are shown in the grid on the left in numeric form and as shading with darker gray indicating greater difference. The sets of distinctions and entities have both been sorted so that those with highest matches indicating greatest consensus are at the top of their respective lists. The graphs on the right show the declining match values and may be used to decide where to place thresholds distinguishing consensus and conflict.

The presentation of Figure 2 contains sufficient raw and processed data that it may be used for a range of discussions, from identification of apparent disagreements, such as that on the use of the term "linear interpolation" and the entity "probability mapping," to a detailed analysis of how these disagreements have arisen. Measures of correspondence and contrast are presented in a similar graphical form with distinctions paired from the two grids.

Figure 3 shows the basis for the calculation of the results given in Figure 2. The ratings

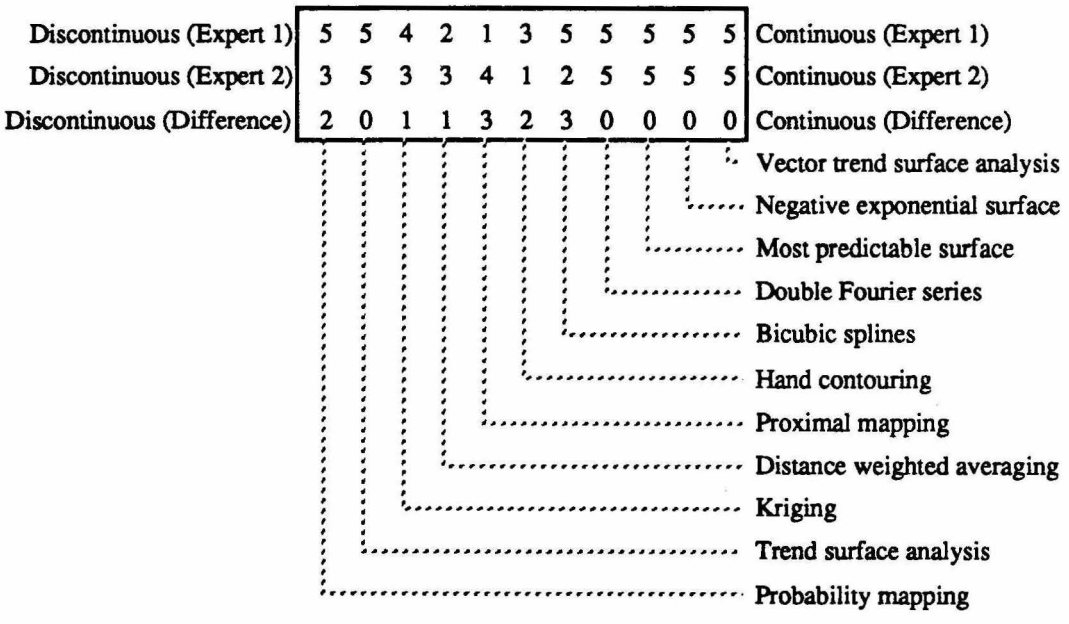


Figure 5.3: Basis for calculation of results in Figure 2

given to the entities on the distinction "Discontinuous—Continuous" by each specialist are shown on the top two lines (1 indicates "Discontinuous" and 5 indicates "Continuous"). The differences are shown on the third line and correspond to those for this distinction in Figure 2 (noting that the entities are re-ordered in Figure 2 and that zeroes are not shown).

To provide a synopsis for discussion, the results of the comparisons are summarized and presented in the four quadrant diagram exemplified in Figure 4 (the 70/80 levels are chosen because they symmetrically separate the no match level of 50 from the total match level of 100— a match level of 0 corresponds to a perfect inverse match).

Note that the derivation of consensual, corresponding, conflicting and contrasting distinctions is completely algorithmic, based solely on the data in the grids. This derivation is done by a computer program, not a person, and its basis can be demonstrated clearly through computer output such as Figure 2. Thus, there are no opinions being expressed about the correctness of the use of the distinctions and terminology, that the differences highlighted are 'right' or 'wrong.' It is open to those involved to consider, discuss and explain these differences, changing or retaining them as they wish.

The methodology has been described in relation to comparisons between two people. However, it scales up linearly with the size of the group, so that n people will be involved in n elicitations, one base elicitation and n-1 exchanges. The following section describes the methodology in detail as a practical technique for developing mutual understanding within groups.

5.4 A methodology for comparing conceptual structures

Figures 5 through 7 show the phases of a methodology for comparing conceptual systems.

- In phase 1, the problem is discussed with the group, and a domain is identified.
- The use of computer-based understanding is introduced, a specific task is agreed upon, and a purpose for the elicitation developed.
- The first step in understanding consists of the elicitation of a grid from each individual. This gives each person experience in using the computer-based system and provides an initial set of entities and distinctions particular to the individual.
- These grids are processed using graphical clustering methods, and the results shown and explained to the individual from whom the data was elicited. As a result an individual may extend or elaborate their conceptual system expressed in the grid.
- The group meets together to discuss each set of entities, review and revise the purpose or context of the elicitations, and agree on a common purpose and set of entities which all understand to be used in the next two phases.
- This common entity set provides the basis for the second phase of mutual understanding which consists of the elicitation of a grid from each individual using the set of common entities.
- These grids are again graphically clustered, and the results reported and explained to each person. Again this may lead to extension and elaboration.
- This data is then processed to identify corresponding and contrasting distinctions.

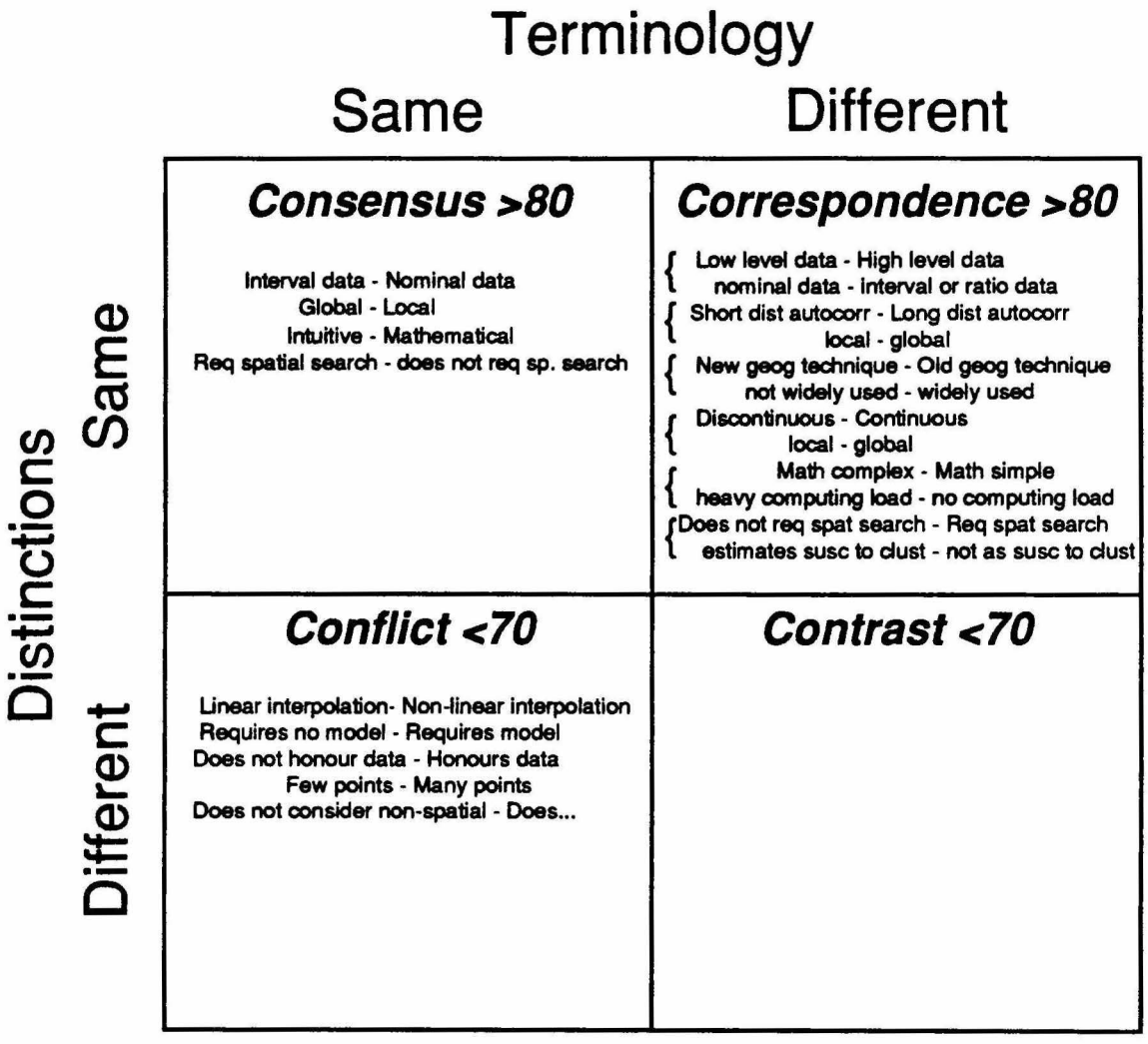


Figure 5.4: Summary of comparisons between two specialists

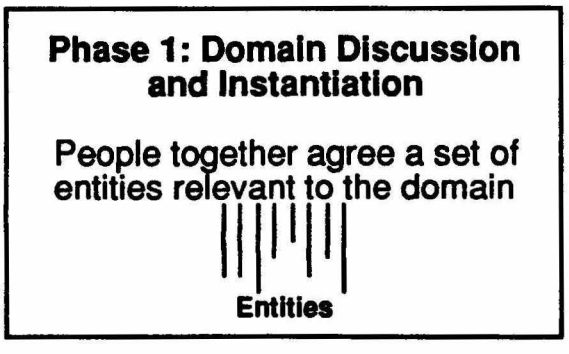


Figure 5.5: Methodology Phase 1

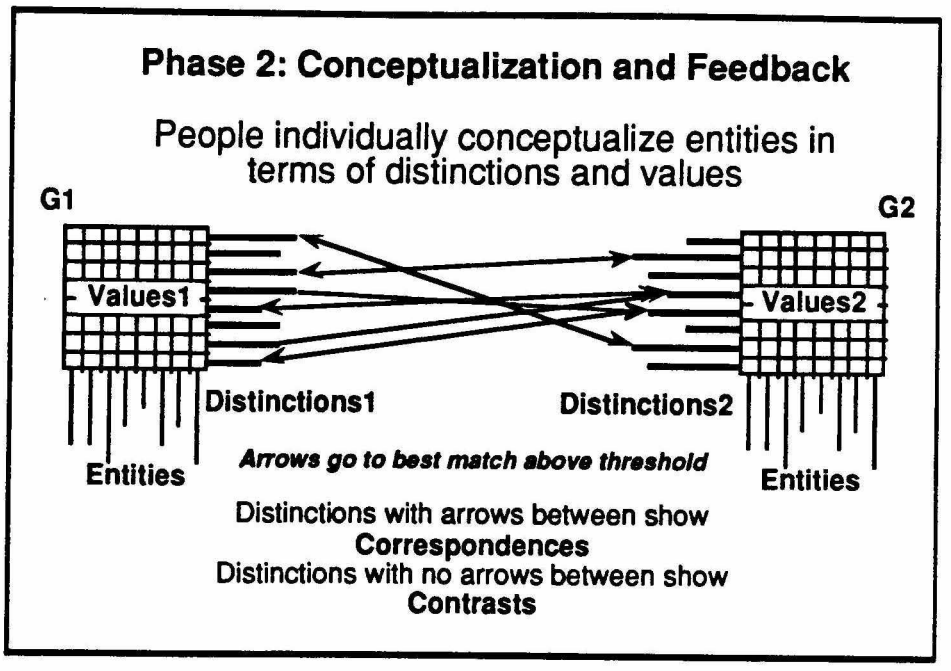


Figure 5.6: Methodology Phase 2

- The third phase of mutual understanding consists of the individuals exchanging their grids elicited in phase 2 with each other individual in the group to produce grids in which one person classifies the common set of entities using another person's distinctions.
- This data is then processed to identify consensual and conflicting distinctions.
- Their conceptual systems and the relations between them are then discussed by the group. Consensus is identified. Conflict is resolved, qualified or noted as irresolvable. Correspondence is interpreted as due to differences in terminology or correlations through some identified phenomenon. Contrasts are analyzed as irrelevant or a relevant part of some specialist viewpoint.
- This analysis is propagated through all further phases of understanding. For example, possible conflicts are avoided if possible, and identified and explained otherwise—correspondences are used to generate alternative forms and explanations.

5.5 Conclusions

This paper describes a computer-supported methodology for developing mutual understanding in groups in which the conceptual frameworks of different members are compared in a way that makes sources of misunderstanding overt and readily identifiable.

The methodology provides facilities for revealing the similarities and differences in the conceptual systems of individuals. It can be used to focus discussion between members on those differences between them which require resolution, enabling them to classify them in terms of differing terminologies, levels of abstraction, disagreements, and so on.

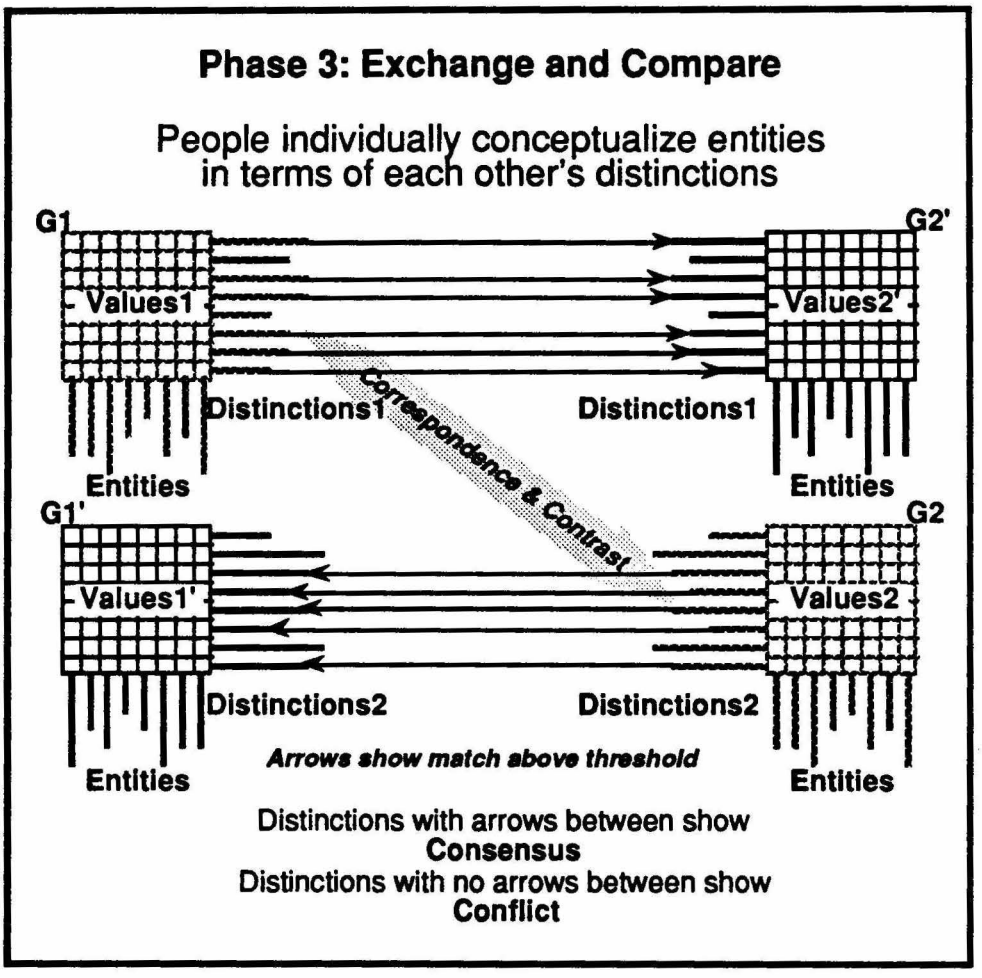


Figure 5.7: Methodology Phase 3

The methodology promotes the full exploration of the conceptual framework of a topic encouraging members to operate in a brainstorming mode as a group, using differing viewpoints to develop a rich framework. It avoids social pressures forcing an invalid consensus by providing objective analysis of separately elicited conceptual systems.

Acknowledgements

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