Emotion as a psycholinguistic polarity in speech

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0. INTRODUCTION

Psycholinguistic polarities can be used to clarify some aspects of speech and of texts. There are many indications for the existence of those polarities, and it can be shown that some very strong polarities are indicated by syntax and semantics.

From an interdisciplinary analysis of the states of consciousness, using metaphorically the interaction analysis of quantum-mechanical operators, it may be shown that the surface of speech or text has a very rich structure, competing with the syntactic and semantic ones.

The definition of psycholinguistic polarities lays on a theoretical frame, a part of which it is necessary to introduce, prior to develope the concept. Its general statements are universal ones, due to the fact that the mathematical equations are a general metaphor for any situation where they are used as a model.

Some aspects of the quantum theory are first introduced. The operator formalism is discussed, in terms of the interaction representation, as a frame for the communication process. In this frame, the concept of a field of consciousness is introduced, in which the psycholinguistic polarities can be observed and mesured. Then the special case of emotions as psycholinguistic polarities is discussed. Finally, a computer program for detecting some polarities is briefly mentioned.

1. A QUANTUM-MECHANICAL METAPHOR

Symmetry and structural stability are strongly related to the structure of matter (Blakemore, 1969). This can be shown to be a consequence of the fact that the wave function is spread over all space and time (Landau & Lifshitz, 1967: 281).

As the mathematical properties of the symmetry groups do not depend on the physical interpretation given to them, it is expected to find similar properties both in the physical case and in the case of the field of behaviors. This field is a generalization of the physical case, including other behaviors besides the interactions between particles and bodies. More particularly, it includes the linguistic behavior, the patterns of which exhibit a high degree of regularity.

In the physical case, for each symmetry property of the mathematical description there is a corresponding conservation law. If one is restricted to the correspondence principle of the quantum theory, the mathematical symmetry properties of the wave equation must similarly correspond to some behavioral constant of any other system. For example, tasks can be executed in cooperation, whereas posts are fulfilled under competition, reflecting the quantum mechanical statistics of **bosons** and **fermions**, respectively.

The **elementary particles** of the **semantic matter** result from cuts made in the conceptual

field (the universe of discourse). Some specific changes in the behavioral pattern correspond to polarities in the field of behaviors, partitioned into the specific symmetry groups resulting from its structure.

In the quantum mechanical model, each situation involves the uncertainty principle, as well as the wave-particle duality from which it raises. So, the semantic matter exhibits structural (morpho-syntactic) aspects as well as non-local, intra- and extra-textual relations. These relations, behaving as bosons, help to establish coeherence, which is a physical-mathematical property of the wave function, leading to an internal phase coordination. This will superimpose, on the morpho-syntactic structure, a **Bose-Einstein condensate** (Zohar, 1990), in analogy to the living cell, where such a condensate gives a molecular structure the behavioral characteristics of life.

Cuts in the semantic matter are polatities, generating some «potencial energy», and so they can govern its dynamics. There are groups of cuts which are mutually incompatible. That is, when done precisely, a cut of one group inhibits a cut of another one to occur at the same time. When they are done less precisely, they can coexist following the incertainty relation $\mathbf{dp.dq} \geq \mathbf{h}$. This is interpreted saying that simultaneous mesurings require commuting operators, which in turn require coincident or nested cuts, as is the case of the syntactic structure of phrases in a sentence.

The set of all possible operators is partitioned into subsets of mutually commuting ones, and so the commutation relation between operators is an equivalence relation (Aho & Ullman, 1972). This is one of the reasons for the syntax to be so a strong structure. As shown in what follows, emotions are also strong polarities, but, as they are generally not compatible with the syntactic structure, they are not currently in focus in text or discourse analysis, if this is based on the formal structure of syntax.

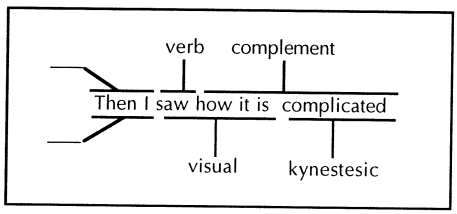
2. PSYCHPOLINGUISTIC POLARITIES

Along the structure of the semantic field, some aspects of the internal states of the speech partners, as they change during communication, may be characterized as polarities, in the sense that they cause the surface of the speech flow to change in some characteristic way. Emotions are the main observed polarities, as most of the internal state changes are due to changes in some emotional aspect. These polarities are clearly indicated in some lexical, morphological, syntactic and semantic aspects of the speech (or text) surface. On the other hand, however, they are in general incompatible with the syntactic structure.

The psycholinguistic dynamics behind the polarities include the mental operations of generalization, elimination and distortion (Bandler & Grinder, 1977), occurring as well at the neural and biochemical level, as at the linguistic level, i.e., at the level of the perception of the actual **concrete reality**, and at the level of the **message** (Whorf, 1956) as a **mental realization**. A sentence, viewed as a quantum mechanical operator acting on a state of consciousness, may lead to a new mental state, changing the wave function describing the system: as a quantum mechanical operator, a sentence may add, or change, or negate some component of the frame.

The list of possible polarities is virtually unlimited. What generative grammars and discours analyses ultimately do is to detach and characterize polarities: subject/predicate, verb/object, theme/rheme, etc. It follows from this that the dimensionality of the linguistic space is unlimited, as is also the case of the nuclear field with its evergrowing number of elementary particles. This analogy led Heisenberg to say that science is only «façon de parler».

Further examples of polarities are: intention/impulsion, actor/instrument, love/hate, instinct/reason, process/product, agent/action, iteration/recursion, value/importance, comparison/distinction, atraction/repulsion, convergence/divergence, matter/energy.



Structural and behavioral regularities, and the quantum mechanical operators describing the corresponding communication links, can be drawn from the same mathematical principles, be it the case of material or psycholinguistic systems, from nuclear physics to psychology. All such regularities occur in a universal field of possible behaviors in wich one has:

a) structural (physical, biochemical or higher) regularity;

b) regular communication channels with:

b1) other similarly structured systems;

b2) the environment as a whole;

c) behavioral regularity with respect to its:

c1) own structure;

c2) previous history.

3. EMOTIONS

As previously stated, emotions are the most evident psycholinguistic polarities. They pop up in almost all communication situations. And this is easy to explain.

A thought is a highly biased form of emotion as the processes of generalization, elimination and distortion are applied to it. The bias comes from the memory store, at the physical, biochemical, neural and social levels, and introduces several degrees of dissociation, in the psychological acception.

Text analysis pulls these aspects to the configurational frame. And even in this frame there is little formal means of handling them.

Polarity analisys of speech or texts, in turn, can add formal and precise cuts, possibly showing new aspects of the psycholinguistic dynamics.

To do the polarity analysis, there is even no need to do further syntactic or semantic analysis, because these aspects are in general incompatible with that analysis. There is no need to distinguish between deep and superficial structure, and even truncated or otherwise non gramatical utterances are easily analyzed.

As seen in the computer output listed in the appendix, there is some evidence that the polarity pattern of an utterance is related to the flow of emotions, as well as the flow of concepts it manifests.

4. AUTOMATED ANALYSIS

Even a relatively simple computer program written in Prolog can show much of such polarities, in an automated analysis. The only requirements for such a system are:

a) a dictionary giving lexical traits for each word;

b) a computer system to scan the text and indicating the frame changes in terms of selected traits, reflecting the polarities saught for.

Sample procedures of the program show that it is conceptually very simple.

```
analyze_sentence([],[],A,A).
analyze_sentence([Word|Words0],[Word/Polarity|Words1],Previous,Traits):-
        fetch(lexicon, Word, Trait),
        update_frame(Trait,PreviousTraits,NewTraits),
        polarities(PreviousTraits,Newtraits,Polarity),
        analyze_sentence(Words0, Words1, NewTraits,Traits).

polarities([],_,[]).
polarities(_,[],[]).
polarities([Polarity/Trait|Traits0],[Polarity/Trait Traits1], Polarities):-
        polarities(Traits0, Traits1, Polarities).
polarities([Polarity/Trait0|Traits0],[Polarity/Trait1 |Traits1],[Polarity|Polarities]):-
        polarities(Traits0, Traits1, Polarities).

update_frame([], Previous, Previous).
update_frame(Trait, [], Trait).
update_frame([P/V|Traits],[P/X|Previous],[P/V|New]):-
        update_frame(Traits,Previous,New).
update_frame([P/X|Traits],[Q/Y|Previous], [P/X|New]):-
update_frame(Traits,[Q/Y|Previous],New).
```

5. CONCLUSION

Polarity analysis is a new approach to language analysis, which will enrich the study of human behaviors in general. It is conceptually simple, and is based on the trivial observation that people speak differently if they are glad, sad, excited, alcoholized, or in an otherwise altered state of mind.

A simple analysis of the frame dynamics is possible using a computer program, the role of which is to watch lexical traits or other properties of the words along a text or speech, updating the frame accordingly.

The use of a quantum-mechanical metaphor is at the moment used only to settle the main frame of the properties discussed. The use of the quantum-mechanical wave equations to formally descibe the frame dynamics in speech or texts is a long term goal.

6. REFERENCES

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