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THE THEORY OF VARIATION IN STUDY SYSTEMS

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SUMMARY

In many models, including the theory of relativity, evolution is described only in terms of a few important variables. In multivariable systems, variations of all variables can contribute to evolution. In the present paper we present a model that starts from the total variation of all the explicit variables, expressing the main parameters of evolution.

1. Basic forms

Starting from the notion of the hipervolume $V(x_1, ..., x_n)$ defined for example in various forms.

$V = k_1 \prod x_i$, x being coordinated, speeds, impulses, time, etc.,

$V = \prod F_j$ $\quad F_j$ nonlinear functions

we define the operator of the relative variation

$$\omega(V) = dV / V = \sum_{i=1}^{n} \left(dx_i / x_i \right) = \sum_{i=1}^{n} (\omega_i)$$

1.1.Critical state

A critical point of a function F is defined, a point where the value of **p** satisfies the below equation: (1) with the principal value of **p = 1**

$$dF = -p.F \qquad (1)$$

The equation can also be taken as a general definition similar to the method of own values / vectors of linear systems, but can also be mathematically proven starting from the tangent approximation through the Newton - Kantorovici development method.

The tangent or the Newton linearization method is applied for the calculation of the real roots of this equation:

$P(x) = 0$

An arbitrary point is chosen x0 near the root, and the equation is linearized around this point, (2)

$$P_{lin}(x) = P(x_0) + P'(x_0).(x - x_0) \quad (2)$$

with the solution:

$$x_1 = x_0 - (P'(x_0))^{-1}.P(x_0) \quad (3)$$

Or

$$\frac{dP(x_0)}{P(x_0)} = -1 \quad (4)$$

$.\frac{dF}{F} = -p \quad \frac{d^2F}{dF} = -p_1 \ldots\ldots \frac{d^nF}{d^{n-1}F} = -p_n$ with primary value p = 1

At an extreme evolution the below hypervolume form can be deduced:

$V = c.e^{-pV} \qquad d(\ln V) = -p, \ \ \ln V = -pV + \ln C$

To locate a particle, we calculate the corresponding hypervolume.

After the Boltzman distribution, for example, the distribution of molecules by coordinates is

$dN(x, y, z) = c.\exp(-\in_p/kT)dV$ density $\rho = \frac{M}{V} = c.\exp(-\in_p/kT)$

M molar mass, V molar volume (22,41l at normal conditions).

Assuming dN = 1 the result is $.dV = c.\exp(\in_p/kT)$

Given that $dV = c.p.e^{-pV}$ at extreme evolution

$p = c.\exp(pV + \in_i/kT)$

Resulting

$$V_{\min} = c_1.M.\exp\left(\varepsilon_p / kT \right)$$

$$M = c_2 V .\exp\left(-\varepsilon_p / kT \right)$$

This equation can be used to represent the system, as the corpus and the wave without classic statistical interpretations. (in comparison with the actual quantum mechanics).

1.2. A model of evolution

$A = m.a$ **v** being the speed of movement

$v = const \quad a = 0 \quad A = 0$

$v = a.t \quad A = m.a$ **a** is the accelerated evolution

$E = m.v.^2$ being the energy

$\frac{dE}{E} = k.\omega \qquad a = \frac{dv}{dt}$

a acceleration, t time, for gravity a = g

Result:

We also get:

$$\frac{dE}{E} = \frac{dm}{m} + \frac{2dv}{v} = k.\omega$$

$$\frac{dm}{m} + \frac{2dv}{v} = k.\omega$$

$$\omega = \omega(x, v, t, m, T, Q, q, E, D, B, H, ...) = \sum \omega_i$$

Field density is $\rho = \frac{dE}{\omega.E} = k$

The intensity of the field will be $\frac{A}{m} = a$

the energy propagates at different frequencies with specific mass quanta at low energies the speed far exceeds the speed of light, the upper limit being on the threshold of the explosion of black holes.

$\lambda = \frac{k}{m.v}$ Hubble speed $v = c.\frac{\Delta\lambda}{\lambda}$

If the amplification is $u = \frac{V}{V_0}$ $\omega = u - 1$

from the Barchausen oscillation condition $u.\beta = \pm 1$ results

the reaction required for oscillation is $\beta = \frac{\pm 1}{\omega + 1}$

I showed that for extreme condition we have

$\omega = \frac{dV}{V} = -1$

$d(\ln V) = -p$ $\ln V = -pV + \ln c$ $V = c e^{-pV}$ wave function

ω can be assimilated with the Hamilton function.

We can express the principle of the maximum Pontreaghin as follows:

$$dF(x(t), u(t)) = 1$$
$$H(x, u) = \omega(x, u) = 1$$

Elementary variations $\frac{d x_i}{x_i} = \omega_i$ are gradients of evolution in the first instance considered independent.

$$\left(\frac{ds}{s}\right)^2 = \sum \left(\frac{dx}{x}\right)^2$$

The infinite universe can be considered as a reunion of finite universes.

We can expand at any time for example

$V = V_1 \cdot V_2$

And for gravity we can write a relation of the form:

$$m_1 \cdot \bar{v}_1 + m_2 \cdot \bar{v}_2 + m_3 \cdot \bar{v}_3 + ... = const$$

1.3. From Srodinger's equation

$$ih\frac{\partial V}{\partial t} = H.V \qquad V = .c.e^{-pV} = c.\prod x_1 \cdots x_n .t = c_1.M.\exp\left(\varepsilon_p \big/ kT \right)$$

results: $H = -\frac{ihp}{t}V$

For an optimal evolution we have

$$\frac{\partial V}{\partial t} = -\frac{\partial H}{\partial x_k}$$

From which we obtain for the optimal case:

$$x = c.i.h.p \qquad p = -\frac{dV}{V}$$

For macro systems you can use k instead of h.

For the relativistic case we will use $V = V_0.\sqrt{1 - \frac{v^2}{c^2}}$

If we accept that the increase in action is equal to the product between motion ω and inertia

$$(\frac{dm}{m} - \omega)$$

$$\frac{dA}{A} = \omega.(\frac{dm}{m} - \omega)$$

Steady state is obtained for:

$\omega = 0$ corpuscular condition and

$\omega = \frac{dm}{m}$ undulating condition

If we particularize as the main variable, the speed (similar to the Lorentz transformations from the theory of relativity) we will have

Result $\omega(v) = \frac{dv}{v}$

$v = const$ corpuscular condition and

$\frac{dv}{v} = \frac{dm}{m}$ undulating condition

Note that in general the stationary condition depends not only on speed

At the beginning of the article I showed that for extreme conditions we will have $\omega = -p$ with principal value $p = 1$.

1.4.Symmetrical values

We say that x1 is symmetric with x2 if we have

$$x_1^2 = x_2^2$$

A rotation consists of two successive symmetries. For n symmetries we have

$\dfrac{x_2}{x_1} = (-1)^n$ the number of rotations will be

$r = \left[\dfrac{n}{2}\right]$ the total angle

$$\phi = \frac{n}{2}.2\pi = n\pi$$

1.5.The synthesis of the evolution relations

Starting from a classic series of powers

$$y = y_0 + a_1.h + a_2 \cdot h^2 + a_3 \cdot h^3 + ... + a_n \cdot h^n = y_0 \left(1 + (a_1 / y_0) h + (a_2 / y_0) h^2 + ... + (a_n . / y_0) h^n\right)$$

It can be illustrated a relation of type error of form

$$(y - y_0) / y_0 = (a_1 / y_0) h + (a_2 / y_0) h^2 + ... + (a_n . / y_0) h^n$$

On the other side, a relation of error can be also obtained through the expression of a relation of type Taylor of form:

$$y = y_0 (1 + c_1.h(1 + c_2.h(1 + c_3.h...)).....)$$

$$(y - y_0)/y_0 = c_1.h + c_1 \cdot c_2 h^2 + c_1 \cdot c_2 c_3 h^3 + ... + c_1 \cdots c_n h^n \qquad c_n = (1/n).(f^n / f^{n-1}) \mid x_0$$

$$c_1 = a_1 / y_0 \qquad c_1 \cdot c_2 = a_2 / y_0 \qquad ....$$

Having recurrence relations:

$$c_n = {a_n}/{a_{n-1}}$$

We are recommending the last development, which has a high convergence speed, it is easily to be used inclusive in the discrete domain.

Expressing one by one error relation of the above type for the essential variables of the system, replacing the observed/measured values for these variables in these relations, we can achive the superposition of these expressions in one general expression for example through the next method:

$$\varepsilon = \sum \varepsilon_i - \begin{pmatrix} \varepsilon_1 \cdot \varepsilon_2 + \varepsilon_1 \cdot \varepsilon_3 + \dots + \varepsilon_1 \cdot \varepsilon_n + \\ + \varepsilon_2 \varepsilon_3 + \varepsilon_2 \varepsilon_4 + \dots + \varepsilon_2 \varepsilon_n + \dots\dots \\ + \varepsilon_{n-1} \cdot \varepsilon_n + \\ + \varepsilon_1 \cdot \varepsilon_2 \varepsilon_3 + \varepsilon_1 \cdot \varepsilon_2 \varepsilon_4 + \dots + \varepsilon_{n-2} \varepsilon_{n-1} \varepsilon_n + \dots \\ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \\ +(-1)^{n+1} \cdot (\varepsilon_1 \cdot \varepsilon_2 \cdots \varepsilon_n) \end{pmatrix}$$

$\varepsilon = [(Y - Y_0)/Y_0] = 1 - \prod (1 - \varepsilon_i)$ – after the composition law of the errors of grade 1.

Example for $n = 2,\ \varepsilon = (\varepsilon_1 + \varepsilon_2) - \varepsilon_1 \varepsilon_2$

For a total error of maximum 5%, in the case for example n=4, it is necessary that the error of the components has not to pass 1%.

We can study the conditions of levitation.

We can compose subsystems according to the principle of composing grade 1 errors in error theory, for example we can calculate the equivalent mass of masses m_1, m_2, m_3

$$\frac{dM}{M} = \varepsilon_1 + \varepsilon_2 + \varepsilon_3 - \varepsilon_1 \varepsilon_2 - \varepsilon_1 \varepsilon_3 - \varepsilon_2 \varepsilon_3 + \varepsilon_1 \varepsilon_2 \varepsilon_3 \qquad \varepsilon_i = \frac{d\, m_i}{m_i}$$

1.3.Relaxing conditions, (the tendency towards independence / equiprobability)

$$\omega_R = \frac{dV}{V} = \sum_{i=1}^{n} \varepsilon_i \frac{dx_i}{x_i} = const.$$
$$\varepsilon_i = \varepsilon_k$$
$$k = 1, n$$

The state of relaxation can be characteristic of the presystemic state with components without interactions, the systemic state with weak interactions, respectively of the highly evolved systemic state with equiprobable components in equilibrium harmony and synchronism with weak interaction.

The gases dilation

$$V = V_0(1+\gamma.\Delta t)$$

$$\frac{V - V_0}{V_0} = \gamma\Delta t \qquad \gamma.\Delta t = 1$$

$$V_{max} = 2.V_0$$

The thermodynamic system

$$\omega_R = \frac{dV}{V} = \sum_{i=1}^{n} \varepsilon_i \frac{dx_i}{x_i} = const.$$

$$\varepsilon_i = \varepsilon_k$$

$$k = 1, n$$

Asymptotic expression for the first fundamental square form of the surface from the differential geometry.

$$ds^2 = Edu^2 + 2Fdudv + Gdv^2$$

$$\frac{1}{u^2 v^2}\frac{ds^2}{s^2} - \frac{E}{s^2 v^2}\frac{du^2}{u^2} - \frac{2F}{s^2 u^2 v^2} du\, dv - \frac{G}{s^2 u^2}\frac{dv^2}{v^2} = 0 \Rightarrow$$

$E = -\frac{s^2}{u^2} \qquad G = -\frac{s^2}{v^2} \qquad F = -\frac{s^2}{2udv}$ replacing in the initial relation $\Longrightarrow$

$$\frac{ds^2}{s^2} = -(\frac{du^2}{u^2} + \frac{dv^2}{v^2} + \frac{du}{u}\frac{dv}{v})$$

1.4. Extreme interactions

$$\frac{ds^2}{s^2} = -1$$

result $s^2 = -(E\,du^2 + 2Fdudv + G\,dv^2)$

Simplifying results: The point M (u, v) is the extreme point of the surface if the relation is satisfied:

$$\frac{du^2}{u^2} + \frac{du}{u} + \frac{dv^2}{v^2} = 1$$

1.5.The evolution preserving law

Generalising the inertia law of Newton from physics, we are defining the evolution preserving law even in the interaction conditions:

A system is preserving the continue evolution if it is preserving its curve form of the evolution.

We can sustain for example that the system evolution is according at the evolutionn curve, if the past, the present, the future of the system is on the curve.

The system evolution can change as a result of the intern working, or of the anisotrophy changing of the environment. Omitting the environment changing , with regard to the evolution preserving law we can stipulate only the indispensable conditions. For the formulation of the sufficient conditions must be included in the model inclusive the environment variations. In the case of a complete system this is possible if there are known the variation laws of the environment. We can enumerate as a necessary conditions for example:

-if the system is keeping its form of the evolution equations

-if it is satisfying an invariate expression, which contains at least some three consecutive points of the trajectory, etc.

Similar to the notion of curvature of the space from physics (inclusive the relativity theory) we will be able to define expressions of evolution threshold, after that we can characterize the movement, for example on the form:

$I(k) = 1$ stable liniar evolution on the initial curve (every k point of the trajectory)

$I(k) = \text{const} \neq 1$ nonlinear stable evolution of constant curvature

$I(k) \neq I(k-1)$ variable, k discontinuity point of the trajectory.

A first relation can be definited for example as:

The curvature ratio

$$I(k)=(x_k-x_{k-1}).(x_k-x_{k-2})/(x_{k+1}-x_{k-1}).(x_{k-1}-x_{k-2})$$

of 4 consecutive points of the trajectory are taken at equal temporal intervals. It can be verified that the upper relation has the invariate value equal with 1 for the liniar systems and it respects the curvature conditions upper definited. **The upper conditions can stand at the durable evolution verification base.**

We have to remember that the relativity theory sustains the preservation of the equations form of evolution for the inertial systems.

So we can get certain results simultaneously on the corpuscular and undulatory properties without resorting to statistics, probability, uncertainty functions.

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