

The Polysemy of the Sign

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In both natural language and biology, signs are polysemous, with a range of possible meanings before interaction-in-context determines their value



For example, the Oxford English Dictionary teaches us that the sign "Cat" can signify:

(1) A well-known carnivorous mammal
(*Felis domesticus*)



A prostitute (*slang*)

or

*An expert in, or one expertly
appreciative of, jazz. slang (orig.
U.S.)*

Polysemy is evident in biology too:

Although in the standard code
CUU specifies leucine, for yeast it
specifies threonine

One codon, two senses

What is the meaning of polysemy?

What is the role of polysemy in linguistic and biological systems?



It may be helpful to discuss polysemy metaphorically as a superposition of the sign

Here the superposition of the sign is defined as *the “simultaneous existence of mutually exclusive values”*

My use of the term superposition
in the above sense does not
reflect an idiosyncratic
interpretation of a well-defined
physical concept



Clearly, in the quantum sense,
neither molecules nor linguistic
signs can exist in superposition



The question I am asking is
whether the general conceptual
sense of a superposition
presented before can lead us to
better understand polysemy



The fundamental unit in classical information theory is the bit

A bit of information can take only one of two mutually exclusive values, 0 OR 1

In contrast, quantum computation presents a unit of information—a qubit — that can exist in superposition, *being 0 AND 1 at the same time*

In other words, in a qubit two mutually exclusive values coexist

The superposition of a qubit is a linear combination of the states 0 and 1, each multiplied by a complex number representing the amplitude ("Probability") of the state



The qubit combines differences
(i.e., the states 0 and 1) and
values (i.e., the amplitudes)



Let us turn to Gregory Bateson
and the idea that the basic unit of
information is a "difference that
makes a difference"



A difference is a qualitative relation between at least two entities

The most basic relation is that between the binary categories "1" and "0," in which each entity is defined simply as the negation of the other

This idea resonates with similar ideas: G. Spencer-Brown and the idea of a distinction



A basic difference is actually a bit

The basic operation of the difference system is the logical gate NOT

Each state is defined only in negative terms

Differences constitute the digital code

The digital code and its combinatorial capacity underlie the flexibility of the living system

The most important characteristic
of the digital code is its
arbitrariness



The digital mode of communication is arbitrary and is not bound strictly to the message it carries

In other words, there is no logical necessity that a given sign will correspond to a given signified

This arbitrariness is true of any system of digital codes, whether organic codes or codes in natural language



Convention is at the heart of the
digital code



The idea that a difference is our starting point of reference also appears in the work of Saussure:

"In the language itself, there are only differences"

However, according to Saussure
language is a system of
differences and values



A semiotic value is an abstract concept that, according to Saussure, involves:



(1) something dissimilar which can be exchanged for the item whose value is under consideration (e.g., a sign for a signified) and



(2) similar things which can be compared with the item whose value is under consideration (e.g., a word for a synonym)



A value belongs to another mode
of communication—the
analogical mode—that involves
continuity



If we think about a semiotic system in terms of a network, then differences are expressed as the different parts of the network (i.e., the nodes) and value is expressed in terms of their relative positioning



The language system, like any other semiotic system, combines the digital and the analogue, difference and value

The two codes are crucial for understanding any system of signs in which differences negatively defined have to take on values in order to make "a difference that makes a difference"

Pure differences mean nothing if they do not have a value

For example, DNA as a string of differentiated letters is informative only for a given interpretative system, and only if it can make a difference for the production of proteins

Natural language, however, like any other semiotic system, is more than an abstract system of differences and values (la Langue)

In natural language a difference makes a difference only for someone in a concrete context of interaction

Language exists in
speech—Parole—in a concrete
context of interaction and
exchange



If we understand this point, then we cannot accept the sharp Saussurean division between langue and parole

We cannot accept the desperate Saussurean withdrawal from the complexity of the parole to the simplicity of the abstract langue

Language, or any semiotic activity, is a wholeness constituted by the delicate interplay between the abstract and the concrete,
langue and *parole*



Wisława Szymborska/ "Sky"

Even the highest mountains
Are no closer to the sky
Than the deepest valleys.
There's no more of it in one place
Than another...

Division into sky and earth
It's not the proper way
To contemplate this wholeness

The problem facing us is: understanding how living systems "*contemplate this wholeness*"

How people, for example, stitch the abstractness of *langue* to the concreteness of *parole*?

How does the immune system usually treat sperm cells as "non-self" but in a specific context as self? (Neuman 2006)

What is exactly the problem?

Arbitrariness underlies convention, and convention underlies flexibility and resilience

However, convention and arbitrariness have their price, namely, that they cannot directly support the generation of meaning in context

Direct translation from the
abstract to the concrete is
impossible



So?

The answer I would like to provide
concerns the polysemy of the sign



The superposition of the sign:

(1) Combines the two orthogonal dimensions: The digital and the analogue codes



(2) It is a state in which we “lift” the sign from its embodiment in an abstract system of relations (i.e., differences) and positioning (i.e., values)



If we let its potential values coexist, the sign is no longer in the realm of pure, mutually exclusive potentialities

On the other hand, it is not in the realm of actualities either

It exists "in-between!"



When it is in a paradoxical state of superposition – in between – the sign functions as a “quantum” bridge between the abstractness of la Langue and the concreteness of Parole



How is it done?

A perspective of reversible and irreversible processes



An irreversible process is a computational process in which the input cannot be reproduced from the output

For example, I have in my mind the concept of a cat. When this concept is translated into natural language, it is represented by the particularities of a given language, such as cat in English or gato in Spanish

I have in my mind the concept of a cat. When this concept is translated into natural language, it is represented by the particularities of a given language



However, the sign itself is irreversible, because the sign *cat* can be used in different senses, such as the feline mammal or a jazz musician



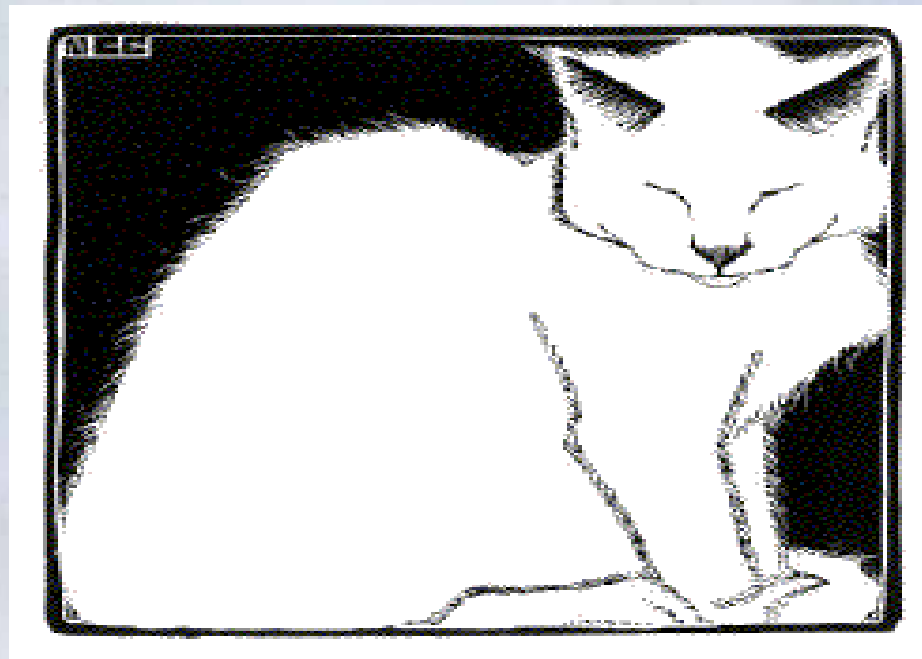
That is to say, from the sign itself
(i.e., the output) I cannot recover
its conceptual counterpart (i.e., its
input)

Again, convention and
arbitrariness have their price



CAT

The Feline Mammal?



OR a Jazz player?



How is it possible for the interlocutor to understand the meaning of "Cat"?



When uttered "Cat" is in a
superposition

It is the feline mammal AND a jazz
player



No information was lost

The conceptual counterpart of
"Cat" can be restored through
context markers



Only context determines the sense of the sign and allows us to restore its meaning



Counterintuitive as it may sound, the superposition of the sign puts us in a situation in which the original input can be restored despite having necessarily been subjected to an irreversible process of computation as implied by the arbitrariness of the coding system

Sounds strange?

More explanations in my paper:

“The Polysemy of the Sign: From
Quantum Computing to the
Garden of the Forking Paths”

Thank You

