Sentences with Associated Geometry

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Abstract
This communication illustrates the sentence power whose essential function is to integrate the working way of its verb in a more accurate subspace. It is a logic sequel of our article "Language and Geometry"
Because the verb is the main component of its sentence, it is logic to present a sentence classification very narrowly related to the verb classification, already done in the previous paper "Language and Geometry". Besides a sentence is the shortest complete unit of language, totally structured. It acts as a semantic synergy for its components. Like vectors, the sentences have a few components which introduce the dimensions of their associated spaces. Sentence performs an idea flow what is a "Z" operator and achieves a wave modulation because it inserts idea into a mute wave which is the carrier.
Conversations are dynamic nets of crossed sentences between a few interlocutors to enrich topics meanings. There is analogy between the mind analysis of a text and the tensor formation, what highlights the understanding of text structure.
Sentence associated with a describing picture acquires a universal understanding because a picture plays as obvious ideogram or pictogram. This transfer is automatically performed by the mind.

Keywords: Communication process, Sentence classification, Modulated waves, Geometric configurations, Idea illustration

1 Introduction

The sentences give supplementary characteristics about the working frame of their verbs. Indeed a verb inserted in a sentence acquires a more specific value with more accuracy. The same verb introduced in different sentences exerts its own action in different circumstances. By means of a chemical analogy: the sentence may be considered as an atom whose verb is the nucleus and other elements are alike the electrons. The subject acts as an electromagnetic radiation. Sentence and verb classifications are logically in perfect accord. Any sentence composed of many elements presents a vector structure.
Therefore each component may be projected on an associated axis whose number gives the space dimensions.
Accordingly each reasoning or conversation aims to modify our surroundings because they bring an addition of information and this is recorded by a modification of our

mental space curvature. A level for meanings transported by sentences is fixed from the verb kind and this supports the hierarchy of ideas. Besides a text may be associated with a picture train or cartoon to supply idea diffusions and interpretations. This leads to topologic transformations and didactic representations.

2 Presentation and Logic Composition of Sentences

Any sentence is a unit of language. Sentences play as micro quantifiers of our ideas. When we search a geometric translation of a sentence, we have to determine the kind of its verb, its main component. The purpose of any sentence is to coat its verb with some additional qualifications to locate and to specify its action. After its insertion in a sentence, the verb plays in a particular way, its meaning becomes totally impregnated by the including sentence. The same verb introduced in two different sentences operates along two different modes or with different colours imposed by the specific sentence coating. To illustrate this phenomenon we may consider the education of a pupil in a particular school. Pupil is the verb, both have basic potentials. The school is similar to a sentence, both develop specific abilities. The school gives the pupil a technical formation and sentence gives the verb a semantic adaptation. (Figs.1- 4)

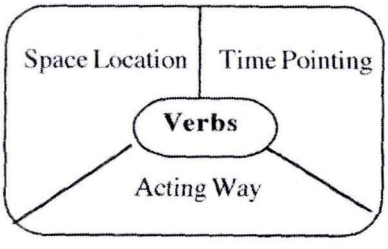


Fig.1: Adverbs Functions

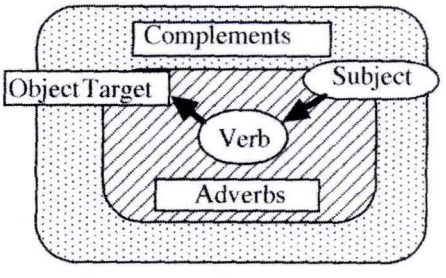


Fig.2: Sentence Structure

Table 1: Verb Modifications by Sentences

Verb	N°	Sentences
to Dig	1	Here we have to dig a trench
	2	Today I dig with pleasure a trench in my garden
	3	Every day I have to dig trenches with energy
	4	Yesterday I carefully dug a deep hole in front of my house
	5	Tomorrow I am going to buy tools for digging, during the next week
	6	dig and shovel are the essential tasks of a pit worker
	7	Are you ready to dig during the whole day?
	8	To dig a Trench

In table 1, each sentence adapts the verb "to dig" to various circumstances and for different moments and locations. The sentences transfer their verb in particular decors where their actions have to exert their specificities.
Functions of sentence components: around the verb are two proximity zones:
The next peripheral is composed of adverbs, which act as epidermal adaptors. We may consider the coupling verb /adverbs similar to a chemical adsorption. (Fig. 1)
The further peripheral is composed of complements, which act as external adaptors
The subject plays as the verb driver, or the pilot of the verb. Without any defined subject, the verb stays in rest and only indicates a possible action what is similar to a tool kept in a shed or to a locomotive stopped on a siding. Among the verb complements, there is a preferred one which supports or receives the verb action and consequently will be considered as the object target. In the declension languages this latter appears as an accusative factor, because it receives the verb effects.

Table 2: Functional Interpretation of the Sentences in Table 1

Sentences	Subjects	Verbs	Target object
1	I	Have to dig	Trench
2	I	dig	Trench
3	I	Have to dig	Trenches
4	I	dug	Hole
*5	I	Buy	Tools
*6	Tasks	are	Indeterminate
*7	You	are ready to dig	Indeterminate
*8	No propellant	To dig	Trench

The sentence *5 indicates in a very near future the preparation for digging.
The *6 describes a dynamic state (dig and shovel) for the pit workers
The*7 tries to discover the reactive behaviour of people ready to dig.
The *8 expresses no action but is the mention of a task without any location in time or in space
The locution "have to dig" adds to the verb "dig" a colour of obligation or convenience.
Tables 1 and 2 indicate the various suiting effects of the verb insertion in different sentences. Consequently it is possible to sum up these coupling between verbs and sentences by the following notice: the verb gives life to its sentence and the sentence suits and dresses its verb. Indeed a solitary verb is a fuzzy action, without any location or accurate effect. But a sentence without verb expresses no structured idea.

3 Sentence Classification

The classification pointer of the sentences will be its verb because verb induces in its sentence the main meaning. Therefore we choose a perfect correspondence between sentence and verb classification. (table 3).

This double classification is very fundamental for the further deductions of this study. From this functional analogy, it is possible to transfer systematically the verb properties to the including sentence. Consequently the first topological deduction projects the sentences in a cylindrical configuration as follows: (Fig.3)
Sentences including state or metrological or reactive verbs will be considered as circular vectors and will constitute a curling field. These reactive sentences act in imaginary spaces
Sentences including anticipative verbs will be considered as time axial vectors and will constitute a time diverging field (= axial time field).
Sentences including trans or social verbs will be considered as radial vectors and will constitute a radial diverging field. These active sentences act in real spaces

Table 3: Classification of Verbs and Sentences

Verbs	Sentences
State	Specification of the State
Metrological	Specification of this Evaluation method
Reactive	Description of Reactive variations
Anticipative	Indication of the Future objective
Trans verbs	Explanation of this Action
Social verbs	Specification of the Social activity

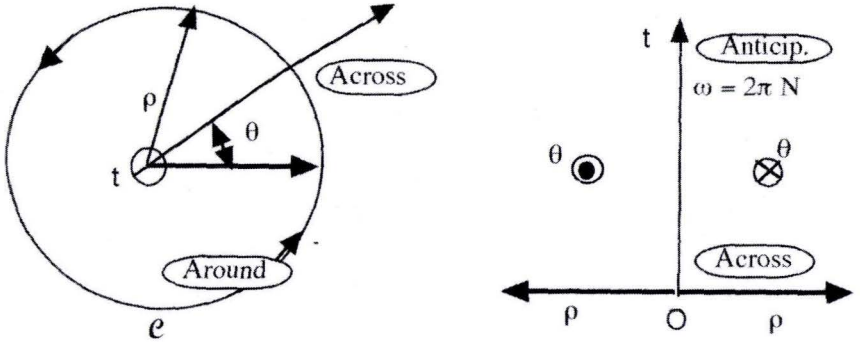


Fig.3: Cylindrical Integration of different Sentence Kinds

4 Sentences and Vectors

Table 4: Vector Structure of Sentence

Subject Driver	Verb	Object Target	Auxiliary Complements

As shown in table 4, any sentence is composed of a few parts corresponding to projections on specific subspaces constituted by the translated meanings. This divided

structure is analogous with vector structure which is constituted by various components projected on axes carrying their physical nature. (Fig. 5)
Hierarchy of the sentence components: by analyzing table 1, we have underlined the particular functions of verb, of subject and of the object target (= accusative). Therefore these 3 main topics produce a sub domain of higher meaning in front of the other complements. Accordingly any sentence space will be divided into 2 levels: the dynamic with three axes respectively supporting the subject, the verb, the object target; and the locating or colouring one supporting the other complements.
Active and reactive domains:
The spaces associated with sentences are of complex composition: real subspaces carrying the active information or variations of surroundings, and imaginary ones carrying the reactive topics which modify the levels of states or our potentialities. This complex distribution follows the logic procedure used in electricity. At this stage we deduce that any axial sentence field is inserted in a real subspace and any circular sentence is inserted in an imaginary.

5 Chemical Analogy of Sentences

By searching visualizations of sentences, it is interesting to discover the remarkable analogy between sentence and atomic structure.

Table 5: Analogy between Structures of Atoms and Sentences

Parts of Atom	Components of Sentence
Nucleus	Verb
Near Orbital	Adverbs & Auxiliary Complements
Further Orbital with ionisable electron	Target (accusative)
Penetrating Electromagnetic Wave	Subject

Interpretation of table 5 and (Fig.5)
Nucleus and Verb: both are the essential elements (= barycentres) of their including structures. They carry the most important information of their systems.
Electronic orbital and Complements: these elements present similar behaviours. Indeed for the orbital electrons, they are under the influence of their nucleus and for the complements they are under the influence of their verb.
The electrons on the near orbital are strongly linked with their nucleus and are staying in their atom. This is similar to the behaviour of the auxiliary complements because they are also static elements in their sentence.
The electrons on the further orbital have a weak link with their nucleus and may be easy ionisable. This is similar to the behaviour of the object target (accusative) which may be transported to its neighbourhood under the action of a trans or social verb.
Penetrating electromagnetic wave and subject; both inject energy or activity in their respective systems. Subject commands the verb action and the electromagnetic wave brings energy into the atom. Imported energy increases when the wave frequency increases.

Comparison between the behaviours of the pair (nucleus- electromagnetic wave) and the pair (subject - object).
If the wave energy is lower than the link energy of peripheral electron, there is no ionization and there is only an increase of the internal potential of the atom, what is similar to the reactive behaviour of the pair (reactive verb -- subject). We are in a circular topology.
If the wave energy is higher than the link energy of a peripheral electron, there is ionization and the peripheral electron is ejected into the surroundings of its atom, what is similar to the trans or social or anticipative behaviour of the pair (act verb – object target). We are in an axial or radial topology. From these considerations we have associated the behaviours of various verb kinds and their including sentences with the energy levels transported by waves. This point of view will be used to evaluate the information levels of sentences.

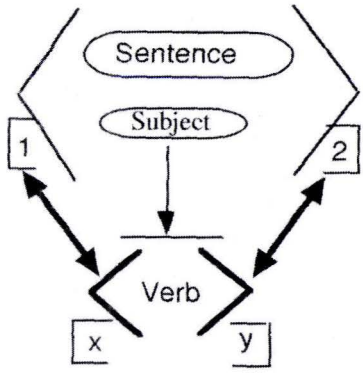


Fig.4: Verb coating in Sentence

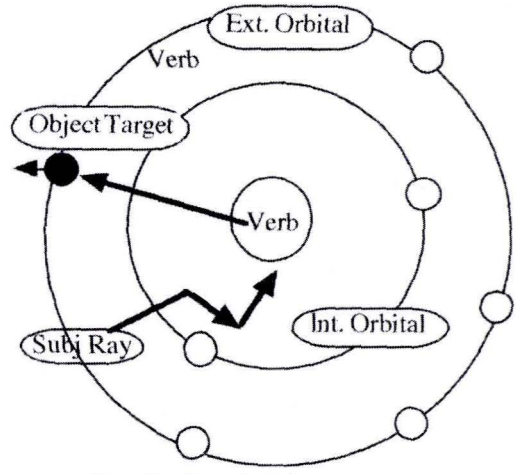


Fig.5: Chemical Representation of a Sentence

6 Sentences and Waves

When we consider the table 3 of the sentence and verb classification, in the section 3, it is obvious that the sentences have to inherit the essential characteristics or their contained verbs. In our first communication "Language and Geometry", verbs and waves have been associated because both present a lot of similar functions. For the same reason it is logic to assimilate sentences to waves what allows to transfer wave characteristics to their correspondent sentences. Due to the fact that a sentence contains more information than its verb, the linked wave will be also more specified.
Table 6 displays the differences between the verb waves and the sentence waves. The sentence gives its associated wave more information what corresponds to sentence

coating of its verb. The sentence wave receives a meaning enrichment in comparison with the verb wave. If the verb waves are sliding without any defined location, the sentence waves have their application points determined and they act through a well described landscape. The sentence waves transport the sentence effects on their surroundings in a way related with the forms of their associated trajectories. It is deduced from the following vector relations:

Table 6: Comparison between Verb Waves and Sentence Waves

Verbs	Sentences	Linked Waves
Radial verbs		Mobile or sliding Waves along radial trajectories through space
Axial verbs Or Active		Mobile or sliding Waves along time axis
Circular verbs or Reactive		Mobile or sliding Waves along circular trajectories (sometimes imaginary)
	Radial sentences or Actives	Mobile Waves acting on a defined target along radial trajectories through a described landscape
	Axial sentence	Mobile Waves acting on a defined target along axes through a suggested future landscape
	Circular sentence or Reactives	Mobile Waves describing subject characteristics along circular trajectories through a described land
Verb Actions Sliding meanings		Flying Waves without any (subject – object)link
	Resulting effect of coupling between sentences & waves	Integration of Waves in a described landscape

For the rotational sentences: St(θ) (state, metrological, reactive) accordingly Stokes's theorem:

$$\int_C St(\theta)\, d\theta = \iint_S Curl\,[St(\theta)]\, dS \qquad (1)$$

These circular trajectories indicate an exploration around the subject for a total estimation. The "Curl" operator expresses the additional curvature produced by this new information, in its neighbourhood.

For the radial sentences: St(ρ) (trans, social) accordingly Ostrogradsky's theorem:

$$\int_R St(\rho)\, d\rho = \iint_S Div[St(\rho)]\, dS \qquad (2)$$

These radial trajectories indicate a penetrating action through the external vicinity of the subject. The "Div" operator expresses the thought surge in this action space.

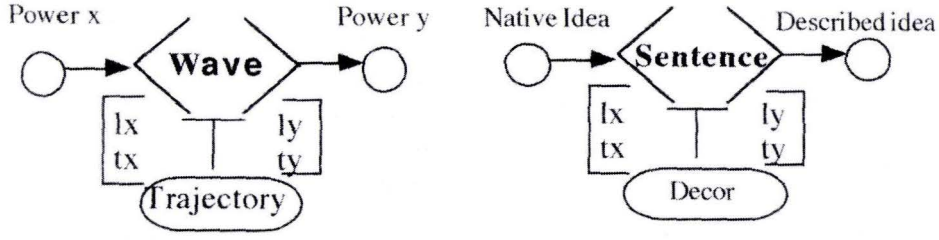


Fig.6: Analogy between Sentences and Waves

7 Generalized Poynthing Vector Associated with Sentence

Any electromagnetic wave is produced by the inter action of a time variable electrical field with a time variable magnetic field. From this field interaction appears a propagating effect what transports an electromagnetic power designated by the "Poynthing vector". This moving vector is actually a power wave of electromagnetic kind. In accord with the rule of the vector product, this propagating wave follows a linear trajectory orthogonal to the plan formed by the electric and magnetic fields

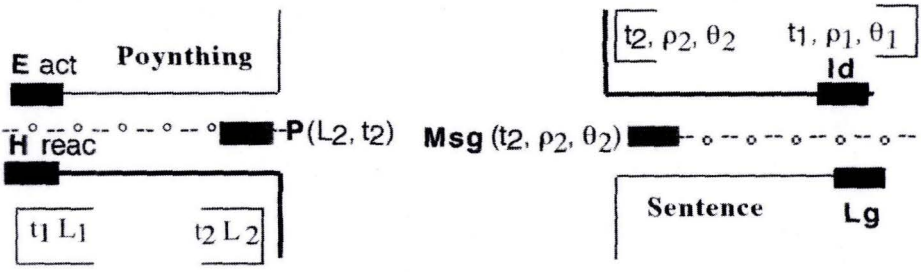


Fig. 7: Illustration of Analogy between Poynthing Vector and Sentence Vector
Poynthing Sentence

Correspondences between the electromagnetic and the sentence quantities
In the table 7, we need to define the variable Idea = E act: it expresses the active effects exerted on the target object what can transform the vicinity landscape. It is also useful of defining the feeling or the reactive frame which is induced in the sentence; this is expressed by the variable: Language = H reac

Table 7: Comparison between the Electromagnetic Poynthing Vector and the Generalized Sentence Vector

Parameters & Effects	Poynthing Vector	Generalized Sentence Vector
Action	Electric field	Trans, social, or anticipative effects = Id act
Frame	Magnetic field	Reactive, anticipative or metrological Potential = Lg reac
Propagation	Electromagnetic Power	Message
Effect	Power transit	Information diffusion
Vector expression	$\mathbf{P} = \mathbf{E}(t) \wedge \mathbf{H}(t)$	Msg = Id ^ Lg
Space kind	Time & Geometric space	Complex space
Space factors influencing	ε: Dielectric permittivity μ: Magnetic permeability	Selected Act Induced Feeling

P results from the vector product $\mathbf{E}(t) \wedge \mathbf{H}(t)$ This expresses the conjugated effect of an electric and a magnetic causes and **P**(t, l) is a travelling wave

(**Msg**) results from the pseudo vector product Id act ^ Lg reac. This expresses the conjugated effect of active effects = E act and reactive level = H reac. (Msg) is a propagating sentence wave through the thought space. The table 6 displays the similarity between the electromagnetic behaviours and the mind working translated by sentences. Consequently this confirms the fact that a sentence may be assimilated to a wave. See (fig 9). Message propagates ideas from the mind through space and time. It is possible to establish the following equivalences:

$$\text{Msg}(l,t) = \text{Sentence}(l,t) = \text{Wv}(l,t) = \text{P}(l,t) = \text{mobile vector} \qquad (3)$$

This relation fundamental for the geometric configuration of language justifies the objective of this study.

8 Tensor Multiplication and Text Understanding

Any lecture or report is a sentence chain. This constitutes a sequence of information stored by the mind. Each recorded sentence seems to be integrated in its vector subspace. To understand the whole meaning of a lecture or of a text, the mind has to detect the topics transported by the different sentences for associating and comparing. These tasks may be considered analogous to the extern or tensor product of vectors. These considerations introduce the tensor product of sentences to establish a mathematic modelling of the mind operations to acquire the deep understanding of a text.

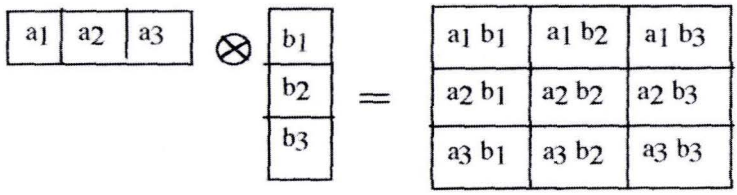


Fig.8: Tensor Product of order (2) of 2 Vectors

What is a tensor? A tensor of order (p) appears as an agent to project on axes of order (p), the resulting effects of the product of each component from (p) vectors, each by each. It is a hyper geometric operator to exert the transition from (p) vector spaces of (n) dimensions to a hyper space supported by (n^p) axes. Any tensor space of order (p) is composed by products of components from these (p) different vectors. It is also possible to perform the tensor product of k vectors with n ones of different dimensions; if the k and the n vectors are respectively embedded in spaces of r and s dimensions, we obtain a tensor of order (k.n) with ($r^k.s^n$) dimensions.
For a tensor of order (3), the (n^3) tensor unities are composed as described by the following relation:.

$$\varepsilon\ i,j,k = (ei)\ (ej)\ (ek) \qquad (4)$$

These tensor products are well adapted to show the geometric interpretation of the resulting meaning acquired by the chain of (p) sentences constituting a text. The number of essential topics contained in each sentence are considered as dimensions of their sentences.

Table 8: Synthesis of the Meaning produced by a Sentence Doublet

Operations for global understanding	Sentence (A)	Sentence (B)
Text to interpret	The frequency of a wave expresses its power	A high frequency wave can ionized an atom
Essential topics	Frequency wave, power	Frequency wave, ionization
Essential relations	f(wv) → power	Hf(wv) → ionizes
Concatenation	Hf(wv) → H power	→ ionizes
Meaning Synthesis	Important power ionizes	

Table 8 displays the operational sequence to retrieve the essential meaning from a pair of sentences. The meaning synthesis is performed by detecting the conjugated effects of the pairs of topics retrieved from each sentence. It is similar to the constitution of a tensor product.

At first we are going to illustrate the algorithm of the tensor product of 2 vectors with 3 components to limit the developments of the calculations; it gives a tensor of order 2 with ($3^2 = 9$) components. (Fig.8)
In a similar way we perform the tensor product of 2 sentences (**T**& τ), each with 3 meaning topics. In each case of this tensor product of order (2), is a symbolic product **T**(l) τ(k) which has to express the meaning composition.(where T = topic. = τ)

9 Convolutions between the Clauses Inserted in a Same Sentence

The insertion of two or more clauses in a same sentence constitutes a composed sentence. This procedure plays as a condensation of complementary linked ideas and in this way, we project a mini paragraph in a sentence. If each of the p linked clauses contains only an essential topic or idea as p vectors of (1) dimension, it is possible to consider that this composed sentence is a tensor product of order (p) in a hyperspace of (1) dimension. But these clauses develop very tight mutual couplings. There is always a main clause or a driver which virtually drags the complementary ones. But these towed clauses add information to the main idea; and act as inductive in coupling with the main clause or the inductor. The mutual movement may be interpreted as a convolution or a moving tensor product between the main clause and the other ones. The result is the enrichment of the main idea with explanations added by the dragged proposals.

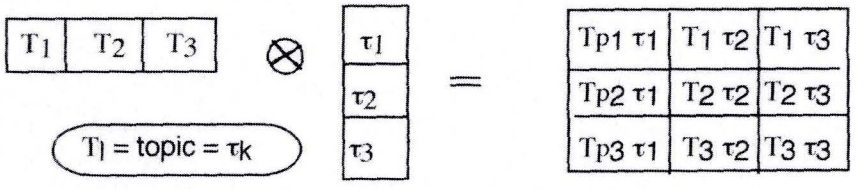


Fig. 9: Tensor Product of 2 sentences

10 Universal Understanding of Drawing

Any graphic or picture can support a lot of information. Besides the pictures are easy to memorize by our mind. It is well known that any fastidious explanation acquires a better understanding when it is converted into a graphic representation. Any graphic scenery is automatically interpreted by anyone. Geometric objects and illustrations acquire a synoptic suggestive power.
When you see the picture of a cat, anyone immediately detects the presence of a cat and afterwards is able to express this picture in his own language.
During a long time the texts dominated the drawings because it took more time to draw than to write. But at present, there is a reversal trend due to T.V. diffusion, computer use with their net connections. The geometric visualization gives ideas a universal expansion. This is a major advantage of the electronic drawings and justifies the diffusion of scientific drawing in technology.

Table 9: Logic Analysis of Composed Sentences

	(1) Main Clause	(2) Secondary Clause	(3) Tertiary Clause
Composition	I take a torch	in case it gets dark	before I return
Convolution	Driver	Dragged	Linked to (2)
Logic	Action	Justification of (1)	Justification of (1)
Coupling	Inductor	Inductive	Inductive
Essential Topics	Torch	Darkness	Return
Time Distribution	1° Present Act	Time Event	Future Act
Tensor Analysis	Vector (1 dim)	Vector (1 dim)	Vector (1 dim)
Tensor of order (3) with (1) dimension			
Composition	(1) I don't very often get out	(2) because I have too much to do	(3) but I regret this situation
Convolution	Driver	Dragged	Dragged
Logic	Action	Justification of (1)	Reactive on (1)
Coupling	Inductor	Inductive	Inductive
Essential Topics	Never out	Too busy	Regrets
Simultaneity	At present	At present	At present
Tensor Analysis	Vector (1 dim)	Vector (1 dim)	Vector (1 dim)

11 Conversation and Multi Modulation

In a few explanations we describe the usual wave modulation. This is the insertion of a meaning wave (= modulating wave) into a neutral wave (= carrier) of suited frequency for a long propagation to reach a far receptor. The essential operation of a modulation is the insertion of information in a carrier. When a few persons exchange proposals, there are also insertions of knowledge in the sounds emitted by these partners. These sounds may be considered as the carriers of the oral languages. Indeed, in a conversation there are a few modulations because each partner uses his specific voice to speak and transmit his assertion. Here each speaker produces his own carrier, but all carrier frequencies belong to the audio frequency spectrum and therefore are detected by each other chatter. It is possible to deduce: any conversation proceeds from a multi modulation.
Any conversation between n partners constitutes n instantaneous nets with n nodes and (n-1) unidirectional channels at the frequency of the speaker who plays as an instantaneous master of the net to communicate with the (n-1) other ones. When he emits, he requires the radio silence from his auditors. The communication channels are unidirectional because the carrier frequency differs with any speaker. (Fig. 12)

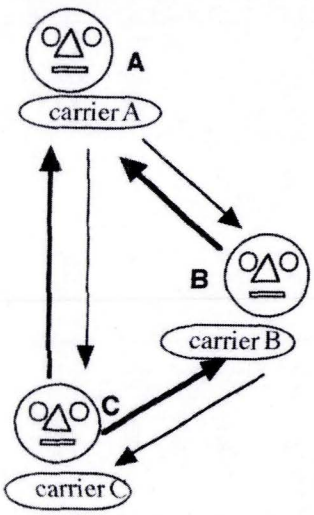


Fig.10 : Communication Net with 3 Carriers

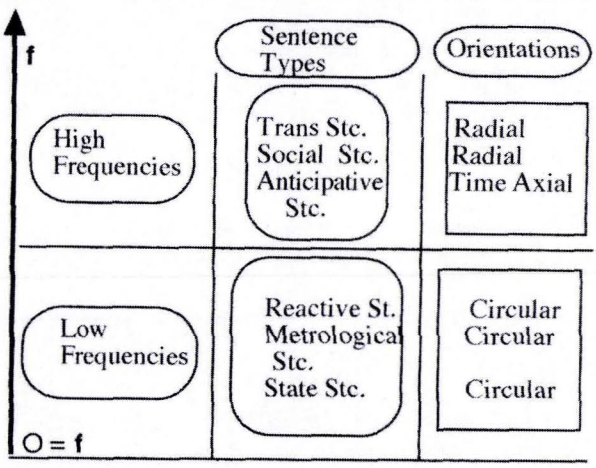


Fig.11 : Sentences and associated Frequencies

Table 10: Illustration of Conversations by Modulations

Parameters	Partner A	Partner B	Partner C
Carriers	Carrier (A)	Carrier (B)	Carrier (C)
Nodes	Partner A	Partner B	Partner C
Channels	[A→ B] [A→ C]	[B→ A] [B→ C]	[C→ A] [B→ C]
Times of Receptions	(A) detects Msg(B) at (tB) (A) detects Msg(C) at (tC)	(B) detects Msg(A) at (tA) (B) detects Msg(C) at (tC)	(C) detects Msg(A) at (tA) (C) detects Msg(B) at (tB)
Structure of Conversations	Diffusion of information produced by a few partners		
Aims of Conversation	Increase of the knowledge levels for each partner Neguentropic procedure for each partner		

12 Scale of Pseudo Frequencies A1ssociated with our Sentence Kind

This point of view has been begun in the section 5: "Chemical Analogy of Sentences". There we have shown the analogy between the wave frequencies and the kinds of sentences. According to Planck's law, we learn that any wave energy is proportional to its frequency

$$W = n\,(Kp)\,f \qquad (5)$$

Where (Kp) is Planck's constant $\sim 6.6\ 10^{-34}$ Js ; W is the energy in J;
(n) is an integer number for introducing the energy quantization; (f) is the wave frequency.
A sentence scale is established in relation to their functional trajectories as follows: the high frequencies associated with the radial sentences oriented to their surroundings and the low ones with the circular sentences around their subjects. This appears as a logic key of frequency classification because high power are able to transform the surrounding. The verb and sentence behaviours are shown in Table 6, with discrimination between trans or active behaviours. Afterwards in Fig.11, apparent frequencies were associated with the different sentence kinds from an atomic similarity. This induces similarity between the electromagnetic devices and the sentence kinds

13 Jacobians and Transfer of Languages

Any Jacobian is a geometric operator acting as adapter when an object is transferred from a particular referential frame to an other one. Any Jacobian is an indicator of transit distortion caused by the curvature variation between both referential frames. Jacobians appear when we convert a text from its initial language to an other one. Each translation is an implicit Jacobian because it has to adapt the differences between the grammars and the correspondent idiomatic expressions of both languages. Any geometric configuration or scenery of a text plays as a Jacobian because this conversion adapts words into drawings to produce picture(s) of the same idea, with minimal alteration. Our mind establishes a few Jacobians for interpreting the idea transported by the texts. These deductions show the frequency of Jacobian occurrences during our mind activities. The representation and interpretation of our surroundings use a lot of generalized Jacobians. (Fig. 12)
In this report, each chapter expresses a specific Jacobian to display the information contained in sentences. Indeed we have followed a sequence of various Jacobians as vehicles of our assertions.

14 Use of (Z) Transformation for exploring the Meaning Spaces

The mathematical (Z) operator acts as a vector vehicle. Accordingly, it can transport a few geometric objects through their space, along trajectories defined by parameter variations. (Z_λ) gives a unit sliding between two successive integer values of the

parameter λ. To represent a displacement of a (p units) along the parameter scale l, we apply the $(Z_\lambda)^p$

And its object is moving from the location $\lambda = m$, to the location $\lambda = m + p$

Because we have explained the association between geometry and language, it is possible to describe any iteration between topics or manipulation of ideas in the topic space by means of (Z) operators. Here, the displaced objects are ideas, topics or sentences. The chosen parameter may be the pseudo frequency associated with the meaning level of the sentences.

The (Z) operator is advantageous to present the influences between the main clause and its complementary clauses. Indeed in chapter 9, we have assimilated the influences between a main sentence and its complementary ones to convolution, and these latter are (Z) operators sliding through the topic space. We represent any knowledge increase by a travel between a pair of topics associated with a progression along the frequency scale. The (Z) operators play as travelling waves for diffusing and retrieving information. They may be considered as the dynamic illustration of vector products. (Figs.13 – 14)

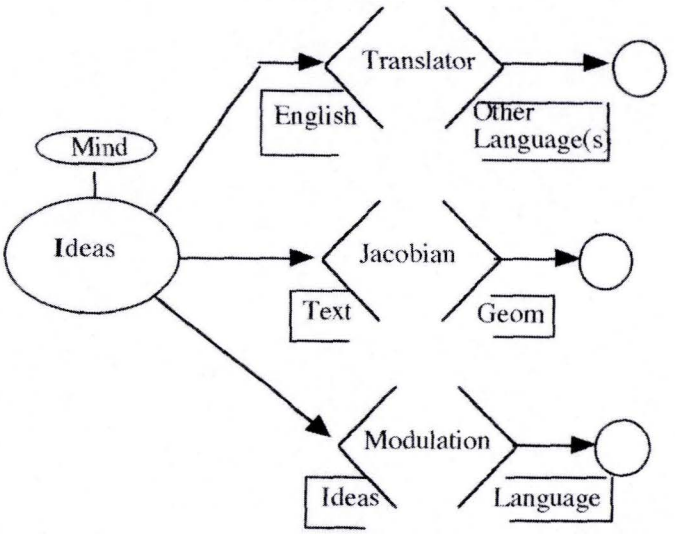


Fig. 12: Illustration of Functions of Jacobians, Modulation & Translations

Table 11: Operators for Text Analysis and for Idea Diffusion

(Z) Operator	Convolution	Travelling Wave	Tensor Product	Sentence
Displacement	Coupling of movements	Transport of Information	Topic Association and Synthesis	Idea Expression
Iteration	Mutual Progression	Info. Net	Transit to space of higher order	Language
Object Location	Construction of Idea Linking	Idea Diffusion	Sentence Coupling	Idea Sequence

(Z) Operator and Jacobian

Any Jacobian is an external (Z) operator which performs the transfer of mathematic topics or ideas between 2 different referential frames. It plays as kinetic agent, a travelling wave through its space. All these kinetic operators are necessary for choosing or adapting any frame of idea representation.

Table 12: Kinetic Operators used in Language Adaptations

(Z) Operator	Convolution	Jacobian	Tensor Product	Drawing	Travelling Wave
Absolute Displacement	Inductive Multiplication of meaning	Migration between different frames	Climbing along increasing order of vector spaces	Text illustration for universal understanding implicit Jacobian	Universal Displacement for internal or external propagations.

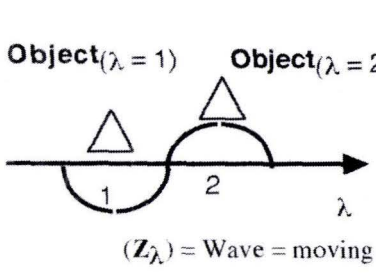
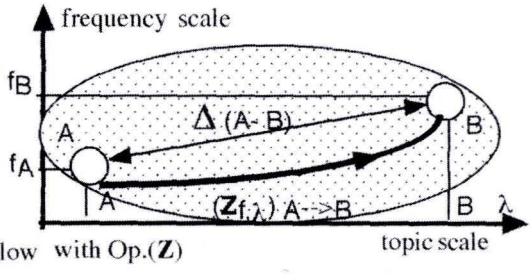


Fig. 13: Object Displacement



$(\mathbf{Z}_{\lambda})$ = Wave = moving Flow with Op.(**Z**)

Fig. 14: Travel through Frequency between 2 Topics

15 Specification Gain due to Word Absorptions into larger Sets

Fig.15 indicates the verb specification gain due to insertion in sentence and the added specification by absorption in a particular text. Each integration level produces a complementary gain to the absorbed component. Indeed a verb is assimilated to a sliding vector without any defined application location. Each sentence coats its verb by projecting it in a defined semantic landscape. Each text projects its sentences as components in an explanation space what induces a tensor from sentence vectors with gain of complementary functions. Indeed each text constructs a bridge from its start topics to their elaborated results.

The verb vector integration into the sentence (B) corresponds to the level (α)

The sentence vector absorption into the text (B) corresponds to the level (β).

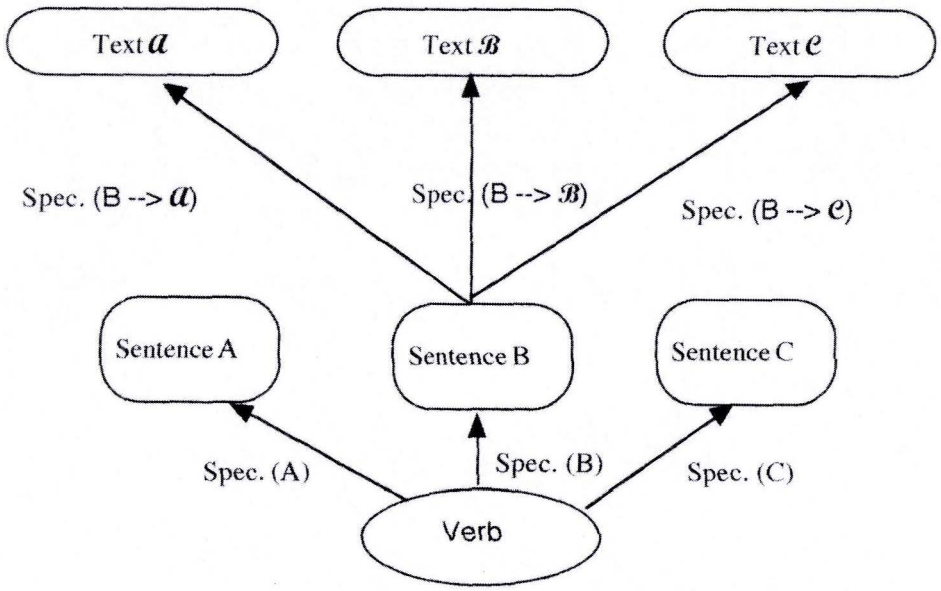


Fig.15: Integration Effect of a Verb in a Sentence and of a Sentence in a Text

16 Differential Operators necessary for Information Storages

Each information variation in our mind and in any system modifies the knowledge level among the memory subspaces. These variations are performed by derivatives giving the difference between 2 levels at different times

$$[Lv(2) - Lv(1)] / [t_2 - t_1] \quad (6)$$

It is logic to establish a correspondence between the storage procedures and the time derivatives what is the usual method for describing the storage functions in technology. Besides each integral operator can detect the historic evolution of the knowledge level in any memory sub system, between a fixed time t_0 to the present time tp as expressed here:

$$_{t0}\int^{tp} Lv(t)\, dt = \Delta \{Lv\, [tp - t_0]\} \qquad (7)$$

It gives the global knowledge variation during the time $[tp - t_0]$ .See table 13

Table 13: Energy Kinds in Verbs and in Sentences

Verbs or sentences	Energy Kinds	Elm. Devices	Effects
To suggest To persuade To convince To induce	Reactive Energy Radial influence Mutual influence External potential	Inductances Antennae White elements Radiating Couplings	Mind coupling System association in their vicinity
To reason To document To acquire To learn To think	Reactive Energy Performance modifications Absorption of knowledge	Capacities Black elements Absorption devices	Inside storage Level variation Absorption of potential
To transform To carry To act To work	Active Energy Transformation Energy Action through vicinity	Resistances Active converters Generalized motors Electrical nets Power channels	Outside Energy Energy conversion Action transit Vicinity Modification
To forecast To foresee To presume	Future resonances Extrapolations Time extensions	Conception of Future systems	Anticipative sensibility

17 Conclusion

This communication underlines the geometric characteristics transported by the sentences. This point of view seems logic because we have to organize our activities in space and time. Therefore it was useful to describe the relations between past, present and future, 3 relative moving concepts which induce our behaviours and works.

The assimilation of sentences with waves is logic because any knowledge may be considered as an electromagnetic wave. Beside the waves underline the implicit movements corresponding to the text effects. The travelling waves transport their information through space and time, as the thought wings. They are useful to understand the variations in matter and in mind.

The projection of sentences in a Complex space is well adapted to discriminate the reactive behaviours from the active movements and transformations.

The reactive components are located in the imaginary sub spaces whereas the active ones are projected in the real sub domains, what is similar to the followed procedures in the electromagnetic domains.
The (Z) operators, the Convolutions, the Jacobians, the Tensor products, the Translations, the Graphic Transfers play as travelling waves because each of these induces displacement in their own domain. The waves play as universal agents for diffusing the ideas.
Thoughts and ideas live. Therefore they are kinetic objects able to expand and to associate with other ones for increasing their signification. This study has underlined the kinematical shape of language and supplies a synoptic tool for analyzing the idea structures.
Ideas are sentences. Sentences are waves. Waves are mobility agents. Any propagation needs space and any space is impregnated by its own geometry.

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