

QUANTUM DETERMINISM OF RELATIVE SPACETIME COUNTING

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ABSTRACT

The phenomenal mathematical efficiency of quantum field theories in modern high-speed information and communication systems has a very simple explanation from the point of view of common sense and higher mathematical logic: all of them – quantum cosmology, quantum physics, quantum metrics and quantum calculus – are the self-informational mathematical systems based on symbolic and numerical functional analysis and elementary recursive calculations of interrelated space and time parameters of matter motion in various states of the material environment.

For the first time in scientific and engineering practice, it was clearly shown that the information entropy of both standard symbolic and non-standard numerical functional analysis has absolute exact limits of computational accuracy – $1/10^{16}$ and $1/10^{64}$, respectively. Moreover, the second limit determines the maximum level of accuracy of practical quantum metrics and calculations and fully coordinates four branches of classical physics – thermodynamics, electrodynamics, gravodynamics, chromodynamics with special and general relativity.

INTRODUCTION

To estimate the absolute parameters of the motion of various material particles at various states of the material medium, it is necessary both symbolically and numerically to describe all possible trajectories of motion of a ball of radius $[e/2]$ inside a ball of radius $[\pi/2]$ or, which is the same, to imagine physically and to describe mathematically a spider web matrix by direct analogy with the Heisenberg uncertainty relation $[P] = 2\pi[R]$, where the dispersion matrix of partial perimeters $[P]$ is direct analog of Planck's units $[h]$ dispersion, and the dispersion matrix of partial radius-vectors $[R]$ is direct analog of Dirac's units $[\hbar]$ dispersion

$[R] = 1 + 2/100 \cdot (e + [A] \cdot (1 + \sqrt{2\pi e})/10))$ is spider web matrix of relative radius-vectors,

$[A] = (100 \cdot ([R] - 1) / 2 - e) / (1 + \sqrt{2\pi e}) / 10$ is spider web matrix of relative eccentricity.

As it turned out, [1] - [14], only two of the above-mentioned interrelated equations, both of which contain the Gaussian argument of the informational entropy of the normal distribution $\sqrt{2\pi e}$, are sufficient to fully describe the functional relationship of the transcendental numbers "pi" and "e" with one, two, three or four decimal digits "a", "b", "c", "d" randomly selected from the full decimal alphabet [0; 1; 2; 3; 4; 5; 6; 7; 8; 9], and the following formula in symbolic notation with a numerical decimal result [73*137] is always absolutely correct for the calculation of cosmological time, with the exception of only one combination [0000] as arithmetically meaningless:

$$abcdabcd / abcd = 73 \cdot 137.$$

In fact, this simple formula was deeply hidden in the anthropic logic of measuring and counting periods of time – in the ancient sundial and lunar clocks, in medieval mechanical and modern atomic clocks, in

It is easy to show that the results of engineering calculations of inverse exponents in symbolic [pi...e] and numeric [3.14...2.71] notations are catastrophically different (by more than 100 power orders):

$$\text{Symbolic form } 1/\pi^{32} = 1/e^{37} = 1/10^{16}.$$

$$\text{Numeric form } 1/(3.14\dots)^{129} = 1/(2.71\dots)^{148} = 1/10^{64}.$$

$$\text{Symbolic form } 1/\pi^{33} = 1/e^{38} = \text{Zero}.$$

$$\text{Numeric form: } 1/(3.14\dots)^{130} = 1/(2.71\dots)^{149} = \text{Zero}$$

Thus, the mutual entropy of symbolic and numeric calculations of reciprocal exponents in the decimal positional system can reach 48 orders of magnitude. The computational limit 10^{-16} of functional analysis in symbolic notation (pi...e) corresponds to the powers of [32...37], but computational limit 10^{-64} of functional analysis in numeric notation (Pi...E) corresponds to the powers of [129...148]:

$$1/(3.14\dots)^{129} = 1/10^{64} = 1/\text{PI}^{129} - \text{inverse PI-exponent}.$$

$$1/\pi^{32} = 1/10^{16} - \text{inverse pi-exponent}.$$

$$1/[\text{MR}]^{34} = 1/\text{Sqrt}((\pi^2 + e^2)/2)^{34} = 1/10^{16} - \text{inverse exponent of root mean square [MR]}.$$

$$1/[\text{MA}]^{34} = 1/((\pi + e)/2)^{34} = 1/10^{16} - \text{inverse exponent of mean arithmetical [MA]}.$$

$$1/[\text{NM}]^{34} = 1/[(\text{MR} + \text{MA} + \text{MG} + \text{MH})/4]^{34} = 1/10^{16} - \text{inverse exponent of natural median [NM]}.$$

$$1/[\text{MG}]^{35} = 1/\text{Sqrt}(\pi * e)^{35} = 1/10^{16} - \text{inverse exponent of mean geometrical [MG]}.$$

$$1/[\text{MH}]^{35} = 1/(2/(1/\pi + 1/e))^{35} = 1/10^{16} - \text{Inverse exponent of mean harmonic [MH]}.$$

$$1/e^{37} = 1/10^{16} - \text{inverse e-exponent}.$$

$$1/(2.71\dots)^{148} = 1/10^{64} = 1/\text{E}^{148} - \text{inverse E-exponent}.$$

The detection of very high informational discrepancy between symbolic and numerical functional analysis was at first view absolutely unexpected for us, because it had no precedents, but now it is a vivid illustration of the natural informational entropy caused by recursive arithmetic when decimal fractions have a short mantissa. And all this actually was the only reason for the "ultraviolet catastrophe" at the birth of quantum physics, but today it is the only reason for the "gravitational catastrophe" in modern quantum physics and in fact it is a serious logical error of standard metrology based on symbolic mathematical methods when working with very small space gradients and very short intervals of time. Well, we can not exactly measure micron length of light waves with a meter ruler!

QUANTUM ALPHABET OF MATTER LANGUAGE

We can now show that the Sommerfeld's prime $A = 137$ combined with the Avogadro's integer number $B = 602214183$ with the Maxwell's rotor speed number $C = \{105456978/10^8 + 4 * \pi * C / 10^{18}\}^{64} * 10^7$ and the well and long known Gaussian argument of the informational entropy of the normal distribution $\text{Sqrt}(2 * \pi * e)$ allows us determine the refractive indices of material waves in various types of condensed media, and then accurately calculate the normal and anomalous dispersion of wave energy of thermal, electromagnetic and gravitational origin and, therefore, all the fundamental constants of the standard physical model with extreme accuracy, limited only by the finite bit capacity of the computing device.

$$\begin{aligned} AF &= 1/(A+36/10^3). & PF &= 6.62607066502366300000 \\ AO &= (PI^*E/100)^2. & PO &= 6.62606983982545790000 \\ AS &= 1/100/[10/(10-1)]^3. & PS &= 6.62606935923704950000 \end{aligned}$$

Quaternion of ideal gas state, where $BS = \text{Lim}\{\text{Sum}[B/10^{(3*N+8)}]\} = 0.00602817$:

$$\begin{aligned} RC &= (R+4*PI*C/10^{10})/10^8. & KBC &= 1.38064845028400000000 \\ RE &= (R+1/E)/10^8. & KBE &= 1.38064845018800000000 \\ RA &= [R+1/(E+AS)]/10^8. & KBA &= 1.38064845017700000000 \\ RK &= [R+1/(E+AS+BS)]/10^8. & KBK &= 1.38064845016800000000 \end{aligned}$$

Zero-point of ideal vacuum state:

$$AX = 5/X-1.$$

Two space-time units – the rational one C and the transcendental one $K = e + AS + BS$ determine upper and lower boundaries of translational velocity in an ideal gas environment, where any real or any virtual structural element (molecule, atom, nucleon, electron, photon) has 12 absolutely identical neighbors, symmetrically located on the surface of the sphere relative to center (like a three-dimensional star with twelve rays). The time shift of ideal infinite waves "sine" and "cosine", recursively moving along the sphere perimeter relative to 12 equidistant points, gives us the angular Boltzmann metrics. By analogy, such a metric can be transferred to cosmic space for satellites, planets, stars, constellations, galaxies.

Presented equations clearly show that there are no uniform quantum units for different aggregate states of matter. Thus, there cannot be a unified theory of the Universe, but instead there are seven interrelated mathematical "languages" of natural science: analytical chemistry (integral vector-tensor calculus), quantum physics (differential vector-tensor calculus) and five branches of mathematics: arithmetic, geometry, trigonometry, algebra, logarithms. For the logical connection of these languages, only the Gaussian informational functional of the entropy of the normal distribution $\text{Sqrt}(2*\pi*e)$ is sufficient, and now mathematical physics can be defined as the differential geometry of an arbitrarily moving sphere with a radius of $e/2$ inside a sphere of radius $\pi/2$. This fact was missed by Hawking and Penrose in their equations for "black holes" of Universe. Moreover, if the above set of eigenfunctions is computed with an exponent back-compression of extremely truncated numbers $PI = [3.14]$ and $E = [2.71]$ into the inverse power mean space - from $1/PI^{129} = 1/E^{148} = 1/10^{64}$ to $1/PI^{130} = 1/E^{149} = 0$ then we get the natural arithmetical limits of the accuracy of root extraction. By Kolmogorov-Arnold-Moser, these hidden inverse exponent quantities are the cardinal parameters for power means but this was missed by authors of "chaos" theory.

QUANTUM WEB OF GRAVITY

Now we can calculate exactly (up to $1/10^{64}$) the perimetral matrices of Planck [P], the radial matrices of Dirac [R], the entropy matrices of Avogadro [NA], the atomic mass matrices of Dalton [DA], the velocity matrices of Maxwell [V], the temperature matrices of Kelvin [T], the phase matrices of Boltzmann [KB], but let's restrict ourselves only to Newtonian gravity matrices $[G] = [P]*(1+[A])$. One of the particular values $G(NB)$ was not specially calculated to show that the informational entropy in SI in principle cannot be less than $1/10^8$, and this is the natural arithmetic limit of accuracy for weighted average quantum metrology and computation. The previous system with the declared experimental entropy of fundamental constants was more "honest" and "fair" from the point of view of mathematical, chemical and physical logic, statistics of big data and information theory.

Three-dimensional (volume integrals and stereometry) gravitational matrix:

$$\begin{aligned} G(A4) &= 6.6745704910750265485376520841945674109436315576651411126710705788 \\ G(AH) &= 6.6745689043376525769289720333765430722301010754854776960339352496 \\ G(NB), & \text{ where } NB = B/(1+4*\pi/10^8)/10^8 \text{ is the median point of the three-dimensional entropy} \end{aligned}$$

$$G(AL) = 6.6744900157701819328593530509858699615007788098243815678024821509$$

Two-dimensional (surface integrals and planimetry) gravitational matrix:

$$G(A1) = 6.6744364873680224292185910483000481884177319277195916202766912038$$

$$G(AF) = 6.6744234384921214159611943953611634645758144315309572175422129523$$

$$G(A0) = 6.6743918194962957193271732313472748453752700748755734914847060150$$

$$G(AS) = 6.6743734048658876250224876184710519248528280242449461899834781806$$

One-dimensional (contour integrals and algebra) gravitational matrix:

$$G(RC) = 6.6739140452062992860293936167978444193636663660125695249577923340$$

$$G(RE) = 6.6739140244578731661939937274667944631317509843397120609727937384$$

$$G(RA) = 6.6739140215288578693056001955271762539009208673810926887358535804$$

$$G(RK) = 6.6739140195795574401178024788041027602493412757457590964306919405$$

Zero-dimensional point (circle center and logarithms) of the radial gravity web:

$$G(AX) = 6.6725781076198223768643093336888740997069675170845242464300377157$$

The complete set of partial gravity matrices presented here was obtained analytically and without any experimental measurements for the first time in scientific and engineering practice.

DISCUSSION AND CONCLUSION

The web of gravity fully harmonizes classical mechanics with quantum mechanics, and Newton's theory of gravity with Einstein's general theory of relativity within the framework of objective logic of common sense, according to which the experimentally detected one-dimensional (radial) temperature field and two-dimensional (transverse ring) electromagnetic field – these are only part of special cases of the mathematical description of wave processes in a three-dimensional gravitational field. Gravitational waves (density waves of the translational velocity field) are primary in relation to electrical and thermal ones and cannot be described by only electrodynamics and thermodynamics, the combination with chromodynamics is required – and this is already the relative dynamics of frequency and wavelength, showing the relationship between transcendental wave functions “pi” and “e”.

The eigenvectors for the ideal gas state of matter make it possible to accurately calculate the weighted average temperature of the cosmic microwave background radiation TBG or the so-called "relic" cosmic temperature, which is measured by the COBE satellite in the interval (2.72491...2.72605) K.

$$TBG = \text{Median}\{\text{Median}[e...(e+AS)]...\text{Median}[(e+AS)...K]\},$$

where the operator "Median" means the arithmetic mean of the four mean values – root mean square, arithmetical mean, geometrical mean and harmonic mean.

$$TBG = 2.7252543275634558348257203374492224585435413056374625751755012329.$$

This is the first in engineering practice direct calculation the cosmic background temperature without any preliminary measurements and this is a direct confirmation of the mathematical definition of gravity as the relative amplitude-phase and frequency-wavelength density of the translational velocity field.

A superposition of dynamic and infinitely long ideal wave functions “sine” and “cosine” doubles the observed frequency of oscillations when the instant translational velocity "v" tends to C – this was first shown and stated by Nyquist, but intuitively clear for any electrical engineer – as a natural result of full-wave rectification of alternative current. Thus, the canonic expression for the kinetic energy of quanta of

different frequency ranges should be as follows in physical terms of chromodynamics (instant action and frequency) and of gravidynamics (instant mass and velocity):

$$QE = h \cdot F \cdot [1 + (v/C)^2] = m \cdot v^2 / 2 \cdot [1 + (v/C)^2].$$

Moreover, now we can write down the canonic expressions for the kinetic energy of quanta in terms of electrodynamics (instant charge and voltage) and thermodynamics (instant phase and temperature) as the natural result of one half-wave rectification of alternative current:

$$QE = q \cdot U \cdot [1 + (v/C)^2] = k \cdot T \cdot [1 + (v/C)^2]$$

The energy of quanta tends to the Einsteinian limit $m \cdot C^2$ if and only if the translational velocity tends to C , and tends to Newtonian zero if and only if the velocity tends to zero. But in a physically observable real and in mathematically described virtual Universe there can never be zero velocity, zero acceleration, zero force, zero mass, zero charge, zero energy, zero entropy and zero information. Just as there in recursive arithmetic is no absolute zero, so in natural science can be no universal field theory. World Wide Web of Gravity is there – the mathematical quintessence of the classical Newtonian physics.

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