Neguentropy and Forecasting

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Abstract:
This communication develops the particularities of the"heat-entropy" which are related with the chaotic behaviour of the heat in opposition with the other kinds of energies which are polarized and well directed.
By means of a fast survey of every technical domains which are stretched from the Thermodynamic to the Linguistic, including a large range of scientific disciplines related with Systems Theory, we shall discover the usefulness and power of the topic "Entropy" or "Neguentropy" to show the common influence of chaotical seeds in our surrounding.
This "entropic" point of view allows a gain for the forecasting, the analysis and the understanding of a lot of events, designs and actions because increase of homogeneity.
Neguentropical sight is anavoidably lying in the basement of every teaching _ learning and anticipatitive procedure.
Indeed it is always very useful to develop a tool for the highlighting of behavioral analogy between many very various phenomena because it leads to more homogeneous planification in the forecasting procedures and it permits to save much time and a lot of thoughts by their modelings.

Keywords: Entropy, Energies, Forecasting, Chaos, Uncountability

1 Introduction

1.1. Etymologic meaning of the word "Entropy"

From ancient Greek language: "Εντροπια" with the meaning of "disturbances" and also "to turn around" or "to turn upside down".
To sum up: "Entropy" translates the ideas of "trouble, "erratic movement" or "confusion"
On the other hand Neguentropy was introduced for evaluating the accuracy grade of the evolution of every procedure and consequently plays the opposite role of Entropy
(R. Minne) Our selected notation:

$$^{c}S = (S)^{-1} = \text{Neguentropy} \qquad (1)$$

1. 2. Comparison between Heat and other energies

In gas, Heat is caused by the succession of shocks between the particles: it is a fuzzy motion analogous with the "bumper cars" on a fair's field.(fig. 1 & 2)
The other kinds of energies are polarized or directed, without any disturbance during their action. Therefore we can deduce : Heat is a depreciated or chaotic energy in front of all the other ones which we can be depicted as oriented or valuable energies.

1.3. Composition of any energy. (fig 3)

Each one can be evaluated as a multiplication of a potential or intensive factor with a quantitative or extensive factor,as follows

Mechanical energy:

$W_m = p.V$ (2)

with p: pressure (intensive factor) and: V volume (extensive factor)

Electrical energy:

$W_e = \Delta V.q$ (3)

with ΔV: voltage (intensive factor) and q: electric charge (extensive factor)

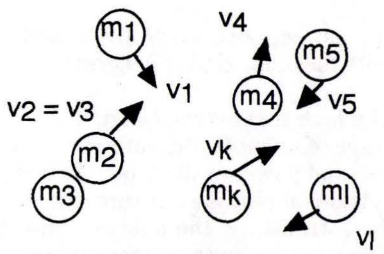


fig.1: Thermal twirl of bumpered molecules - cluster

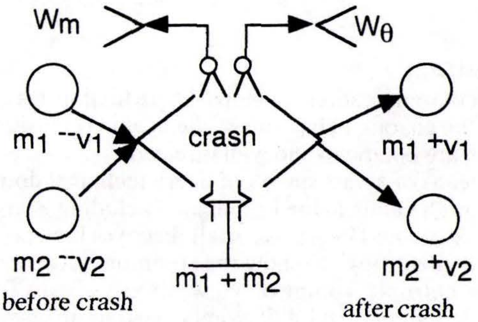


fig.2: Energetic effects by a crash between identical particles

Entropical Discremination of Energies	
Fuzzy or depreciated Form	Valuable or directional Forms
Heat $\Delta\theta.S$ where where: q: the Temperature is the accurate factor and S the Entropy is the fuzzy factor	Mechanical Energy $Wm = p.\mathcal{V}$ or $= F.v$
	Electric Energy $We = \Delta V.\, q_e$
	Magnetic Energy $Wmg = \mathfrak{F}.\Phi$ where F is the magnéto effect Φ the magnetic flow
	Chemical Energy condensed in well established architectures

fig.3: Array of the principal various forms of Energies

Heat energy:

$W_q = T.\Delta S$ (4)

with T temperature (intensive factor) and ΔS: variation of entropy (extensive factor)

Because the temperature is carrying accurate information, the entropy has to bring the notion of chaos which makes heat fully different from the other energies.

From this constatation we conclude the straight correlation between the entropy level and the fuzziness grade.

From this point we are going to use the Entropy or Neguentropy topic as a real key to classify every procedure in relation with their ability of producing gain in forecasting or in accuracy.It will be a particular powerful strategy to track at the first sight the entropical evolution of every considered phenomenon, because we shall at first detect the foreseeable likelihood of functional troubles during their working and of this way we shall think to develop every safety measure.

2. Production of Entropy in Technological Systems.

It is well known that every heat production always gives entropical increasing because Entropy is the flow fuzzy factor of Heat. Besides it was previously showed that the dissipating elements are anergy producers (= integral heat conversion) and on other way storage unities like thermal capacities can keep heat inside.We can conclude that the entropical evolution of a system generally follows from a connected action of his dissipating and storage elements. As the working of these ones (= defocalizing effect) modifies the size of the exergy flow, it may be deduced that entropy may be used as an indicator of functional non efficiency or of exergy deterioration. (fig. 4)

Here it is to remind that specific entropy has the same dimension as specific heat.

$$W_\theta / T.\,M = S_{sp} \;\Rightarrow c = {}^{st}W_\theta / T.\,M \qquad (5)$$

3.Entropical meaning of the system-run along the States trajectory.

3.1. Entropy and occurence frequency

From the Thermodynamic, we know that every isolated(= switched off) system is always approaching to a balanced rest state wherin it is usually to stay a very long time, compared with his time in the transient states.This staying-time usually lasts until the intervention of a next external perturbation. From this constatation we deduce that the frequency of these balanced states is very high. (fig. 5 & 6)

Besides, we have to keep in mind that the systems reach their balanced states (= every internal flow between the underparts are canceled) by levelling the potentials among their tanking elements, which is also translated by an entropy increase, because every homogenization procedure always leads to a wasting of informations and a loss of hierarchy.

Therefore it implies that the instantaneous System Entropy can also translate the occurence frequency of each state. Indeed the following formula was previously established. (fig. 7)

$$\{\, S_t(\Sigma) = K_B \ln[\, f(\mathcal{E}_t)] \,\} \qquad (6)$$

These previous considerations are developed in every classic treaty of thermodynamics (for instance: Borel L. and Minne R.)

3.2. Entropy and relief of states space.

When we present the States space under a relief profile, it is also possible to compare entropy with the intensity of the attraction strength into the rest valleys (= stability local points) of this space. Therefore entropy maxima are related with stability maxima and hollows of this space (fig 8).

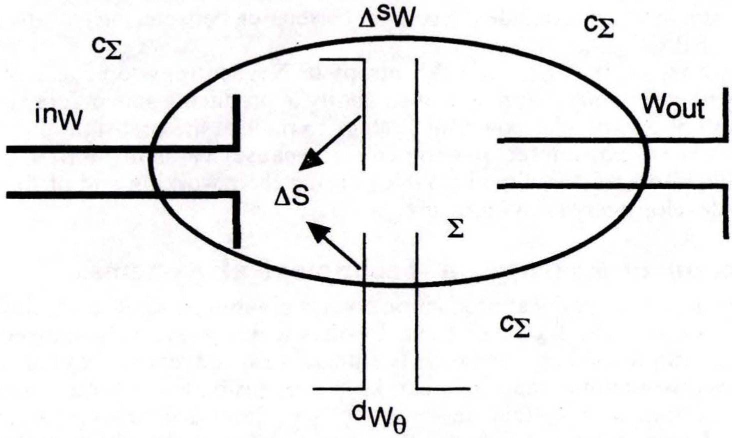


fig.4: Contribution of the Storage Energy and Anergy over the Entropy level

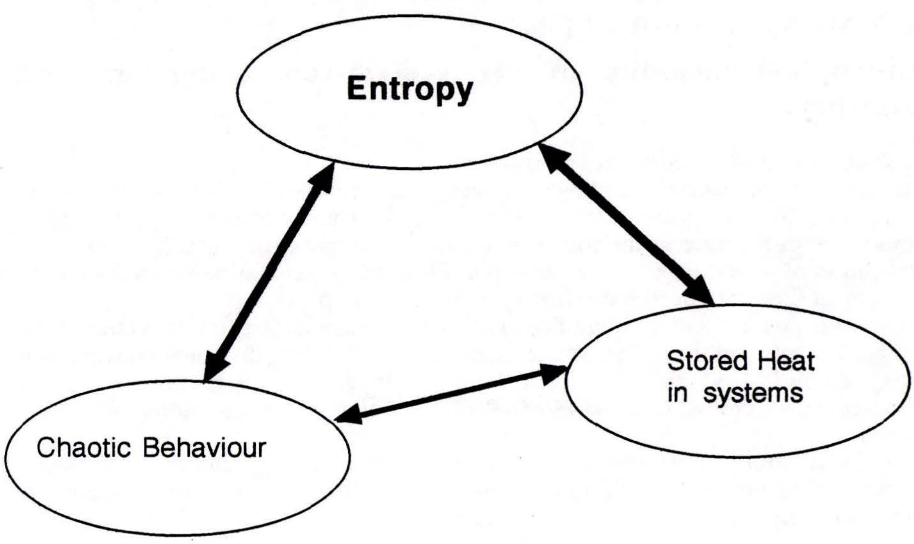


fig.5: Thermal meanings of Entropy

4. Entropy and Chaos scale.

Consequently, we define the "Thermo or Heat chaos" as "the absolute bottom chaos", (= "Black Chaos") which must stochastically behave and is consequently lying at the top of uncountability and disturbance without any usefull information, in opposition with the other moving chaos like "determinist or periodic chaos" which are supplying some

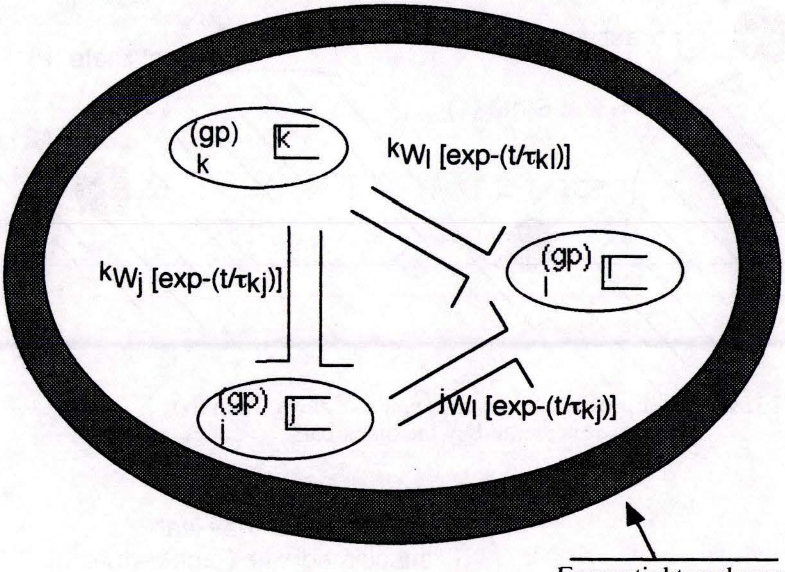


fig.6: Relaxation of a System into the rest

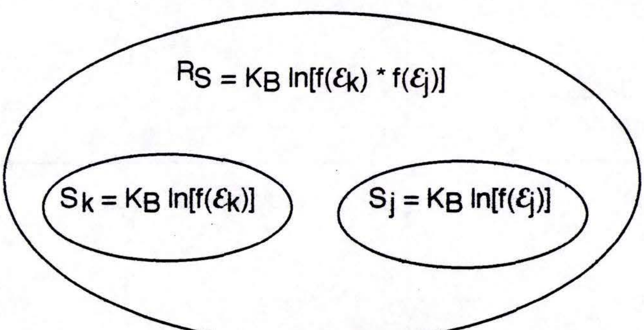


fig.7: Relation between Entropy and Occurence Frequency of the states

behavioural information. Therefore entropy will be chosen as a universal indicator for fuzziness and uncountability in every domain or in an obvious dualistic way, neguentropy will be used like a forecasting factor. We decide to focus our attention on the "Endoentropy" of the systems according the definition of Dubois D. in Cybernetica 2.
On (fig.10) there is a display of the different kinds of Chaos in association with the Entropy and Forecasting or Neguentropy scales.

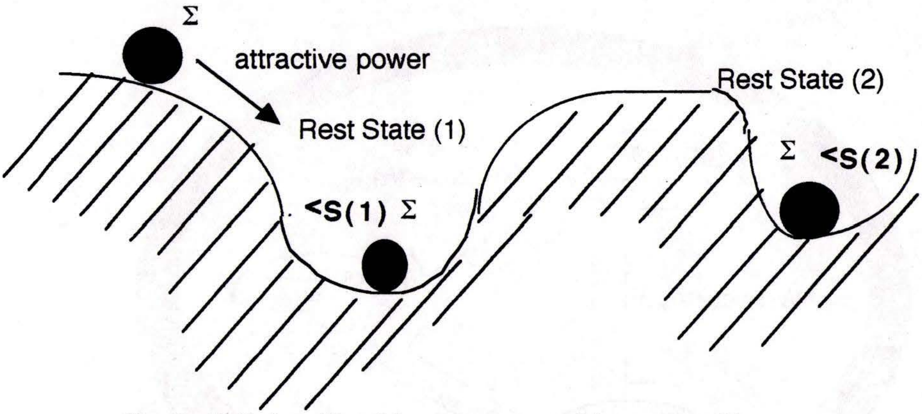


fig.8: Relief profile of the states space of the system (S)
System is represented by the black ball

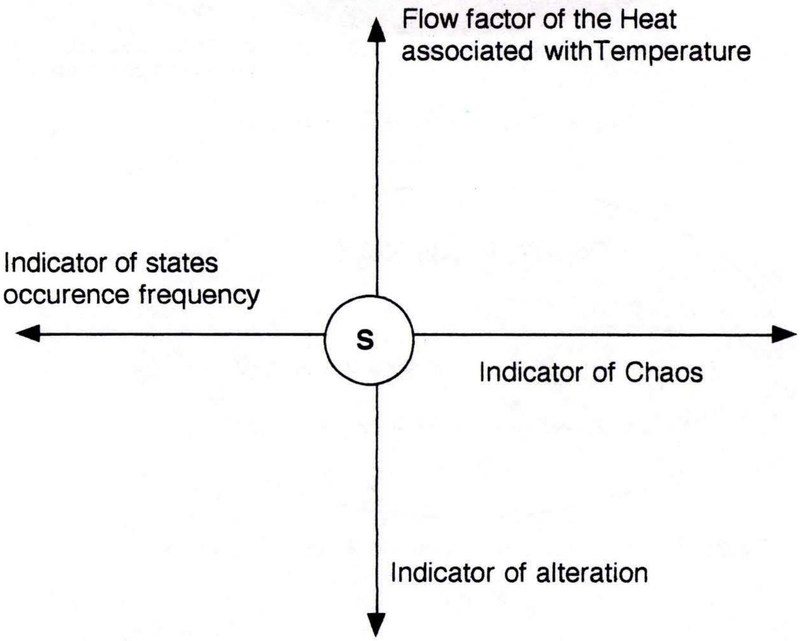


fig.9: Space of the different components of Entropy

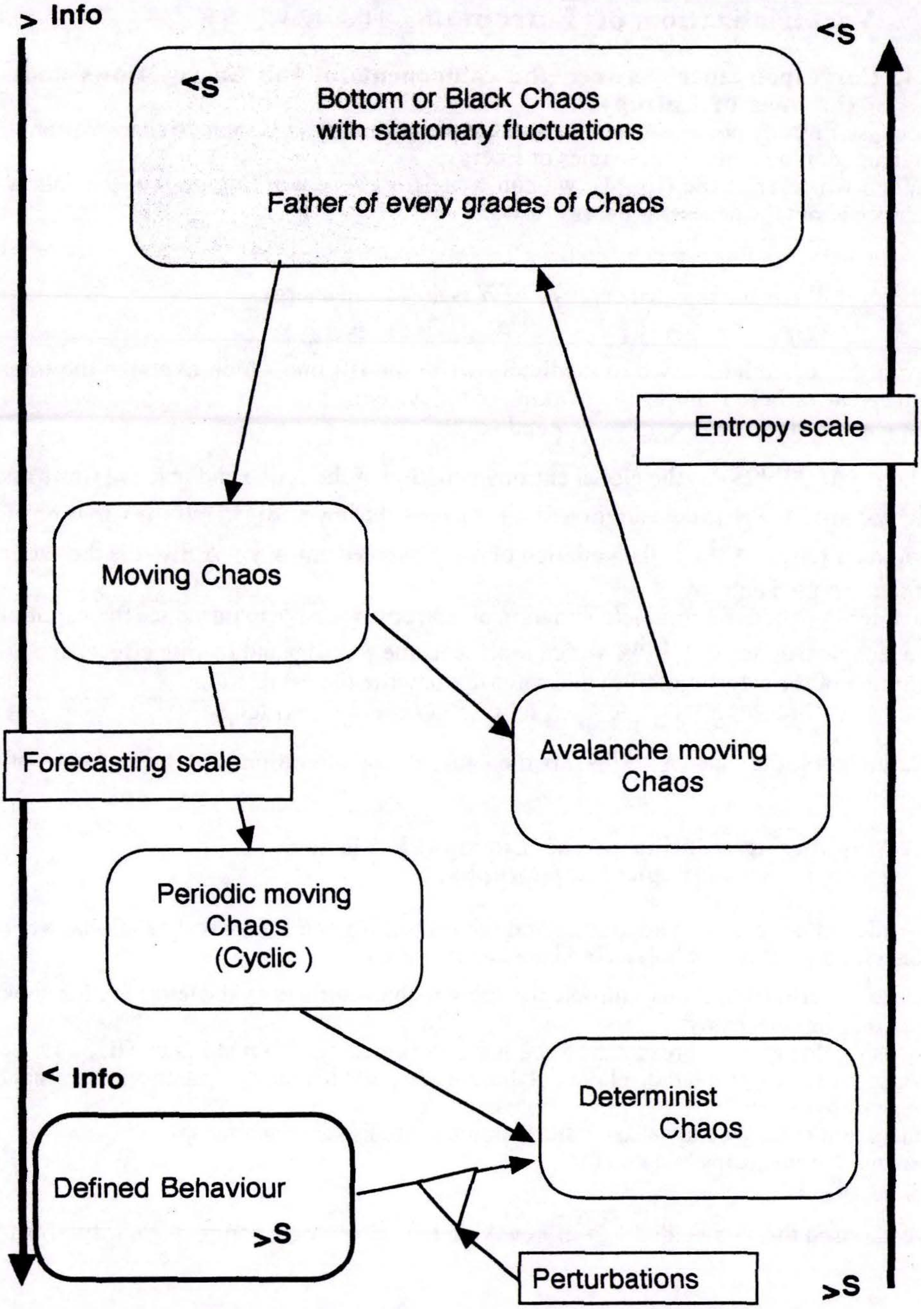


fig.10: Hierarchy of any Chaos related with their entopical grade

5 . Vectorialization of Entropy. (fig. 11 & 12)

5.1. Correspondance between the components of the Energy flows and the ones of Entropy;

Because Entropy points out an alteration grade of Energy, it is logic to share Entropy into as many components as these ones of Energy.

When we refer to the (fig. 4), we can write for every working system the following balance about the necessary energy flows:

$$ {}^{in}W = {}^{st}W + {}^{d}W_{\theta} + W_{out} \qquad (7)$$

where: ${}^{in}W$ is the injected energy ; ${}^{st}W$ is the stored energy

${}^{d}W_{\theta}$ is the anergy ; W_{out} is the exergy

From this (7) relation, we immediately write the (8) one,which explains the internal entropical variation during the working of the system.

$$\Delta ({}^{in}S + {}^{st}S + {}^{d}S + S_{out}) = \Delta ({}^{endo}S) \qquad (8)$$

where: $\Delta({}^{endo}S)$ is the global entropy variation of the active and reactive flows inside the system; $\Delta\, {}^{in}S$ is the variation of the injected entropy ; $\Delta({}^{st}S)$ is the variation of the stored entropy ; $\Delta\, {}^{d}S$ is the variation of the dissipated entropy ; $\Delta\, S_{out}$ is the variation of the exported entropy.

In order to obtain the complete variation of entropy, we have to introduce the variation of the technical entropy $\Delta\, {}^{tch}S$ which represents the wearing and tearing effects due to the working of the sytem and from this way we can write the (9) relation:

$$\Delta ({}^{in}S + {}^{st}S + {}^{d}S + S_{out} + {}^{tch}S) = \Delta({}^{endo}S) + \Delta({}^{tch}S) \qquad (9)$$

We have to note that $\Delta({}^{tch}S)$ is the cause of the alterations anb breakdowns of the systems.

5.2.Mapping translation of the Entropical relations or entropical topography.

In order to develop a synoptic method for translating the Entropical relations, we have conceived graphic symbols as indicated on (fig. 13).

It is to underline that every entropical supply is characterized by the letter **S**: for evoking the notation of entropy.

By using this graphic presentation, we have presented the (9) relation on (fig. 14).

We propose this graphic display to elaborate a more schematic neguentropic approach of the entropy!

On an other side we may also create analogic symbols for Neguentropy because Neguentropy is noted by:

$$ {}^{c}S = (S)^{-1} \qquad (1)$$

we choosed the surrounded **S** for evoking the "c" of logic complementarity. (fig 15).

${}^{in}W$	= in-energy
W_{out}	= ex-energy = exergy
${}^{st}W$	= stocked-energy
${}^{d}W$	= dissipated-energy = anergy
${}^{tch}W$	= technic-energy

fig.11: Energy vectorialization

$\Delta^{in}S$	= Variation of in-entropy
ΔS_{out}	= Variation of ex-entropy
$\Delta^{st}S$	= Variation of stocked-entropy
$\Delta^{d}S$	= Variation of dissipated-entropy
$\Delta^{tch}S$	= Variation of technic-entropy

fig.12: Entropy vectorialization

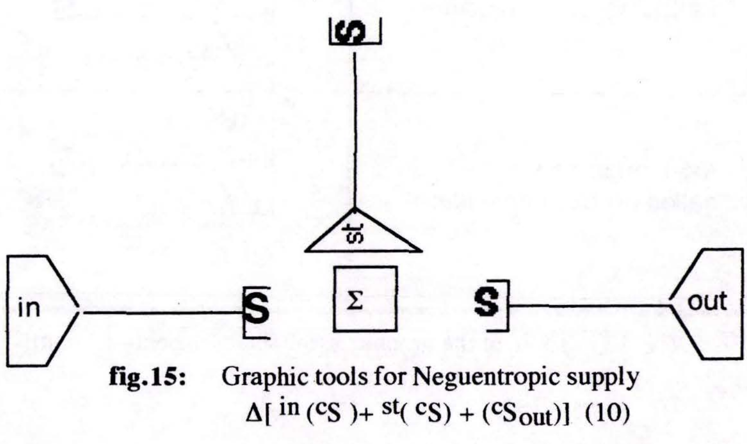


fig.15: Graphic tools for Neguentropic supply

$$\Delta[{}^{in}({}^{c}S) + {}^{st}({}^{c}S) + ({}^{c}S_{out})] \quad (10)$$

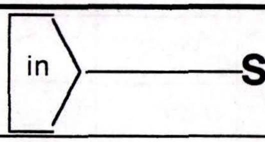
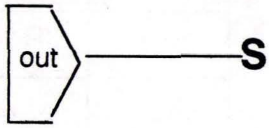
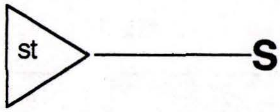
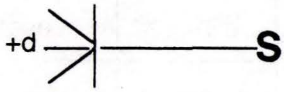
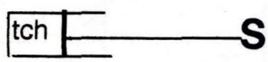
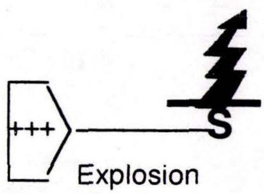
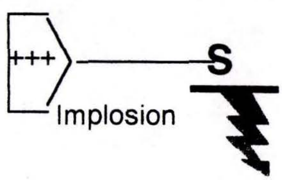
Components of Entropy	Graphical translations
Δ(S) carried by the "in flow"	
Δ(S) brought away by the "out flow"	
Δ(S) stored in the tanking elements	
Δ(S) dissipated in the wasting elements	
Δ(S) delivered to or from the technical parts of the system	
Δ(S) exploding or galloping by explosion	
Δ(S) imploding or galloping by implosion	

fig.13: Table of the graphic symbols for the entropy components

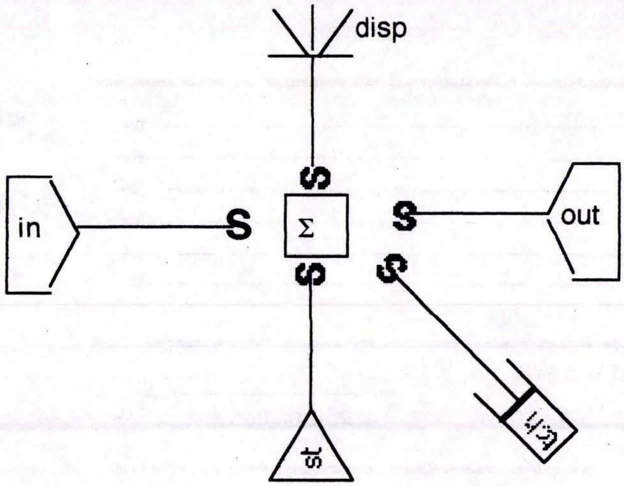


fig.14: Graphic display of the relation between the various entropical variations

$$\Delta[\ {}^{in}S + S_{out} + {}^{d}S + {}^{st}S + {}^{tch}S\ ] = \Delta({}^{endo}S + {}^{tch}S) \quad (8)$$

6.Logic use of Entropy or Neguentropy to forecast the accuracy gain in many domains and procedures.

6.1. Crystal Neguentropy.

At the "Zero Kelvin" (= total lack of heat), every material is staying in a cristallized state what means an absolute regular space structure without any swing or distortion. There is no more thermal activity and it follows that all heat functions like thermal energy, enthalpy and also entropy reach together their cancellation point, becauce it is there impossible to store, carry and exchange heat flows.
It is the Supraconductivity domain with the disturbanceless electric current, because no more inferference of the electrons flow with the oscillations of the molecules architecture.

6.2 Flow or Fluid Entropy.

In hydraulic we have to consider two different kinds of streams: (fig. 16)
a)The laminar stream, in which the trajectories are parallel without any mixture into themselves. This is a slow soft movement with keeping the cinetic information and consequently a neguentropic phenomenon
b) The turbulent stream, in which a lot of whirlings occurs with particles shocks and mixture of trajectories. This is a speedy movement with high entropic grade.
From these considerations it appears a drastic correspondance between Reynold's number and flow entropy.

6.3. Traffic Entropy.

By the vehicles traffic we can also consider two types of mobilities:
a) Fluent circulation without any crash which is a regular safe and quiet traffic. This one may be labeled with a high neguentropy;
b) Too fast circulation with high likelihood of dangerous collisions which is similar with the turbulent flow. This last one may be labeled with a very high entropy.
N.B.: Fog is always playing a supplelentary entropical action because it reduces the

visibility by driving.

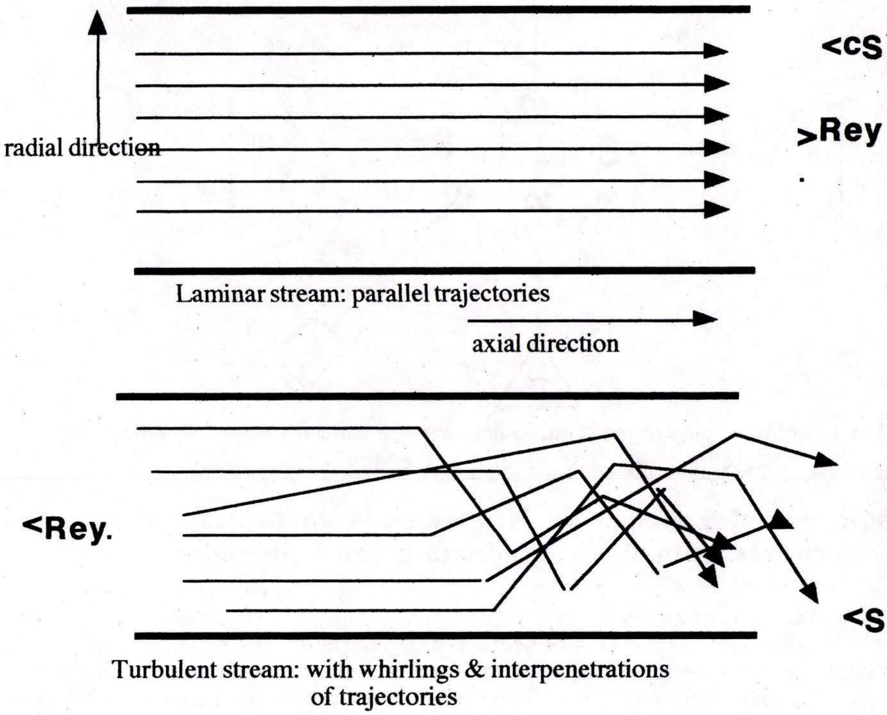


fig.16: Both kinds of Streams situated along the Entropy scale

6.4. Numerical Entropy.

In Mathematics we track the insertion of uncoutability due to the occurence of functions poles which translate very high undefined overclimbings along the numerical scale. The grade of these poles is in accordance with their entropical power.
Example of n° grade-pole occuring:

$$(z-a)^{-n} \qquad (11)$$

: here the n° pole is located at a.

6.5. Net neguentropy.

By means of selected linkings between space points we realize an exchange network and consequently there is apparition of a particular directional structure by which any other connection is canceled. Every network has always a powerful space neguentropical action.

6.6. Overflow and underflow Entropy of every Sensor.

These measure systems are conceived to reach a high detection accuracy along their defined working areas.(= zone with powerful neguentropy)
Outside these operational areas, are lying the overflow and underflow zones where the

results translate no correct value (fig. 17).

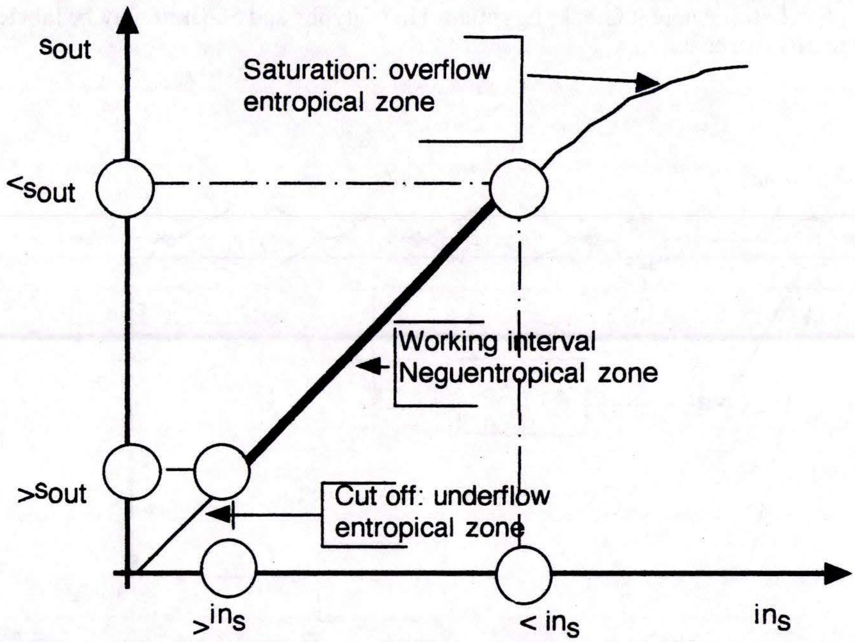


fig.17: Partition of a sensor response into neguentropical and entropical zones

6.7. Stabilization Neguentropy of the storage elements.

For the regulation of the systems we observe the intrinsic feedback loops developed by the working of the storage elements. The loops number is equivalent to this one of the storages because storage number defines the grade of the differential response . These loops belong to the structure of the differential relations and allow to improve the stability andthe forecasting. (fig. 18)

6.8. Transforms Neguentropy.

The development of the Fourier and Laplace Tranforms permits to obtain a precious increase of easiness for analyzing the signals and learning the behaviour of systems. They are useful for understanding the deep nature of shapes and evolutions. (See Cadzow J.)

6.9. Communication Entropy.

By a message transmission it is very important to keep his meaning against the unavoidable noises of every transmission system.Therefore the technical quality of a transmission is translated by a very low entropy, if possible equal to zero in the best case..

6.10.Language Entropy.

It is a continuous alteration caused by the users which is the cause of the evolution of the present modern languages.In this linguistic domain, distortion entropy is a fertilizing

factor of progress and matching! While the ancient deadlocked languages are unaltered staying on the pages of grammars and ditionaries. At these last ones we can attribute "the Zero grade entropy" just fully similar with the crystal state.
For examples: Latin, Ancient Greek, Egyptians Hieroglyphs and Sanskrit may be labeled with the "totally frozen entropy".

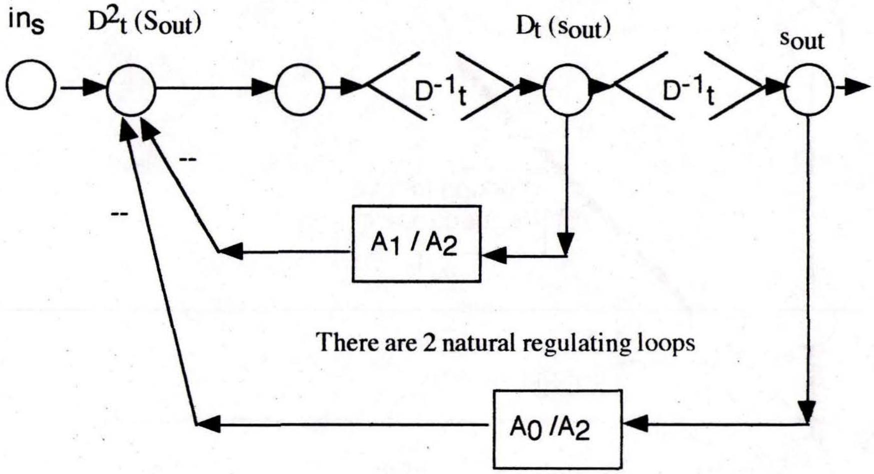


fig.18: Operational presentation of a 2° differential relation
$(A_2 D_t^2 + A_1 D_t + A_0)\, s_{out} = in_s$ (12)
the system contains 2 tanking elements

7. Alternations of increase and decrease of Entropy.

7.1.Technical and physical explosions.

It is to underline that explosions in the dusty materials and storm lightnings show a large similarity during their evolution.
Indeed for each of these both phenomena we can record a sequence of two preparation phases:
The first one is a separation action for which the electric charges with opposite signs are moving away from themselves, due to friction between particles during the convection movements.(= stochastical tribo electrization) It provides a neguentropy increase.
The secund one is a sudden short action for which the both groups of charges with opposite signs are moving clother together. From these massive meetings it occurs powerful neutralizations with generation of wild violent ewplosions. these last events supply a high entropy increase. These sequences are codified on (fig. 20).

7.2. Ideas Management and Creativity.

Brain Storming is a modern procedure elaborated for discovering new products and more successful policies in business strategy. Here also we detect a sequence of two phases.
The first one consists of the chaotic expression of a lot of ideas by a group of persons and consequently it is an entropical operation.

Afterward it follows a sorting and comparison action to find out the interesting solutions and consequently it is a neguentropical operation. The scheme of the brain storming is presented on (fig. 21)
From a stimulated chaos come new structures and we conclude that the initial chaos has led to a larger bank of inspirations.

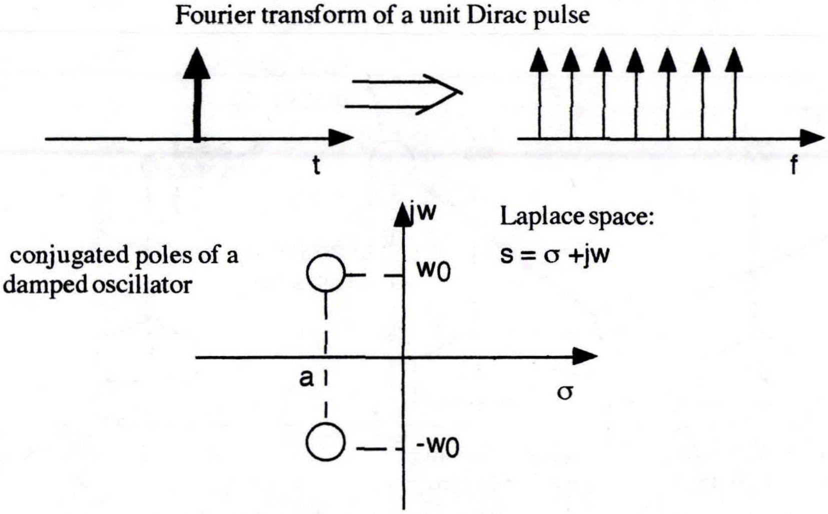


fig.19: Neguentropical supply of Fourier and Laplace Transforms

8.Entropical and Neguentropical Scales

A very important matter for sustaining this topic is: "how to evaluate the Entropy or Neguentropy level of a considered procedure?" Usually this is no easy task because we possess no Entropy/Neguentropy-meter and consequently we must develop indirect deductions to approach the entropic grade of a procedure. Outside Themodynamic, where some differential relations where developed from the translation of the 1° Principle (see Borel L and Minne R.) to find equivalences of the entropy-variations, we have to search correlated parameters easy to evaluate (fig.22)

9. Domains non covered by this Entropical Investigation

The entropical /neguentropical point of view may be applying for evaluating the quality of every evolution in any domain and consequently it is impossible to cover completely this matter in a single communication.Indeed the most human activities accomplish a fight against disturbances and information-destruction and therefore it will be always possible to develop further considerations over this nearly universal subject.

10. Conclusion.

Here we must stop this amazing trip through the entropical or neguentropical landscapes of our activities and before starting for other surprizing countries it is adviced to draw up

an inventory of the advantages of our discoverings.
Consequently of this large (nearly universal) entropy interference, we can consider this last notion like a "bridge factor" which is able to detect the similar behaviours of a great part of the technological and natural systems. It also reveals a basic analogy between the shapes and pictures of the spaces of our thoughts and these ones of the raw natural world. Neguentropy approach of the procedures trys to evaluate the accuracy level in forecasting and therefore is the basic tool for more homogeneous theory for learning the easiness (or difficulty) of the intrinsic feasability of each process.
Entropy may be considered like an Energy-disease.Neguentropy brings in foreheadthe anticipative view systems analysis.

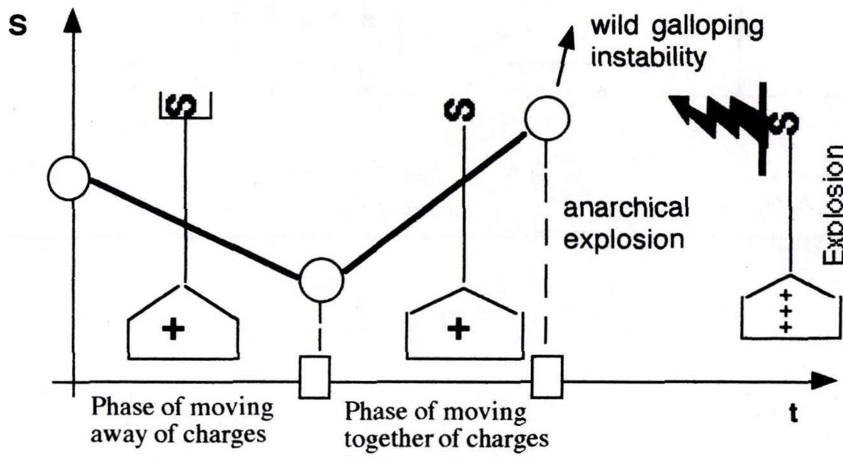


fig.20: Chronogram of pulsing entropy variation before explosion

Symbols	Meanings
$<A$	Maximum value of the variable A
$>A$	Minimum value of the variable A
$R_A = T_A$	Total value of the variable A
S	Entropy
^{c}S	Neguentropy
Rey.	Reynolds number

fig.23: Mini glossary

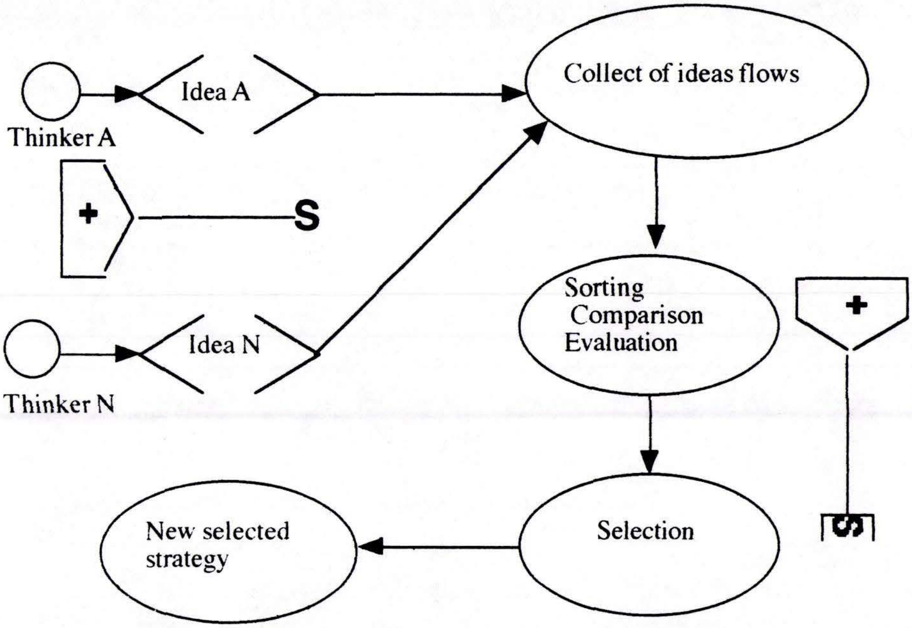


fig.21: Brain Storming schematic with his both phases and their entropical evolutions

Domains	Associated Parameter and Quantification of the Scale
Thermodynamics of gas	$D_T(\mathbf{S})_{V=]} = c_V / T$ $D_V(\mathbf{S})_{T=]} = p / T$ $D_T(\mathbf{S})_{p=]} = c_p / T$ $D_T(\mathbf{S})_{V=]} = -V / T$
Signals Transmission	$^{trans}S$ related to the rate of disturbances or noise
Hydraulics	^{flow}S related to the Reynolds number
Mathematics	^{num}S proportional to the grade of poles
Systemics	^{c}S related to the number of storers
Linguistics	^{ling}S related to the amount of disappearing obsolete word sadded tot he coming of new ones in the dictionaries
Vehicles Traffics	^{trf}S in straight relation with the number of crashes

Fig.22: Table of the Procedures for evaluating the Entropic Grade in different domains

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