Mathematical Physics

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External Documents

Within This Document

To be done

(coordinates, etc.)

Positive definity ☺

Number Line

Origin

Length

Simultaneity

Space-Time as vector in STR (TBD)

Position from single origin (TBD)

$(0,0)$
(x,t)

Completeness of mathematical operations (groups).

Degeneracy (experimental)

Quadratic form

Scaling (why radiation STR "almost" works for everyday (experimental reality).

Locomotive/cave thought experiment

Introduction and Synopsis

(further discussion)

Assumption: the realm of physics and mathematics is that:

1. existence is characterized by the property of addition for positive real elements, where subtraction $c = a - b$ is defined by $a \geq b$ and not otherwise
2. interaction is characterized by multiplication of positive real elements
3. addition and multiplication are group operations individually but must be included in any description of the real world.
4. The reification of any positive single valued real function can be expressed parametrically as $n = f(x = c\tau),\, m = g(x' = v\tau')$ by parametrization of the variables $x = c\tau$, $x' = v\tau'$, n ,and m are positive real numbers.

Non-interacting elements are expressed by the matrix $|c| \triangleq \begin{vmatrix} a & 0 \\ 0 & b \end{vmatrix} = \begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix}$; for positive integers $Tr|c| = a + b$ but $Det|c| = 0$ since the elements do not interact. Then

$|c|^n \triangleq \begin{vmatrix} a & 0 \\ 0 & b \end{vmatrix}^n = \begin{vmatrix} (c\tau)^n & 0 \\ 0 & (v\tau')^n \end{vmatrix}$ and in particular, $Tr|c|^2 \triangleq a^2 + b^2 = (c\tau)^2 + (v\tau')^2$

Trigonometric and Hyperbolic functions are defined by the relations

$1^2 = \cos^2\theta + \sin^2\theta$ and $\cosh^2\theta = 1^2 + \sinh^2\theta$ where the color magenta indicates that the complex plane is necessary for their expression.

The full equation of interaction is a result of the solution of Fermat's Last Theorem for the case $n=2$, since if $c=a+b$ then $c^2=a^2+b^2+2ab$ by the Binomial Expansion; parameterizing for interacting particles yields the single valued equation $(c\tau')^2=(c\tau)^2+(v\tau')^2+2(c\tau)(v\tau')$ from the relation $(c\tau')=(c\tau)+(v\tau')$. This equation can be expressed in matrix (vector) form as

$$(c\tau')^2 = Tr\begin{vmatrix}(c\tau)^2 & 0\\ 0 & (v\tau')^2\end{vmatrix} + Det\begin{vmatrix}c\tau & c\tau\\ -v\tau' & v\tau'\end{vmatrix} =$$

$$Tr\begin{vmatrix}(\overrightarrow{c\tau})\bullet(\overrightarrow{c\tau}) & 0\\ 0 & (\overrightarrow{v\tau'})\bullet(\overrightarrow{v\tau'})\end{vmatrix} + \begin{vmatrix}(c\tau)\\ -(v\tau')\end{vmatrix} \otimes \begin{vmatrix}(c\tau)\\ (v\tau')\end{vmatrix}$$

Note that both "dot" and "cross" products must be included in the characterization.

(**Special Relativity**)

The "Time Dilation" equation Special Theory of Relativity is generated by solving the equation

$c\tau'=c\tau+v\tau'$ for $\tau'=\tau\Gamma, \Gamma=\dfrac{1}{\sqrt{1^2-\beta^2}}$, $\beta=\dfrac{v}{c}$, and is only made possible by a "Spacetime" diagram

where space $(x)\vec{i}$ and time $(t)\vec{j}$ are orthogonal vectors where $v=\tan\theta=\dfrac{x}{t}$ instead of the

parametrized length $(x)\vec{i}=(v\tau)\vec{i}$ where $(\dfrac{x}{\tau})\vec{i}=\left(v\dfrac{\tau}{\tau}\right)\vec{i}=(v)(1_\tau)\vec{i}$ where 1_τ represents a single "clock

tick) so that $1_\tau=\log_\tau(\tau)$ and $(nx)\vec{i}=(v)(n\tau)\vec{i} \Leftrightarrow \dfrac{x}{n\tau}=v\left(\dfrac{n\tau}{n\tau}\right)=v(1_\tau)$

In particular, for $\psi=(c\tau)+i(v\tau')=(c\tau)+(v\tau')$, $\psi\psi^*=(c\tau)^2+(v\tau')^2$ but $\psi\psi^*\neq(c\tau')^2$

The "Time Dilation" equation can also be derived from the two equations of the Lorentz transform by assuming $x'=c\tau' \Leftrightarrow x=c\tau$ (c is a constant w.r.t. τ and τ') which combines the two equations into the expression $\tau'=(\tau-v\tau')\Gamma$ and then eliminating the term $v\tau$ (coordinate distance) so that $x'=(x-vt)\Gamma \Rightarrow \tau'=\tau\Gamma, vt\equiv 0, v\neq 0, \tau'\neq 0, t\neq 0$

This implies that if $(c\tau)$ is an invariant initial state than any change $(v\tau')$ producing a final condition $(c\tau')$ must be imaginary where $(c\tau')(c\tau')^*=(c\tau)^2+(v\tau')^2$

Quantum Mechanics

(**Quantum Mechanics**)

Quantum mechanics assumes that if the initial state $(c\tau) >> (v\tau')$ then any change to the initial state can be ignored, so that the model is characterized only by the change $(v\tau')^2 = 2(c\tau)(v\tau') = h^2, (c\tau) = 1$ (an invariant, so ignored in the expression)

Then the fundamental equation becomes

$\psi\psi^* = (v\tau')^2 + h^2 = -Tr\begin{vmatrix} 0 & (v\tau')^2 \\ h^2 & 0 \end{vmatrix}$ where $\psi\psi^* = \phi^2$ is interpreted as a "wave equation" in terms of an imaginary perturbation to an invariant initial condition. This change interpretation is consistent with change defined as the derivative of a general function (which doesn't include the constant of integration corresponding to $h^2 = 2ab = 2(c\tau)(v\tau')$ in the binomial expansion for $n = 2$

The Equation of Interaction

$$c\tau' = c\tau + v\tau'$$

$$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$$

Note:

$$\frac{c\tau'}{c\tau} = 1_{c\tau} + \frac{v\tau'}{c\tau}$$

$$\Rightarrow \frac{c\tau'}{c\tau} = 1_{c\tau} + \frac{v\tau'}{c\tau}$$

$$v\tau' = c\tau$$

$$\Rightarrow \frac{c\tau'}{c\tau} = 1_{c\tau} + 1_{c\tau}$$

$$\left(\frac{c\tau'}{c\tau}\right)^2 = (1_{c\tau} + 1_{c\tau})^2 = (1_{c\tau})^2 + (1_{c\tau})^2 + 2(1_{c\tau})^2$$

$$\Rightarrow (1_c)^2\left(\frac{\tau'}{\tau}\right)^2 = (1_{c\tau})^2 + (1_{c\tau})^2 + 2(1_{c\tau})^2$$

$$\Rightarrow \left(\frac{\tau'}{\tau}\right)^2 = \left[\frac{1}{(1_c)^2}\right]\left[(1_{c\tau})^2 + (1_{c\tau})^2 + 2(1_{c\tau})^2\right]$$

$$= (1_c)^2\left[(1_{c\tau})^2 + (1_{c\tau})^2 + 2(1_{c\tau})^2\right]$$

$$(\tau')^2 = \tau^2\left\{(1_c)^2\left[(1_{c\tau})^2 + (1_{c\tau})^2 + 2(1_{c\tau})^2\right]\right\}$$

$$\tau' = \tau\sqrt{\left\{(1_c)^2\left[(1_{c\tau})^2 + (1_{c\tau})^2 + 2(1_{c\tau})^2\right]\right\}}$$

$$c = \tau = 1$$

$$\tau' = \tau\sqrt{\left\{(1_1)^2\left[(1_{1^2})^2 + (1_{1^2})^2 + 2(1_1)^2\right]\right\}}$$

Fermat's Last Theorem

Let c, a, b, n positive numbers (not necessarily integers)

$$c = a + b$$
$$c^n = (a+b)^n = a^n + b^n + \operatorname{Re} m(a,b,n) \quad \text{(Binomial Theorem)}$$
$$c^n = a^n + b^n \Leftrightarrow \operatorname{Re} m(a,b,n) = 0$$
$$\operatorname{Re} m(a,b,n) \neq 0$$
$$c^n \neq (a+b)^n \quad \text{QED}$$

True also for $n = 2$

$$c^2 = (a+b)^2 = a^2 + b^2 + 2ab$$

Note: Wiles' proof depends on modular functions defined on the upper half of the complex plane. My proof does not use complex numbers where
$$i^2 = \left(\sqrt{-1}\right)\left(\sqrt{-1}\right) = \sqrt{(-1)(-1)} = \sqrt{(1)(1)} = \sqrt{1^2} = 1, \; i = \sqrt{1}$$

(i.e., there is no complex plane; it is a figment of the imagination)

Prime Numbers

For any number a:

$$1_a \triangleq \frac{a}{a},\ 1_b = 1_a \Leftrightarrow b = a,\ 1_a = \log_{1_a}(1_a)$$

$\{1_a\} = \{o_a\}$ is a prime number, so $(1_a)^2$ is also a prime number.

$2(1_a)^2 = (1_a)^2 + (1_a)^2 \equiv \{e_a\}$ (Goldbach's Theorem, since a can be any number whatever, so every even number is the sum of two primes.)

$$\{I_a\}^2 = (1_a)^2 + 2(1_a)^2 = \{o_a\} + \{e_a\}$$

Goldbach's Conjecture (now Theorem)

p and $\left[(1_o) \triangleq \frac{n}{n}\right]$ are prime numbers for any numbers (p, n)

$$[(p)+(1_o)][(p)-(1_o)] = 2p(1_o) = 2p(1_o)$$

$$\psi \triangleq [(p_1)+(p_2)]$$
$$\psi^* \triangleq [(p_1)-(p_2)]$$
$$\psi\psi^* = [(p_1)+(p_2)][(p_1)-(p_2)] = (p_1)^2 + (p_2)^2 = 2(p_1 p_2)$$

$$30 = 2(3)(5) = \left(\sqrt{23}\right)^2 + \left(\sqrt{7}\right)^2 = 23 + 7$$
$$30 = \left(\sqrt{25}\right)^2 + \left(\sqrt{5}\right)^2 = 25 + 5$$
$$30 = \left(\sqrt{29}\right)^2 + \left(\sqrt{1}\right)^2 = 29 + 1$$

$$n = p + q$$
$$n^* = p - q$$
$$nn^* = (p+q)(p-q) = p^2 + q^2$$

p, q prime iff $p^2 + q^2 = 2pq$

$$
\begin{aligned}
&p^2 + q^2 = 2pq \\
&11^2 + 7^2 = 2(7)(11) \\
&121 + 49 = 170 \neq 154 \\
&170 = (2)85 = (2)(17)(5) = 2pq
\end{aligned}
$$

$$
\begin{aligned}
&170 + 54 = 324 \\
&\sqrt{324} = 18 = (17+1) \\
&(17+1)^2 = 17^2 + 1^2 + 2(17)(1) \\
&(18)^2 = 289 + 1^2 + 34 = 290 + 34 = 324
\end{aligned}
$$

Parametrization

One cannot separate parametrized components and remain consistent with the concept of logarithms.

Consider the equation $x = vt$, where x is defined as length, v as velocity and t as time. The conventional definition of velocity is as a "ratio" between space and time, so that $v \triangleq \frac{x}{t}$. However, one is really dividing both sides of the equation by t, so that $"v" \triangleq \frac{x}{t} = v\frac{t}{t} = v(1_t)$, where $1_t \triangleq \frac{t}{t}$ and $1_t = \log_t(t)^{1_t}$ This means that $v\left(\frac{t}{t}\right) = v(1_t) = v\log_t(t)^{v\frac{t}{t}} = v\log_t(t)^{v(1_t)}$ which suggests that "time" is raised to the power of "velocity" $x = v(t)^{v1_t}$, which is inconsistent with the definition of $x = vt$.

The correct expression can only be obtained by dividing both sides by the parameterization vt, which results in $\frac{x}{vt} = \frac{vt}{vt} = 1_{vt} = \log_{vt}(vt)^{1_{vt}}$ so that $2(1_{vt}) = \log_{vt}(vt)^{2(1_{vt})} = \log_{vt}\left[(vt)^{(1_{vt})}\right]^2$.

For example, the equation $E = mc^2 \Leftrightarrow \frac{E}{m} \equiv c^2$ is inconsistent with $\frac{E}{mc^2} = \frac{mc^2}{mc^2} = 1_{mc^2} = \log_{mc^2}(mc^2)$, where $c^2\left[\log_m(m)^{(1_m)}\right] = \left[\log_m(m)^{(1_m)}\right]^{c^2}$ and the consistent definition is

$$E = mc^2 \Leftrightarrow \frac{E}{mc^2} = \frac{mc^2}{mc^2} = 1_{mc^2} = \log_{mc^2}(mc^2)^{1_{mc^2}}$$

Non-Interacting elements (Prime Numbers)

Two odd (non-interacting, prime) numbers are represented by the matrix

$\left|I_{a,b}\right|^n \triangleq \begin{vmatrix} 1_a & 0 \\ 0 & 1_b \end{vmatrix}^n = \begin{vmatrix} (1_a)^n, & 0 \\ 0 & (1_b)^n \end{vmatrix}, Tr\left|I_{a,b}\right|^n = (1_a)^n + (1_b)^n$ However, the $Det\left|I_{a,b}\right|^n = 0$ since a and b are scalar components of affine (not interacting) vectors $\vec{a} = \begin{vmatrix} 1_a \\ 0 \end{vmatrix}, \vec{b} = \begin{vmatrix} 0 \\ 1_b \end{vmatrix}$. That is, the scalar product ab is not defined.

Interacting Elements (Even numbers)

Interaction of two elements is defined as the relation:

$$\varphi^2 = Tr\begin{vmatrix} a^2 & 0 \\ 0 & b^2 \end{vmatrix} + Det\begin{vmatrix} a & a \\ -b & b \end{vmatrix} = a^2 + b^2 + 2ab = (a+b)^2$$

This relation is also consistent for $a = ct$ and $b = vt'$

Here $2(ct)(vt') = 2ab$ is the interaction term, where the perturbation term $b = v\tau'$ is modified by the inverse of the coordinate distance $\frac{1}{x_d}$ for physics, so that

$$\varphi(x_d) = x_0 + \left(\frac{x'}{x_d}\right), \; x_0 = c\tau_0, \; x' = v\tau'$$

$$\varphi^2(x_d) = x_0{}^2 + \left(\frac{x'}{x_d}\right)^2 + x_0\left(\frac{2x'}{x_d}\right)$$

In radial coordinates:

$$\varphi(r_d) = r_0 + \left(\frac{r'}{r_d}\right)$$

$$\pi\varphi^2(r_d) = \pi r_0{}^2 + \pi\left(\frac{r'}{r_d}\right)^2 + r_0\left[2\pi\left(\frac{r'}{r_d}\right)\right], \; r_0\left[\left(\frac{2\pi r'}{r_d}\right)\right] = r_0\left[\frac{C_{r'}}{r_d}\right]$$

Parameterization of length in terms of time

$x = vt$

$$\frac{x}{t} \triangleq v$$

$$\frac{x}{t} \triangleq v\left(\frac{t}{t}\right) = v(1_t),\ 1_t \triangleq \frac{t}{t}$$

$$\frac{\Delta x}{\Delta t} \triangleq v\left(\frac{\Delta t}{\Delta t}\right) = v(1_{\Delta t}),\ 1_{\Delta t} \triangleq \frac{\Delta t}{\Delta t}$$
$$\frac{dx}{dt} \triangleq v\left(\frac{dt}{dt}\right) = v(1_{dt}),\ 1_{dt} \triangleq \frac{dt}{dt}$$

Note that this defines multiplication. For example, in the discussion below the expression $x = c\tau$ can be used to represent many contexts, e.g.
$F = ma,\ m_0 = ct, E = h\nu, P = mv, \lambda_{c\tau_c} = c\tau_c, \lambda_{v\tau_v} = v\tau_v, \lambda_{(c\tau_c)}' = (c\tau_c)'$, etc.

Impulse Response

The Impulse Response of an Inertial System is given by

$$x_{vt} \triangleq vt$$
$$x_{vt} \triangleq S_{vt} = S_v t$$
$$\frac{S_{vt}}{t} = S_v\left(\frac{t}{t}\right) = S_v(1_t)$$

S_v is an inertial system defined by velocity, $1_t \triangleq \frac{t}{t}$ is a unit impulse to the base t and $\frac{S_{vt}}{t}$ is the system response.

Complex Numbers

$$(-1)(-1) = (1)(1) = 1^2$$
$$i \triangleq \sqrt{-1}$$
$$i^2 = \left(\sqrt{-1}\right)^2 = \left(\sqrt{-1}\right)\left(\sqrt{-1}\right) = \sqrt{(-1)(-1)} = \sqrt{1^2} = 1$$

$$\psi = a + ib$$
$$\psi\psi^* = a^2 + b^2 = (a+ib)(a-ib) = a2 + i(ba) - i(ab) + b^2$$

$|ab| = |a \otimes b| = \frac{1}{2}(2|ab|)$, so that the cross product $+|(ab)| = -|(ba)|$ is half the interaction term with the sign defined by the order of the elements.

$$\varphi = a + b$$
$$\varphi^2 = a^2 + b^2 + 2ab = a^2 + b^2 + h^2$$

$h^2 \triangleq 2(ab) \triangleq 2\left(\sqrt{ab}\right)^2 \triangleq 2S^2$, $S \triangleq \sqrt{ab}$, where

This means that i is a tag on the interacting elements that indicates the interaction term $2ab$ is eliminated in the expression, but depends on the definition $i^2 = -1$ in order that the second term be positive.

$$\psi = a + ib$$
$$\psi^* = a - ib$$
$$\psi\psi^* = (a + ib)(a - ib) = a2 + (iba) - (aib) - (ib)^2 = a^2 - (i^2)b^2 = a^2 + b^2$$

Where multiplicative elements commute.

Example:

$$\psi \triangleq 5 = 4 + 3i$$
$$\psi\psi^* \triangleq (5)(5^*) = (4 + 3i)(4 - 3i) = 16 + 9 = 25$$

The reader should be aware that the expression $i = \sqrt{-1} \Leftrightarrow i^2 = -1$ is inconsistent with the arithmetic expression

$i^2 = \left(\sqrt{-1}\right)\left(\sqrt{-1}\right) = \sqrt{(-1)(-1)} = \sqrt{1^2} = 1$, which shows that it cannot be applied to the product of negative numbers as a positive product, and so cannot represent positive definite real numbers (and therefore lengths) since it introduces negative numbers ($i^2 n = -n < n - n = 0$) into the length $|L| \geq 0$ definition.

Compare the above with:

$$\varphi \triangleq 7 = (4 + 3)$$
$$\varphi^2 \triangleq 7^2 = (4 + 3)^2 = 4^2 + 3^2 + 2(4)(3)$$
$$7^2 = 16 + 9 + 24 = 49$$

so that element count is preserved.

I prefer to color "imaginary numbers" so that the color indicates that it is the binary expansion $\varphi^2 = a^2 + b^2 + 2ab$ for $n = 2$ with the interaction term removed by conjugation:

$$\psi \triangleq (3+4i) \equiv (3+4)$$
$$\psi\psi^* \triangleq (3+4)(3-4) = 3^2 + 4^2 = 16$$

$$c = a + b$$
$$c^2 = a^2 + b^2 + 2ab$$
$$\psi \triangleq a + b$$
$$\psi^* \triangleq a - b$$
$$\psi\psi^* = (a+b)(a-b) = a^2 - b^2 = a^2(+ab - ba) - b^2$$

Declaring b "Imaginary" so that $\psi\psi^* = a^2 + b^2 \Rightarrow b^2 = -b^2,\ 2ab = 0$ nonsense in terms of the expression $(-1)(-1) = (1)(1) = 1^2$ The imaginary axis simply expresses a second dimension characterized by square roots. Note that the negative axis doesn't exist for positive definite numbers, square roots or not. The only purpose of its introduction is to force the equation of a circle (i.e., a "wave equation")

$$ab - ba \equiv a \otimes b + b \otimes a$$
$$c^2 = a^2 + b^2 + (a \otimes b + b \otimes a) + 2ab$$

Note that

$$c^2 = a^2 + b^2 + 2ab = (\psi\psi^*) + 2ab \Rightarrow b = 0$$
$$\Rightarrow c^2 = a^2$$

Conjugation 11/15

Note that

$$\psi \triangleq c\tau + v\tau'$$
$$\psi^* \triangleq c\tau - v\tau'$$

$$\psi + \psi^* = 2c\tau$$
$$\psi - \psi^* = 2v\tau'$$

$$\psi\psi^* = (c\tau)^2 + (v\tau')^2$$

Conjugation eliminates the cross product as well as the interaction term, but in first order only expresses the initial state $2(c\tau)$ and the perturbation $2(v\tau')$ (under addition/creation) but not both. It therefore cannot express the final state $(c\tau')^2$ in second order of interacting particles, where:

$$c\tau' = c\tau + v\tau'$$
$$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau') = (\psi\psi^*) + 2(c\tau)(v\tau')$$

Special Relativity

Derivation from the Lorentz transform

The Lorentz transformation are two equations relating space and time derived via Lorentz' solution of squaring the equation $\alpha(x - vt) = c(\Gamma x + \beta t)$ to account for the null results of the Michelson-Morley experiment by equating coefficients, and choosing a solution of the result. (Note that the term on the left is a subtraction, and that on the right is an addition, suggesting that the solution chosen is one term of a conjugation.)

The resulting transform are the two equations

$$\Gamma = \frac{1}{\sqrt{1-\beta^2}},\ \beta = \frac{v}{c}$$
$$x' = (x - vt)\Gamma$$
$$t' = (t - \frac{vx}{c^2})\Gamma$$

To see how the "Time Dilation " is derived from this expression, first declare c a constant velocity (for sea level, suggested by Maxwell's (vector) derivation of the "speed" of light, resulting in $c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$

where ε_0 and μ_0 are the "permittivity" and "permeability" constants derived from Coulomb and Ampere's experimental force laws. This results in the axiom

$$x = ct \Leftrightarrow x' = ct'$$

Substituting $x' = ct'$ into the second equation results in

$$ct' = (ct - \frac{vx}{c})\Gamma = (ct - \beta x)\Gamma,\ \beta = \frac{v}{c}$$

Setting $x = ct$ results in

$ct' = (ct - \frac{vx}{c})\Gamma = (ct - vt)\Gamma = (x - vt)\Gamma,\ x = ct$ where $ct' = x' = (x - vt)\Gamma$ is identical to the first equation. Eliminating the "distance" term ($\chi = vt = 0$) results in the equation

$$t' = t\Gamma = \frac{t}{\sqrt{1-\beta^2}} \quad \text{where } \frac{\tau'}{t} = \Gamma \geq 1$$

The "time dilation" equation $\tau' = \frac{\tau}{\sqrt{1-\beta^2}}, \beta = \frac{v}{c}$ of Special Relativity can be derived from the expression $(c\tau')^2 = (c\tau)^2 + (v\tau')^2$ which can only be derived by conjugation:

$$\begin{aligned}
\psi &= (c\tau) + (v\tau') \\
\psi^* &= (c\tau) - (v\tau') \\
\psi\psi^* &= \left[(c\tau) + (v\tau')\right]\left[(c\tau) - (v\tau')\right] = (c\tau)^2 + (v\tau')^2 \\
\psi\psi^* &= (c\tau)^2 + (v\tau')^2
\end{aligned}$$

Where $\psi\psi^* = (c\tau')^2 \Rightarrow (c\tau')^2 = (c\tau)^2 \Leftrightarrow (v\tau')^2 = 0$

That means that $(c\tau)^2$ and $(v\tau')^2$ do not interact (are "affine", $\perp$), (and so are represented by prime numbers) in the matrix $|R|^2 \triangleq \begin{vmatrix} c\tau & 0 \\ 0 & v\tau' \end{vmatrix}^2 = \begin{vmatrix} (c\tau)^2 & 0 \\ 0 & (v\tau')^2 \end{vmatrix}$, where $Tr|R|^2 = (c\tau)^2 + (v\tau')^2$, but $Det|R|^2 = 0$ because the product $(c\tau)(v\tau')$ has been eliminated by conjugation.

(This implies that there is no energy penalty for rotation of the unit vector in the RUC, since there is no change in entropy $2\sin\theta\cos\theta = 0$ under rotation.)

Since h^2 is the interaction energy in the general expression, the relation

$$n(c\tau')^2 = n(c\tau)^2 + n(v\tau')^2 + n\left[2(c\tau)(v\tau')\right]$$

, where $n\left[2(c\tau)(v\tau')\right]$ is the interaction energy term for n interacting particles

and $nE_{\text{int}} = nh^2$.

The final state (radiation) is given by dividing by $(c\tau')^2$:

$(1_{c\tau'})^2 = \left(\frac{1}{\gamma}\right)^2 + \beta^2 + 2\left(\frac{\beta}{\gamma}\right) = \cos^2\theta + \sin^2\theta + 2\sin\theta\cos\theta,\ \gamma \triangleq \frac{\tau'}{\tau},\ \beta \triangleq \frac{v}{c}$ For $\theta = 0$, $\beta = 0$, and the expression becomes $(1_{c\tau'})^2 = \cos^2(0) = (c\tau)^2$ where $v = 0$ at the end of the interaction. At that point, the initial state has been diminished by the scaling of the interaction term $2\sin\theta\cos\theta$, but when $v = 0$ there is no further perturbation and a new initial state $(1_{c\tau'})_{v=0} = (1_{c\tau'})'$ is obtained

, so that $(1_{c\tau'})' = (c\tau)'$ this invariant final (initial) state can then be perturbed $(v'\tau'')$ so that

$(c'\tau'') = (c'\tau') + (v'\tau'')$

(Note that a $\frac{1}{x^2}$ term provides a scaling of the interaction term with distance (see my analysis of the Lorentz force) so the interaction dies off with distance for $x > 1$ which would be the signal as received by a sensor, with the interaction term the radiated particle. This provides the coordinate relation for the expression in two dimensions.)

(for the radial expression, multiply the 2nd order expressions by π where

$$\pi(c\tau')^2 = \pi(c\tau)^2 + \pi(v\tau')^2 + (c\tau)2\pi(v\tau')$$
$$r = (c\tau), r' = (v\tau'),\ h^2 = rC_{r'}$$
$$r' = \frac{s}{\theta} \Rightarrow h^2 = rC_{\left(\frac{s}{\theta}\right)}$$

So that the interaction $h_{r'}{}^2 = r(2\pi r') = r(\frac{s}{\theta})$ can be represented as an arc length in the RUC, where $C_{r'} = \frac{s}{\theta}$. Then the "distance" reduces the interaction term by the "radius" r_x in the single dimensioni by $\left(\frac{1}{(r_x)^2}\right)(h_{r'})^2 = \left(\frac{1}{(r_x)^2}\right)\left[r(2\pi r')\right] = \left(\frac{1}{(r_x)^2}\right)\left[r(\frac{s}{\theta})\right]$ (i.e., x is "line of sight"; a flat "geodesic", with curvature given by $(h_{r'})^2 = \left[r(\frac{s}{\theta})\right]$ in the RUC)

If the source $(c\tau)^2$ and the sensor $(c\tau')^2 \le (c\tau)^2$ equation are not identical, then the interaction can only be due to a perturbation $(v\tau')^2$ disturbing the path between (the "red shift") reduction due to

$h^2 = 2\left(\frac{\beta}{\gamma}\right) = 2\frac{v\tau'}{c\tau}$ If there has been no change during the path, then $\left(c\tau'\right)^2 = \left(c\tau\right)^2$, $\tau' = \tau$ and there has been no change (nothing in the path) (Feinstein's "path integrals" are the probabilistic changes along all possible paths – if there is "nothing there" then the "probability" of identical particles over the path is unity. Note, however, that the concept of integration includes the "integration constant", which is analogous to the REMainder of the Multinomial expansion.

Note that this only applies to ("trigonometric") radiation, but not to ("hyperbolic") absorption in the full analysis of the RUC.

"Relativistic" Addition of Velocities

The equation for "relativistic" addition of velocities is given by:

$$w = \frac{u \pm v}{1 \pm \frac{uv}{c^2}}$$

The Lorentz transforms are:

$$x' = (x \pm vt)\Gamma$$

$$t' = (t \pm \frac{vx}{c^2})\Gamma$$

The resulting velocity w is then defined in the primed frame as:

$$w = \frac{x'}{t'} = \frac{(x \pm vt)}{(t \pm \frac{vx}{c^2})}(1_\Gamma),\ 1_\Gamma \triangleq \frac{\Gamma}{\Gamma}.$$

$$x = ut,\ t = \frac{x}{u}$$

$$w = \frac{x'}{t'}(1_\Gamma) = \frac{(ut \pm vt)}{(\frac{x}{u} \pm \frac{vx}{c^2})}(1_\Gamma) = \frac{\left(u \pm v\right)t}{x\left(\frac{1}{u} \pm \frac{v}{c^2}\right)}(1_\Gamma) = \frac{\left(u \pm v\right)t}{x\frac{1}{u}\left(1 \pm \frac{uv}{c^2}\right)}(1_\Gamma) = \frac{\left(u \pm v\right)t}{\frac{x}{u}\left(1 \pm \frac{uv}{c^2}\right)}(1_\Gamma) = \frac{\left(u \pm v\right)t}{t\left(1 \pm \frac{uv}{c^2}\right)}(1_\Gamma) = \frac{\left(u \pm v\right)}{\left(1 \pm \frac{uv}{c^2}\right)}(1_\Gamma)$$

$$w = \frac{u \pm v}{1 \pm \frac{uv}{c^2}}(1_\Gamma) = \frac{u \pm v}{1 \pm \beta_u \beta_v}(1_\Gamma)$$

$$w = \frac{u \pm v}{1 \pm \frac{uv}{c^2}}(1_\Gamma) = \frac{c^2}{c^2}\left(\frac{u \pm v}{1 \pm \frac{uv}{c^2}}\right)(1_\Gamma) = \left[\frac{\left(u \pm v\right)c^2}{\left(c^2 \pm uv\right)}\right](1_\Gamma)$$

Therefore c^2 is modified by the multiplicative factor $(u \pm v)$ in the numerator and by the additive factor $\pm uv$ in the denominator.

For $m = 1$, note that

$$P_w \triangleq (m_0\Gamma)w = (m_0\Gamma)\left[\frac{u \pm v}{1 \pm \frac{uv}{c^2}}\right](1_\Gamma) = (m_0\Gamma)\left[\frac{(u \pm v)(c^2)}{(c^2 \pm uv)}\right](1_\Gamma)$$

However, in the inertial frame $v = c$ if

$$\psi \triangleq c\tau + v\tau'$$
$$\psi^* \triangleq c\tau - v\tau'$$
$$\psi^*\psi = (c\tau)^2 + (v\tau)^2$$

by conjugation, then $P_v = (m_0(v)\Gamma)\left[1_{c^2}\right)(1_\Gamma)$; so $P_v = P_c = (m_0 c)$

Note that

$$\psi + \psi^* = (c\tau + v\tau') + (c\tau - v\tau') = 2(c\tau)$$
$$h^2 = 2(ct)(ut') = (cu)(\tau\tau') = 0 \Leftrightarrow u = 0$$

Deconstruction of $\beta = \frac{v}{c}$

$$\beta = \frac{v}{c} = \frac{x_v}{t_v}\frac{t_c}{x_c}$$

Assume $x \triangleq x_v = x_c$, so that the distance (ruler) traveled by an observer with speed v will be the same as the distance “ruler” traveled by an observer with speed c

$$\beta = \frac{t_c}{t_v} \equiv \frac{t}{t'} \quad \text{for radiation only } t' \geq t,\ \beta \leq 1$$

Then for a given distance, the observer with speed c will take longer to travel the distance x than the observer with speed v.

Conversely, if $t \triangleq t_v = t_c$, $\beta = \frac{v}{c} = \frac{x_v}{x_c}$, $x_c \geq x_v$ the observer with “clock” t_c will travel farther than an observer with “clock” t_c ($x_c \geq x_v$

Note, however that $2\left[\frac{\beta}{(x'/x)}\right] = \frac{t}{t'}(1_{x'})\left(\frac{1}{1_x}\right) = \frac{t}{t'}2\left[(1_{x'})\left(\frac{1}{1_x}\right)\right]$, $x \triangleq x_c$, $x' \triangleq x_v$ so that $2\left[\left(1_{x_v}\right)\left(\frac{1}{1_{x_c}}\right)\right] = \log_{\left(x_v/x_c\right)}\left(x_v/x_c\right)^{2\left(x_v/x_c\right)}$ and similarly for $\tau = \frac{\tau}{\tau'}$

Note that in first (coordinate) order

$$\begin{aligned}
\psi &\triangleq t + t' \\
\psi^* &\triangleq t - t' \\
\psi + \psi^* &= 2t \\
\psi - \psi^* &= 2t'
\end{aligned}$$

But in second order coordinate time:

$$\psi\psi^* = t^2 + (t')^2$$

And similarly for coordinate length

$$\psi\psi^* = x^2 + (x')^2$$

Together,

$$\psi = x + t$$
$$\psi^* = x - t$$
$$\psi + \psi^* = 2x$$
$$\psi - \psi^* = 2t$$

And $\psi\psi^* = x^2 + t^2$

Compare this with the expression

$$\varphi = x + t$$
$$\varphi^2 = (x+t)^2 = (x^2 + t^2 + 2xt)$$

Where $h^2 \triangleq 2xt$ characterizes the interaction of space and time.

Electromagnetism

Electromagnetism can be represented by revising the Lorentz force in the following way:

$F = mA = q\left[\varepsilon_0 E + \mu_0 B\right]$, so Newton's Third Law (equal and opposite forces) is represented by the expression

$$\left(F\right)^2 = \left(mA\right)^2 = q^2\left[\varepsilon_0 E + \mu_0 B\right]^2 = q^2\left[\left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2 + 2\left(\varepsilon_0 E\right)\left(\mu_0 B\right)\right]$$

For an invariant $m = 1,\ q = 1$ and $,\tau = 1$ this becomes (radial coordinates)

$\pi\left(F\right)^2 = \pi\left(1_{q/m} A\right)^2 = \pi\left[\varepsilon_0 E + \frac{\mu_0 B}{r_d}\right]^2 = \pi\left[\left(\varepsilon_0 E\right)^2 + \left(\frac{\mu_0 B}{r_d}\right)^2 + 2\left(\varepsilon_0 E\right)\frac{\left(\mu_0 B\right)}{r_d}\right]$ where the term $2\pi\left(\varepsilon_0 E\right)\frac{\left(\mu_0 B\right)}{r_d} = 2\pi\frac{\left(\varepsilon_0 \mu_0\right)\left(EB\right)}{r_d} = E\frac{\left(2\pi B\right)}{\left(c\tau\right)^2} \triangleq \frac{1}{\left(c\tau\right)^2}\left(2EB\right), r_d \triangleq \left(c\tau\right)^2$ which suggests a $\frac{1}{\left(r_d\right)^2} = \frac{1}{\left(c\tau\right)^4},\ \tau = 1$ law for the interaction term of the E and B for the speed of light constant at sea level, with the understanding that the "speed of light" is actually derived from the permeability and permittivity force constants (ε_0 and μ_0) from Gauss's and Coulomb's force laws via Maxwell's equations. However, note that $\left(\varepsilon_0 E\right)$ and $\left(\mu_0 B\right)$ are not vectors in this context, since

$$\left[\left(F\right)_{m=q=1}\right]^2 = \left[\left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2 + 2\left(\varepsilon_0 E\right)\left(\mu_0 B\right)\right] = Tr\begin{vmatrix}\left(\varepsilon_0 E\right)^2 & 0 \\ 0 & \left(\mu_0 B\right)^2\end{vmatrix} + \det\begin{vmatrix}\left(\varepsilon_0 E\right) & \left(\varepsilon_0 E\right) \\ -\left(\mu_0 B\right) & \left(\mu_0 B\right)\end{vmatrix}$$

Quarks

Quarks can be characterized by the expression

$\varphi = r + g + b$, so that

$$\varphi^2 = \left(r + g + b\right)^2 = r^2 + g^2 + b^2 + \mathrm{Re}\,m(r, g, b, 2)$$
$$= \left[r^2 + g^2 + b^2\right) + \left[rg + rb + gr + gb + br + bg\right]$$

Where $\mathrm{Re}\,m(r, g, b, 2) = \left[rg + rb + gr + gb + br + bg\right]$ is the interaction term. Note that if only two of the elements are interacting, then

$$\varphi^2 = \left(r + \left(g + b\right)\right)^2 = r^2 + \left(g + b\right)^2 + \mathrm{Re}\,m(r, g, b, 2) =$$
$$r^2 + \left(g^2 + b^2 + 2gb\right)^2 + \mathrm{Re}\,m(g, b, 2)$$

Where if integers, r is odd prime and $2gb$ is even, so g and b are odd (primes) and $g^2 + b^2$ is even: via Goldbach's Theorem (my proof).

This can be extended to multinomials and different powers, but I don't have the spacetime to write it here.

Quantum Mechanics

It is important to emphasize that the following context only refers to radiation in the context of the RUC, where the function relations are trigonometric. It does not address absorption where the functional relations are hyperbolic. (see the RUC)

Classical Quantum Mechanics is based on the identities $\psi(\theta)=e^{\theta}$, $\frac{d\psi}{d\theta}=\theta e^{\theta}$, $i \triangleq \sqrt{-1}$, and the identity $e^{i\theta}=\cos\theta+i\sin\theta$, and the deBroglie relation $\theta \triangleq Px-Et$, where $E_0 \triangleq Et \equiv (c\tau)^2 \equiv (\cos\theta)^2$ is interpreted as the initial state and $E_v \triangleq P_v \equiv (v\tau')^2 \equiv (\sin\theta)^2$ (Note that these terms express equal and opposite forces). Note that since $\sin(-\theta)=-\sin\theta$, the deBroglie relation can be interpreted as $\sin[-(Et-Px)]=-\sin[(Px-Et)]$ o that the initial state is greater than the change of state ($E_0>E_v$) so the change is positive.

Note the identity $(1_\theta)^2=\cos^2\theta+\sin^2\theta=\left(\frac{\theta}{\theta}\right)^2$ where $\log_{1_\theta}(1_\theta)^{2(1_\theta)}=2(1_\theta)$ (That is, the base (variable) θ not the integer 1.

Interactions (revisited)

The full expression of interaction is given by

$$(c\tau')=(c\tau)+(v\tau')$$
$$(c\tau')^2=(c\tau)^2+(v\tau')^2+2(c\tau)(v\tau')$$

,where $2(c\tau)(v\tau')$ is the interaction term for two particles in a single dimension.

Radiation ($\tau'<\tau,\ v<c$)

For radiation, this can be expressed as

$(1_{c\tau'})^2=(\cos\theta)^2+(\sin\theta)^2+2(\cos\theta)(\sin\theta)$ (see RUC)

$E_f=E_i+E_v\pm\Delta E\equiv E_i\pm h^2$, $E_i\geq E_v\pm\Delta E$ implies that $E_f\leq E_i$

Consider the conjugate expressions $\psi=\cos\theta+i\sin\theta$ where the "i" is merely a tag to indicate that

$$\psi=\cos\theta+\sin\theta\equiv\cos\theta+i\sin\theta$$
$$\psi^*=\cos\theta-\sin\theta\equiv\cos\theta-i\sin\theta$$

So that the expression $\psi\psi^*$ is to be evaluated as a conjugation:

$$\psi\psi^* = (\cos\theta + \sin\theta)(\cos\theta - \sin\theta) = \cos^2\theta + \sin^2\theta + \left[\sin\theta\cos\theta - \sin\theta\cos\theta\right] = \cos^2\theta + \sin^2\theta$$

Note that not only is the interaction term $2\sin\theta\cos\theta$ eliminated by conjunction, but the factor $\left[\sin\theta\cos\theta - \sin\theta\cos\theta\right]$ is not multiplied by 2 for $\left[2\sin\theta\cos\theta - 2\sin\theta\cos\theta\right] = 0$

Note that $\left(1_{c\tau'}\right)^2 = \cos^2\theta + \sin^2\theta + 2\cos\theta\sin\theta \neq \psi\psi^*$ because of the interaction term where

$$\left(1_{c\tau'}\right)^2 = \psi\psi^* + 2\cos\theta\sin\theta$$

(Compare this with the Pythagorean triple $(3,4,5) \Rightarrow 5^2 = 3^2 + 4^2$ vs the expression

$7^2 = 3^2 + 4^2 + 2(3)(4)$ and note that the count in terms of units is only preserved in the latter expression ($5 \neq 3+4$).

Consider the expression $\psi(\theta) = e^{\theta}$ where $\theta = \cos\theta + i\sin\theta$ for $\theta = 0$, so that

$\psi(\theta) = e^{\cos\theta + i\sin\theta} = e^{0 + i\sin\theta} = \left(e^0\right)e^{i\sin\theta} = (1_{e^0})e^{i\sin\theta} = \left(e^0\right)\left(e^0\right) = (1_{e^0})^2$, where $2 = \log_{1_{e_0}}\left(1_{e_0}\right)^2$

This means that $\theta = 0$ implies that $\tan\theta = \left(\frac{\gamma\beta}{1_{c\tau}}\right)^2 = 0$ in the RUC so that $\tau' = \tau,\ \beta = 0 \Leftrightarrow v = 0$ for $c\tau \neq 0$

Then $\theta = 0$ implies that, so that
$\left(E_t - E_v\right) = \left(\left(mc^2\right) - P_c\left(x_c\right) - \right) = \left(\left(mc^2\right)t - (mc)(ct)\right) = \left(mc^2 - mc^2\right)t = 0t = 0$ for $x_c = c\tau_c$

This is valid for any "inertial frame" defined by a single "velocity" $v \equiv c$, so that the change in "velocity" is 0 for that "frame".

That is, $\psi^*\psi = \left(c\tau'\right)^2 \Leftrightarrow \left(v\tau'\right)^2 = 0$ implies that

in the relativistic Schrodinger equation if relativity for $E_v = -(v\tau')$ is applied, since the equation amounts to $H = -i\frac{\partial H}{\partial t}\left(e^0\right)^2 - i\frac{\partial H}{\partial t}(1)^2 = 0 \equiv (0 = 0)$ (i.e., the "entropy" $2(c\tau)(v\tau') = 0$ and

(However, see remarks on Calculus below)

Again, it is important to emphasize that both Special Relativity and (even) classical quantum mechanics only apply to radiation, not absorption, and both refer to invariant “frames” defined only by a single “velocity” (e.g. c) which does not interact with any other “frame” defined by v

This applies to all functions defined by “wave equations”, which are affine vectors, including the spacetime diagram where $t \perp x$ so that x does not interact with t

$$\psi\psi^* \triangleq x^2 + t^2$$
$$\varphi^2 = x^2 + t^2 + 2xt$$

, where $h^2 = 2xt = 2(c\tau)(v\tau')$ is the interaction term where ($x \triangleq (c\tau),\ t \triangleq (v\tau')$

Fermions

Note that the interaction element $h^2 = 2\sin\theta\cos\theta$ is always positive, since $-\sin(\theta) = \sin(-\theta)$ in the quadrants of the RUC that are “negative”); (i.e., for $\pi < \theta < 2\pi$, and that $h^2 < (\cos\theta)^2 + (\sin\theta)^2 = \psi\psi^*$. If this interaction term “breaks off” from the full expression as a separate particle, it no longer interacts with $\psi\psi^*$, and becomes an “observable” at some sensor at a distance $\frac{1}{r^2}$ (see the section on electromagnetism). If $r^2 > (c\tau)^2, \tau = 1$ then permeability parameter has increased, due to a field/particle in the path after ejection, corresponding to an energy decrease in the observable relative to that observed on the surface of the earth (i.e., the “red shift” for identical particles in the local source and distant sensor)

(In this context, it implies that the elements of $\psi\psi^*$ are prime numbers, unless they are related by a further interaction energy (e.g., protons and electrons related by neutrinos).

However, $h^2 = 2\sin\theta\cos\theta$ can now be positive or negative considered independently from $\psi\psi^*$, so that plotting h^2 vs. $2\sin\theta\cos\theta$ over the interval 0 to 2π yields positive $\sin\theta\cos\theta$ in the upper plane and $-\sin\theta\cos\theta$ in the lower plane, where the RUC only expresses $h^2 = r_{\text{int}}$ This corresponds to (e.g.) protons ($\cos\theta$) and electrons ($\sin\theta$), where $\sin\theta << \cos\theta$, but can also be applied to any (e.g. gravitational) interaction (on much larger scales) or smaller particles (on smaller scales).

Of course, r_{int} can also interact with other particles along its journey, causing it to radiate (absorption would never be observable) depending on whether the “spin” ($S^2 = \sin\theta\cos\theta,\ S = \frac{h}{\sqrt{2}}$) is positive (absorption) or negative (radiation) of the new interaction. Since only consequent radiation can be observed, this corresponds to an observed loss of energy from the initial state (“red shift”)

(Two ejected particles (possibly from different sources) with the same sign of Spin repel, and opposite sign attract, with the repulsion/attraction) decreasing as $\frac{1}{r^{\text{int}}} = \frac{1}{h^2}$ $h^2 = r_{\text{int}}$) relative to the sensor.

Consider the expression

$$e^{\theta} \triangleq e^{\varphi},\ \varphi = \cos\theta + \sin\theta$$
$$e^{\varphi^2} = e^{\left(\cos^2\theta + \sin^2\theta + 2\sin\theta\cos\theta\right)} \neq e^{(\psi\psi^*)} = e\left(\cos^2\theta + \sin^2\theta\right)$$

Because of the interaction term $2\sin\theta\cos\theta$, and thus inconsistent with the expressions

$\psi \triangleq e^{i\theta} = \cos\theta + i\sin\theta$ and $\psi^* \triangleq \left(e^{i\theta}\right)^* = \cos\theta - i\sin\theta$ where $\psi\psi^* = \cos^2\theta + \sin^2\theta$

Absorption ($\tau' > \tau,\, v > c$)

TBD

Note on the Fundamental Theorem of Calculus

$$\varphi(x) \triangleq f(x) = \int_0^x f'(x)dx + k(x)$$

$$[\varphi(x)]^2 = [f(x)]^2 = \left[\int_0^x f'(x)dx\right]^2 + [k(x)]^2 + 2\left[\int_0^x f'(x)dx\right][k(x)]$$

$$= x^2 + x'^2 + 2xx',\; x \triangleq \int_0^x f'(x)dx,\; x' \triangleq k(x)$$

, where $k(x)$ is the constant of integration and all variables are in terms of unit integers, where $1_x \triangleq \frac{x}{x} = \log_{1_x}(1_x)$.

$$\psi \triangleq \int f'(x) + k(x)$$
$$\psi^* \triangleq \int f'(x) - k(x)$$

$$\int f'(x) \geq k(x)$$
$$\psi + \psi^* = 2\int f'(x)$$
$$\psi - \psi^* = 2k(x)$$

$$\psi\psi^* = \left[\int f'(x)\right]^2 + [k(x)]^2 = \left[\int f'(x) + k(x)\right]\left[\int f'(x) - k(x)\right]$$
$$= \left[\int f'(x)\right]^2 + [k(x)]^2 + \left\{\left[\int f'(x)\right][k(x)] + [k(x)]\left[\int f'(x)\right]\right\}$$
$$\left[\int f'(x)\right]^2 + [k(x)]^2 + \left\{\left[\int f'(x)\right]\otimes[k(x)] - \left[\int f'(x)\right]\otimes[k(x)]\right\} = \left[\int f'(x)\right]^2 + [k(x)]^2 + 0$$
$$\varphi^2 = \psi\psi^* + 2\left[\int f'(x)\right][k(x)]$$

Where the cross-products $a\otimes b + b\otimes a = a\otimes b - a\otimes b = 0$ have been eliminated by conjugation, and the interaction term is given by $h(x)^2 = 2\left[\int f'(x)\right][k(x)] = 2S^2,\; S^2 \triangleq \left(\sqrt{\left[\int f'(x)\right]}\right)^2\left(\sqrt{[k(x)]}\right)^2$.

Note that $h(x)^2$ is only defined in 2nd order (as an interaction term between two particle/fields), and that complex numbers are not required in this analysis.

Consider the expression

$$g(x,h) = f(x) + f(x+h)$$
$$g(x,h)^2 = f(x)^2 + f(x+h)^2 + 2f(x)f(x+h)$$
$$\lim_{h\to 0} g(x,h)^2 = \left[f(x)^2 + f(x)^2\right] + 2f(x)^2 = 4\left[f(x)\right]^2$$

Compare this with the expression $4\left(1_x\right)^2 = \left(1_x\right)^2 + \left(1_x\right)^2 + 2\left(1_x\right)^2,\ 1_x \triangleq \dfrac{x}{x}$, where

$$4\left(1_x\right)^2 = \log_{\left(1_x\right)^2}\left(1_x\right)^{4\left(1_x\right)^2}$$

$$\left[\left(1_x + 1_x\right)^2\right] = \left[1_x + 1_x + 2\left(1_x\right)\right] = 4\left(1_x\right) = 4\log_{1_x}\left(1_x\right)^{4\left(1_x\right)}$$

$$V = \left[\left(\frac{1}{\sqrt{3}} + \frac{1}{\sqrt{3}}\right)^2\right]\pi r^3 = \left[\frac{1}{3} + \frac{1}{3} + 2\left(\frac{1}{3}\right)\right]\pi r^3 = \frac{4}{3}\pi r^3 = r\left(\frac{4}{3}\pi r^2\right)$$

Conjugation of f(x)

$$\psi(x,h) = f(x) + f(x+h)$$
$$\psi(x,h)\left[\psi^*(x,h)\right] = f(x)^2 + f(x+h)^2$$
$$\lim_{h\to 0}\psi(x,h)\left[\psi^*(x,h)\right] = \left[f(x)^2 + f(x)^2\right] = 2\left[f(x)\right]^2$$

Note: General Relativity depends on calculus rather than the multinomial expansion for $n = 2$

1/29/2022

Forces and Interactions

A single particle/force can be characterized by the single valued function $m_{c\tau} = c\tau,\ F_{c\tau} = c\tau$ where $c\tau$ is a parameterized expression of $m_{c\tau},\ F_{c\tau}$ and c and τ are positive real numbers. An arbitrary single valued function $f(x) = c\tau$ is then categorized when reified in terms of $m_{c\tau}$

The expression $\varphi^2 = \left(m_{c\tau}\right)^2 = \left(F_{c\tau}\right)^2, c = \tau = 1$ expresses Newton's Third Law as the interaction of equal and opposite interacting forces.

A second particle/force can similarly be characterized by $m_{v\tau'} = v\tau',\ F_{v\tau'} = v\tau'$. Where $g(x) = v\tau'$

If there is no interaction between $F_{c\tau}$ and $F_{v\tau'}$, they can be expressed as a two dimensional matrix where $|c| \triangleq \begin{vmatrix} f(x) & 0 \\ 0 & g(x) \end{vmatrix} = \begin{vmatrix} c\tau & 0 \\ 0 & v\tau' \end{vmatrix}$, $|c|^n \triangleq \begin{vmatrix} c\tau & 0 \\ 0 & v\tau' \end{vmatrix}^n = \begin{vmatrix} (c\tau)^n & 0 \\ 0 & (v\tau')^n \end{vmatrix}$, and in particular

$|c|^2 \triangleq \begin{vmatrix} c\tau & 0 \\ 0 & v\tau' \end{vmatrix}^2 = \begin{vmatrix} (c\tau)^2 & 0 \\ 0 & (v\tau')^n \end{vmatrix}$.

For the positive integers $\{c\tau, v\tau'\} \equiv \{a,b\} \in \mathrm{Z}^+$, $Tr|c|^n$ expresses the count of unit elements. If a and b are prime numbers, then $Det|c| = 0$ (no multiplication/interaction between the elements (sets).

For positive real numbers, the interactions can be defined as

$c\tau' = c\tau + v\tau'$ so that Newton's third law (for $c\tau'$) is satisfied by the expression

$(F_{c\tau'})^2 = (c\tau')^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$, where $h^2 = 2(c\tau)(v\tau')$ is the interaction term characterizing the change in entropy of the interaction.

Note that $\pi(F_{c\tau'})^2 = \pi(c\tau')^2 = \pi(c\tau)^2 + \pi(v\tau')^2 + (c\tau)[2\pi(v\tau')]$, where $[2\pi(v\tau')]$ can be characterized as a circumference in radial "coordinates".

This result can be characterized in terms of initial ($1_{c\tau} = \left(\frac{c\tau}{c\tau}\right)$) and final ($1_{c\tau'} = \frac{c\tau'}{c\tau'}$) states and in terms of radiation and absorption, where the initial (non-interacting) states are characterized $|I| = \begin{bmatrix} 1_{c\tau} & 0 \\ 0 & 1_{v\tau'} \end{bmatrix}$

.

Radiation (Red Shift)

Radiation (red shift) is characterized by the expression $(1_{c\tau'})^2 = \left(\frac{1}{\gamma}\right)^2 + (\beta)^2 + 2\frac{\beta}{\gamma},\ \gamma = \frac{\tau'}{\tau} > 1, \beta < 1$

The expression $\left(\frac{1}{\gamma}\right)^2 + (\beta)^2$ is analogous to the trigonometric identity $1^2 = \cos^2\theta + \sin^2\theta$ in the RUC where the interaction term (reduction in entropy) $h^2 = 2\frac{\beta}{\gamma} = 4\left(\frac{1}{2}\frac{\beta}{\gamma}\right)$ corresponding to the sum of the areas of all four quadrants within the unit circle is not included.

Absorption (Blue Shift)

Absorption (blue shift) is characterized by the expression $\gamma^2 = (1_{c\tau})^2 + (\gamma\beta)^2 + 2\beta\gamma,\ \gamma = \frac{\tau'}{\tau} > 1, \beta > 1$

The expression $\gamma^2 = (1_{c\tau})^2 + \beta^2$ is analogous to the hyperbolic identity $\cosh^2\theta = 1^2 + \sinh^2\theta$ in the RUC where the interaction term (increase in entropy) $h^2 = 2\beta\gamma = 4\left(\frac{1}{2}\beta\gamma\right)$ corresponding to the sum of the areas of all four quadrants external to the unit circle is not included.

Note that the "change" in entropy $\tan\theta = \left(\frac{\beta}{1/\gamma}\right)^2 = (\beta\gamma)^2$ is equivalent in both radiation and absorption in the RUC

Gravity

$$\frac{m''}{r} = \frac{m}{r} + \frac{m'}{r}$$

$$\left(\frac{m''}{r}\right)^2 = \left(\frac{m}{r}\right)^2 + \left(\frac{m'}{r}\right)^2 + \frac{2mm'}{r^2}$$

Where $\frac{F_g}{r^2} = \left(\frac{h_g}{r}\right)^2 = 2\frac{mm'}{r^2} = (2G)\frac{m^2}{r^2}$ and r is the mutual radius to the "center of gravity".

Electromagnetic Force

Similarly, for Electromagnetic Force

$$\sqrt{mA} = \varepsilon_0 E + \mu_0 B$$
$$mA = (\varepsilon_0 E)^2 + (\mu_0 B)^2 + 2(\varepsilon_0 \mu_0) EB$$

Where $2(\varepsilon_0 \mu_0) EB = \frac{2EB}{(c\tau)^2}, \tau = 1$ is the interactive force term

The "wave" equation

The wave equation is characterized the trigonometric expression $(1_{c\tau'})^2 = \psi\psi^* = \cos^2\theta + \sin^2\theta$ where

$$i = \sqrt{-1}, i^2 = -1$$
$$\psi = \cos\theta + i\sin\theta = \cos\theta + i\sin\theta$$
$$\psi^* = \cos\theta - i\sin\theta = \cos\theta - i\sin\theta$$

(Note that $i^2 = -1 \neq -1$ since $\log_i (i)^2 = \log_i (-1) = 2 \neq \log_{-1}(-1) = 1$ but that -1 is only defined for $1 - 1 = 1 + (-1) = 0$ in the positive real numbers.)

In general, θ can be defined as the difference $\theta = c\tau \pm v\tau' = f(x) \pm g(x)$, where for radiation , $\sin\theta = +\sin(-\theta)$ in the RUC. For a "coordinate" wave, $\theta = kx - vt$ (Cartesian) or $\theta = 2\pi(\Delta r) = 2\pi(r \pm r')$ (radial)

For the DeBroglie representation, $\theta = \vec{P} \bullet \vec{x} \pm \vec{E} \bullet \vec{t}$ but for inertial "frames" $\vec{P} \perp \vec{x}$ and $\vec{E} \perp \vec{t}$ so that $\theta = 0$. (i.e., for the Lagrangian, $L = T(P,x) - V(E,t) = 0$)

The interpretation of the wave equation suggests that if $c\tau$ is an invariant (i.e., not scaled by $(v\tau')$ in the interaction term, then $(v\tau')$ must be imaginary (and in fact 0) for

$$\psi = (c\tau) + (v\tau')$$
$$\psi^* = (c\tau) - (v\tau')$$
$$\psi\psi^* = (c\tau)^2 + (v\tau')^2$$

(Special Relativity)

Note that $(c\tau')^2 \neq \psi\psi*$ but that the "Time Dilation" equation of Special Relativity

$$\tau' = \frac{\tau}{\sqrt{1-\beta^2}} = \tau\Gamma, \beta = \frac{v}{c}, \Gamma = \frac{1}{\sqrt{1-\beta^2}}$$

is derived from the equation $(c\tau')^2 = (c\tau)^2 + (v\tau')$ by solving for τ'

Parameterization vs "SpaceTime"

(This is for inertial frames and results from the error of treating "spacetime" as a vector relation where space and time are orthogonal at the origin, but somehow also orthogonal at the juncture of space and time related as velocities. This is an error in parameterization since $x\vec{i} = (vt)\vec{i}$ in one dimension, so that

$\left(\frac{x}{t}\right)\vec{i} = (v)\left(\frac{t}{t}\right)\vec{i} = (v)(1_t)\vec{i}$ where (1_t) is a single "clock tick" (to the base t) and n clock ticks are represented by $\left(\frac{x(nt)}{nt}\right)\vec{i} = (v)\left(\frac{nt}{nt}\right)\vec{i} = (v)(1_{nt})\vec{i}$

Introduction (additional comments) (02/01/2022)

The two element field state consisting of parametrized elements $x=(c\tau)$ and $x'=v\tau'$ can be characterized

$(c\tau)$ represents the initial state

$(v\tau')$ represents a second (possibly interacting) state

$(c\tau')$ represents the evolution of the interactions (if any)

These terms actually represent forces, where their squares represent equal and opposite interactions.

Non-interacting states

If the states $(c\tau)$ and $(v\tau')$ do not interact, then the system is represented by the matrix

$\sum\left[(c\tau)+(v\tau')\right]=Tr\begin{vmatrix}(c\tau) & 0 \\ 0 & (v\tau')\end{vmatrix}=(c\tau)+(v\tau')$ where $Det\begin{vmatrix}(c\tau) & 0 \\ 0 & (v\tau')\end{vmatrix}\equiv|0|$, since the interaction product $(c\tau)(v\tau')$ is not defined, and

$$Tr\begin{vmatrix}(c\tau) & 0 \\ 0 & (v\tau')\end{vmatrix}^n=Tr\begin{vmatrix}(c\tau)^n & 0 \\ 0 & (v\tau')^n\end{vmatrix}=(c\tau)^n+(v\tau')^n,\ Det\begin{vmatrix}(c\tau) & 0 \\ 0 & (v\tau')\end{vmatrix}^n\equiv|0|$$

For integers, $\sum\left[(c\tau)+(v\tau')\right]$ represents the count of the sum of integer elements in the sets $N_{a+b}=\sum\left[N_{\{a\}}+N_{\{b\}}\right]$

Note that the coordinate "distance" parametrizations $x_v=v\tau_v$ and $x_c=c\tau_c$ are not included (and in fact is removed from the Lorentz transform in Special Relativity, depending on the condition $x=c\tau\Leftrightarrow x'=c\tau'$ (the speed of light c is a constant), so the characterization is in terms of "inertial frames" independent of any "spacetime" coordinate system.

Interacting states

The interacting state is represented by the relation $\varphi\triangleq(c\tau')=(c\tau)+(v\tau')$; where the equal and opposite force is represented by the equation

$\varphi^2=(c\tau')^2=(c\tau)^2+(v\tau')^2+2(c\tau)(v\tau')$, where the interaction is represented by the term $h^2\triangleq 2(c\tau)(v\tau')$

Note that in second order this equation can be multiplied by π (for "radial coordinates") so that the first two terms are areas (energies) of circles and h^2 can be expressed as the product of a radius and a circumference:

$$\varphi = r + r'$$
$$\pi\varphi^2 = \pi\left(r+r'\right)^2 = \pi\left(r\right)^2 \pi\left(r'\right)^2 + (r)\left(2\pi r'\right)$$

$$\pi h^2 \triangleq (c\tau)\left[2\pi(v\tau')\right] \equiv r\left(2\pi r'\right) .$$

This suggests that radiation and absorption can be characterized by the equations

1. (Radiation) $1_{(c\tau')^2} = (\frac{1}{\gamma})^2 + \left(\beta\right)^2 + 2(\frac{\beta}{\gamma})$ where $1_{(c\tau')^2} = \frac{\left(c\tau'\right)^2}{\left(c\tau'\right)^2} = \log_{(c\tau')^2}\left(c\tau'\right)^2,\ \gamma = \frac{\tau'}{\tau},\ \beta = \frac{v}{c}, h^2 \triangleq 2\frac{\beta}{\gamma}$. Note that all terms are less than $1_{(c\tau')^2}$, so cannot be integers for $v > 0,\ v < c\ \ (\beta < 1),\ \gamma < 1\ (\frac{\tau'}{\tau} < 1)$. Here $v = 0 \Rightarrow \beta = 0,\ \left(c\tau'\right)^2 = \left(c\tau\right)^2$ (i.e., **no change**). Note that $c = 0 \Rightarrow \left(c\tau\right) = 0$ (i.e. no initial state, so nothing exists), and that $v = c,\ \tau' = \tau \Rightarrow$ $1_{(c\tau')^2} = (1_{(c\tau)^2})^2 + \left(1_{(c\tau)^2}\right)^2 + 2\left(1_{(c\tau)^2}\right)^2 = 4\left(1_{(c\tau)^2}\right)^2$.
2. (Absorption) $\gamma^2 = 1_{(c\tau)^2} + \left(\gamma\beta\right)^2 + 2\left(\gamma\beta\right).,\ \gamma = \frac{\tau'}{\tau},\ \beta = \frac{v}{c}, h^2 \triangleq 2\left(\beta\gamma\right)$ where the terms can be integers, $v > 0,\ v > c\ \ (\beta > 1),\ \gamma > 1\ (\frac{\tau'}{\tau} > 1)$. Again. $v = 0 \Rightarrow \beta = 0,\ \left(c\tau'\right)^2 = \left(c\tau\right)^2, \tau' = \tau$ (i.e., **no change**), but for $v > 0$ both $\gamma = \frac{\tau'}{\tau}$ and $\gamma\beta$ increase without bound. Note that for $h^2 = 2\beta\gamma \equiv 2\left(\frac{v\tau'}{c\tau}\right),\ \left(\frac{1}{c\tau}\right)$ is (increasingly) scaled by $\left(v\tau'\right)$
   For $c = v, \tau' = \tau$, $\gamma^2 = 4\left[1_{(c\tau')^2}\right] = 1_{(c\tau')^2} + 1_{(c\tau')^2} + 2\left(1_{(c\tau')^2}\right)$

Negative Numbers and Fermat's Theorem

Consider the expression $c = a + \left(-b\right)$ If $|a| > |b|$ then $c > 0$; however if $|b| > |a|$, then $c < 0$. But swapping sides, the expression becomes $b + c = a \Leftrightarrow a = b + c$ where all elements are positive, and Fermat's theorem still holds.

Note that this is also true for

$\left(c\tau'\right)=(c\tau)+\left(-\left|v\tau'\right|\right)$ so that

$\left(c\tau'\right)=(c\tau)+\left(\left|v\tau'\right|\right)$ (Radiation, $\left|v\tau'\right|<c\tau$)

$\left(c\tau'\right)+\left(v\tau'\right)=\left(c\tau\right)$ (Absorption, $\left|v\tau'\right|>c\tau$)

Note that $\left(c\tau\right)$ can now be considered the "final" state, $\left(c\tau'\right)$ the initial state, and $\left(v\tau'\right)$ the "perturbation", where $\left(v\tau'\right)=0\Leftrightarrow\left(c\tau\right)=\left(c\tau'\right)$

$$\left(c\tau'\right)+\left(v\tau'\right)=\left(c\tau\right)$$

$$\left(c\tau'\right)^2+\left(v\tau'\right)^2+2\left(c\tau'\right)\left(v\tau'\right)=\left(c\tau\right)^2$$

$$1_{(c\tau')^2}+\beta^2+\frac{2\left(c\tau'\right)\left(v\tau'\right)}{\left(c\tau'\right)^2}=\frac{\left(c\tau\right)^2}{\left(c\tau'\right)^2},\ \beta=\frac{v}{c}$$

$$1_{(c\tau')^2}+\left(1_{c^2}\right)\beta^2+2\left(1_{c^2}\right)\beta=\left(\frac{1}{\gamma'}\right)^2,\ \gamma'=\frac{\tau}{\tau'}$$

$$1_{(c\tau')^2}+\left(1_{c^2}\right)\beta^2+2\left(1_{c^2}\right)\beta=\left(\gamma\right)^2,\ \gamma=\frac{\tau'}{\tau}$$

$$\left(\gamma\right)^2=\left[1_{(c\tau')^2}+\left(1_{c^2}\right)\beta^2\right]+2\left(1_{c^2}\right)\beta$$

$$\beta=n\ \text{(integer)}$$

$$\left(\gamma\right)^2=\left[1_{(c\tau')^2}+\left(1_{c^2}\right)n^2\right]+2\left(1_{c^2}\right)n$$

$$\left[1_{(c\tau')^2}+\left(1_{c^2}\right)n^2\right]=2\left(1_{c^2}\right)n\Leftrightarrow\left(\gamma_e\right)^2\ \text{(even)}$$

$$\left(\gamma_o\right)^2=1_{(c\tau')^2}\Leftrightarrow\left(\gamma_o\right)^2\ \text{(odd), n=0}$$

$$\gamma_{(o+e)}=\gamma_o+\gamma_e=\left\{o\right\}+\left\{e\right\}=Tr\begin{vmatrix}\left\{o\right\} & 0\\ 0 & \left\{e\right\}\end{vmatrix}$$

Odd numbers are represented by $\left\{n_{ii}\right\}$ even numbers by $\left\{n_{jk}\right\},\ i\neq j, i\neq k, j\neq k$

$$\gamma_{(o+e)}=\left\{n_{ii}\right\}+\left\{n_{jk}\right\}$$

Initial and Final states

Since Initial state $\left(1_{c\tau}\right)^2 = \left(\frac{c\tau}{c\tau}\right)^2$ and Final state $\left(1_{c\tau'}\right)^2 = \left(\frac{c\tau'}{c\tau'}\right)^2$ do not interact for $v = 0$, where

Radiation is characterized by the relations $\frac{\tau'}{\tau} < 1$ (Radiation) $\frac{\tau'}{\tau} > 1$ (Absorption) at the Final state,

they can be represented by the matrix

$$\begin{vmatrix} \text{Initial State} & 0 \\ 0 & \text{Final State} \end{vmatrix} = \begin{vmatrix} \left(1_{c\tau}\right)^2 & 0 \\ 0 & \left(1_{c\tau'}\right)^2 \end{vmatrix}$$

, where the expression

$$\begin{vmatrix} \left(1_{c\tau'}\right)^2 & 0 \\ 0 & \left(1_{c\tau}\right)^2 \end{vmatrix} \to \begin{vmatrix} \left(1_{c\tau}\right)^2 & 0 \\ 0 & \left(1_{c\tau'}\right)^2 \end{vmatrix} \equiv \begin{vmatrix} \left(1_{c\tau'}\right)^2 \to \left(1_{c\tau}\right)^2 & 0 \\ 0 & \left(1_{c\tau}\right)^2 \to \left(1_{c\tau'}\right)^2 \end{vmatrix}$$

expresses the concept that the Final State has now become the Initial State for the next interaction.

The role of Complex Numbers

Consider the expression

$\psi \triangleq (c\tau) + i(v\tau') = (c\tau) + (v\tau')$ where the color magenta represents a position in the complex plane not on the real line.

Then $\psi\psi^* = (c\tau)^2 + (v\tau) - (v\tau) + (v\tau)^2 = (c\tau)^2 + (v\tau)^2$ where the "coordinate) relations $x_v = (v\tau)$ have been removed from the expression (corresponding to the operation on the Lorentz transforms mentioned above) This suggests substitution into the real expression above so that

$$(c\tau')^2 = \left[(c\tau)^2 + (v\tau')^2\right] + 2(c\tau)(v\tau') = (\psi\psi^*) + h^2$$

However, note that $(c\tau')^2 \neq (c\tau')^2$ unless $(v\tau') = 0$, in which case $c\tau' = c\tau$ (no change)

(Radiation $\beta < 1$)

Note that the "Time Dilation" equation of Special Relativity is derived from the relation

$\left(c\tau'\right)^2 = \left(c\tau\right)^2 + \left(v\tau'\right)^2$ by solving for τ', so that $\tau' = \tau\Gamma, \Gamma = \frac{1}{\sqrt{1-\beta^2}}$, $\beta = \frac{v}{c}$ and is only valid for $\tau' = \tau,\ v = 0$ (i.e., different inertial frame defined by $v \neq c$ do not interact. This is the reason that the traces of SU(2), SO(3), and the relativistic field tensor are zero, as well as the Pauli σ_1 and σ_2 matrices (compare the latter with the $\sigma_1 + \sigma_2$ matrix.

(Absorption $\beta < 1$)

Consider the following integer example where the (3,4,5) Pythagorean triple is applied:

$$49 = 7^2 = (3+4)^2 = 3^2 + 4^2 + 2(3)(4) = (25) + 24$$
$$5 = 3 + 4i = 3 + 4$$
$$55^* = 3^2 + (12) - (12) + 4^2 = 3^2 + 4^2 = 25$$
$$\varphi^2 = 49 = 7^2 = (3+4)^2 = \left(\psi\psi^*\right) + 2(3)(4) = (25) + 2(3)(4)$$

Where the elements omitted by the conjugation ± 12 have been restored by the interaction term $h^2 = 12$.

Note that

$$49 = Tr\begin{vmatrix} 3 & 0 \\ 0 & 4 \end{vmatrix}^2 + \begin{vmatrix} 3 \\ 0 \end{vmatrix} \otimes \begin{vmatrix} 0 \\ 4 \end{vmatrix} = Tr\begin{vmatrix} 3 & 0 \\ 0 & 4 \end{vmatrix}^2 + Det\begin{vmatrix} 3 & 3 \\ -4 & 4 \end{vmatrix}$$
$$(3+4)^2 = 3^2 + 4^2 + 2(3)(4) = (25) + 24$$

is a single valued function in one dimension

Note that $55^* = \sqrt{25}$ is not an integer, and thus not "countable"; it does not include the expression $h^2 = 2(3)(4) = 2(12) = 4(\frac{1}{2})(3)(4)$. This relation is true for all Pythagorean triples, since they are represented as vectors with a resultant. The term $h^2 = 4\left[(\frac{1}{2})(3)(4)\right)$ is the area of the 4 triangles in the RUC, where the lower two quadrants are positive since $\sin(-\theta) = -\sin\theta$ and $\tan\theta = \left(\gamma\beta\right)^2$ since it does not involve the entropy h^2 for either radiation or absorption. However, the second order tangent of the RUC $\tan\theta = \left(\gamma\beta\right)^2$ does not express the entropy either, and so is consistent with the derivative.

For $\left(c\tau'\right)^2 = \left(\psi\psi^*\right) + 2\left(c\tau\right)(v\tau') = \left(\sqrt{\psi\psi^*}\right)^2$, $r = \left(\sqrt{\psi\psi^*}\right)$ is the radius of any single circle (i.e., the radius of the circle in the complex plane, so $1_r \triangleq \frac{\sqrt{\psi\psi^*}}{\sqrt{\psi\psi^*}}$ the radius of the unit circle in the complex plane, so that $2\left(1_r\right) \triangleq 2\log_r(r)$ where $2 \triangleq \log_r(r)^2$

Updates

4/9/2022

Is Goldbach's Conjecture False?

By defining prime numbers via the interaction equation, I may have proved that the sum of two prime numbers is even. However, the sum of two even numbers is also even so it may be that Goldbach's conjecture ("**Every even number is the sum of two primes**" is false.

Asa consequence, prime numbers (as per the fundamental theorem of arithmetic) are insufficient to characterize syntactically any system described by Gödel numbers (that is, the system is incomplete). This is because that characterization does not include the group operation of arithmetic. If such a system is complete (includes negative numbers), then it is inconsistent, because negative numbers (except as differences of positive numbers) render it inconsistent.

In my previous expression $L = \left[p_1{}^2 + p_2{}^2 \right] = \{2N\}$ I invoked the fundamental theorem of arithmetic to arrive at $L = 2N$ via $\{o_p\} + \{o_p\} \in \{e\}$, but that expression excludes the expression

$$\{e\}\left[(o_p)^2 + (o_p)^2 \right] = \{e\}\{2N\} \in \{e\}$$

That is, "**Not every even number is the sum of two primes.**", and thus Goldbach's conjecture is false?

4/11/2022

On the other hand:

Not sure about the above. The omission of $(c\tau')$ ensures the expression $(c\tau)^2 + (v\tau')^2 = 2(c\tau)(v\tau')$ defines $(c\tau)$ and $(v\tau')$ as prime numbers, and there is no restriction on setting $(c\tau) = (v\tau')$ (since both are variables over the complete real set, where any real number can be characterized as the product of two other real numbers under multiplication.

In that case, $(c\tau)^2 + (c\tau)^2 = 2(c\tau)(c\tau) = 2(c\tau)^2$ for all real numbers, and in particular

$1_{(c\tau)^2} + 1_{(c\tau)^2} = 2\left[1_{(c\tau)} \right]$ where $2 = \log_{c\tau}(c\tau)^2 = \log_{c\tau}(c\tau) + \log_{c\tau}(c\tau)$

So all the real numbers on a single number line are included (noting that $2(c\tau)(c\tau)$ is not a prime number (since it is even) though $(c\tau)$ and therefore $(c\tau)^2$ are (since they are both odd – the square of an odd number is still square, but the sum of two odd numbers is even).

Complex Numbers

Consider the interaction equation

$$\varphi = \left(c\tau'\right) = (c\tau) + (v\tau')$$
$$\varphi^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$$

(For radiation, $(v\tau') < \left(c\tau\right)$ and for absorption $(v\tau') > \left(c\tau\right)$

As an expression of the $\left(3,4,5\right)$ "Pythagorean triplet" this is instantiated as:

$$49 = (4+3)^2 = \left[4^2 + 3^2\right] + 2[(3)(4)] = [25] + [24]$$

Consider the expressions

$$\psi = \left(c\tau\right) + i\left(v\tau'\right)$$
$$\psi^* = \left(c\tau\right) - i\left(v\tau'\right)$$
$$\psi\psi^* = \left(c\tau\right)^2 + i\left(c\tau\right)\left(v\tau'\right) - i\left(c\tau\right)\left(v\tau'\right) + \left(v\tau'\right)^2$$
$$= \left(c\tau\right)^2 + \left(v\tau'\right)^2$$

This expression is then instantiated by

$$\psi = 4 + 3i$$
$$\psi^* = 4 - 3i$$
$$\psi\psi^* = 4^2 + 4(3i) - 4(3i) - (3i)(3i) = 16 + 25$$

The Interaction equation then becomes

$$\varphi^2 = \left[\psi\psi^*\right] + 2(c\tau)(v\tau') = \left[25\right] + \left[24\right];$$

The expression

$\psi\psi^* = \left(c\tau\right)^2 + \left(v\tau'\right)^2$ expresses the concept that if $\left(c\tau\right)$ is invariant, then any perturbation $\left(v\tau'\right)$ must be imaginary. That is, the complex expression assigns the interaction expression $h^2 = 2\left(c\tau\right)\left(iv\tau'\right)$ to an imaginary force.

Since

$$\psi = 1 + i$$
$$\psi^* = 1 - i$$
$$\psi\psi^* = 1^2 + 1$$

It is clear that the complex axis is orthogonal to the real axis (a second dimension) because the logarithms for the numbers on each axis are different.

Note that

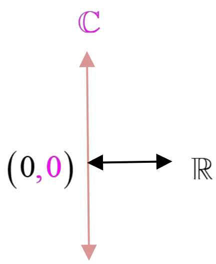
$$\psi = -i^2(c\tau) + i(v\tau')$$
$$\psi^* = -i^2(c\tau) - i(v\tau')$$
$$\psi\psi^* = -i^4(c\tau)^2 - i^2(v\tau')^2 = (c\tau)^2 + (v\tau')^2 = 25$$

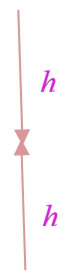
With all values in on the complex axis, so that

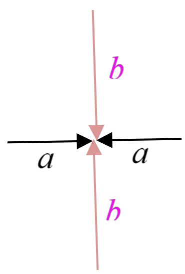
$$\psi = -i^2(4) + i(3)$$
$$\psi^* = -i^2(4) - i(3)$$
$$\psi\psi^* = -i^4(4)^2 - i^2(3)^2 = 16 + 9 = 25$$

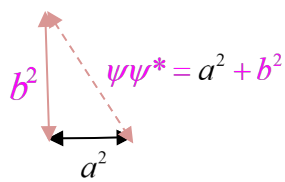
Since there is no change in imaginary entropy for translation and rotation in the complex plane, the complex conjugate of any two complex numbers can be found by translation and rotation of the complex origin.

In terms of vectors, the “origin” is at the junction of the positive real axis and the origin of the complex axis:









$$h = \sqrt{2ab} = \sqrt{2}S$$
$$h^2 = 2ab$$

$$\psi\psi^* = a^2 + b^2$$

h

Quantum Mechanics

The real equation for interaction between two forces at the final state given by:

$$(c\tau') = (c\tau) + (v\tau')$$
$$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$$

, where $(c\tau')^2$ is the (equal and opposite) result of two interacting forces $(c\tau)$ and $(v\tau')$

$$\varphi^2 = 1_{(c\tau')^2} = \left(\frac{c\tau'}{c\tau'}\right)^2 = \left(\frac{1}{\gamma}\right)^2 + \beta^2 + 2\left(\frac{\beta}{\gamma}\right),\ \gamma \triangleq \frac{\tau'}{\tau},\ \beta \triangleq \frac{v}{c}$$

The interaction energy is given by the term $h^2 = 2\left(\frac{\beta}{\gamma}\right)$

Define $\frac{1}{\gamma}=\frac{\tau}{\tau'}=\cos\theta,\ \beta=\frac{v}{c}=\sin\theta$

$$\varphi^2=1_{(c\tau')^2}=\cos^2\theta+\sin^2\theta+2\cos\theta\sin\theta$$
$$h^2\triangleq 2\cos\theta\sin\theta$$

Note that:

$$\pi\varphi^2=\pi 1_{(c\tau')^2}=\pi\cos^2\theta+\pi\sin^2\theta+(\cos\theta)(2\pi\sin\theta)$$
$$\pi h^2=(\cos\theta)(2\pi\sin\theta)=(r_h)(C_h)$$

Complex expression for Quantum Mechanics

$$\psi\triangleq\left(\frac{1}{\gamma}\right)+i\beta$$
$$\psi^*\triangleq\left(\frac{1}{\gamma}\right)-i\beta$$
$$\psi\psi^*=\left(\frac{1}{\gamma}\right)^2-i^2\beta^2+i\frac{\beta}{\gamma}-i\frac{\beta}{\gamma}=\left(\frac{1}{\gamma}\right)^2+\beta^2+0=\cos^2\theta+\sin^2\theta$$

$$1_{(c\tau')^2}=\psi\psi^*+2\frac{\beta}{\gamma}$$

(**Special Relativity)**

Note that solving the expression $(c\tau')^2=(c\tau)^2+(v\tau')^2$ for τ' results in the expression

$$\tau'=\Gamma\tau,\ \Gamma=\frac{1}{\sqrt{1^2-\beta^2}}=\frac{1}{\sqrt{\frac{c^2-v^2}{c^2}}},\ \beta=\frac{v}{c}$$

Note also that the expression $\beta^2=\frac{mv^2}{mc^2}$ is an expression for imaginary mass and energy.

Z Transforms

By shifting the origin of the RUC so that $(c\tau)^2$ becomes imaginary, the real operation of addition is eliminated, so that imaginary number characterize elements that do not exist in the real world. The mathematics is then limited to first order expressions, which ignores Newton's Third Law, in which $(c\tau)$ represents a real force, so that $(c\tau)^2$ represents an equal and opposite force (an energy).

Therefore, Z-transforms represent imaginary relations of (wave) periods which do not involve mass (lengths), and do not interaction (so that the traces of the Electromagnetic Tensor, SU(2) (translation) and SO(3) (rotation) are zero. Note this is also true of the Dirac ("Zero") matrix:

$$Tr\left|0_{Dirac}\right| = Tr\begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \end{vmatrix} = Tr\begin{vmatrix} i^4 & 0 & 0 & 0 \\ 0 & i^2 & 0 & 0 \\ 0 & 0 & i^4 & 0 \\ 0 & 0 & 0 & i^2 \end{vmatrix} = 0$$

The Minkowski Matrix (characteristic of quaterion) is represented by

$$|M| = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & i & 0 & 0 \\ 0 & 0 & i & 0 \\ 0 & 0 & 0 & i \end{vmatrix} \text{ so that } |M|^2 = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & i & 0 & 0 \\ 0 & 0 & i & 0 \\ 0 & 0 & 0 & i \end{vmatrix}^2 = \begin{vmatrix} 1^2 & 0 & 0 & 0 \\ 0 & i^2 & 0 & 0 \\ 0 & 0 & i^2 & 0 \\ 0 & 0 & 0 & i^2 \end{vmatrix} = \begin{vmatrix} 1^2 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{vmatrix} \text{ where}$$

$$Tr|M| = 1 + 3i$$

Note that

$$|M| = \begin{vmatrix} i^2 & 0 & 0 & 0 \\ 0 & i & 0 & 0 \\ 0 & 0 & i & 0 \\ 0 & 0 & 0 & i \end{vmatrix} = \begin{vmatrix} -1 & 0 & 0 & 0 \\ 0 & i & 0 & 0 \\ 0 & 0 & i & 0 \\ 0 & 0 & 0 & i \end{vmatrix} \text{, so that}$$

$$|M|^2 = \begin{vmatrix} i^4 & 0 & 0 & 0 \\ 0 & i^2 & 0 & 0 \\ 0 & 0 & i^2 & 0 \\ 0 & 0 & 0 & i^2 \end{vmatrix} = \begin{vmatrix} (-1)^2 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{vmatrix} = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{vmatrix}$$

Reality

Two Non-Interacting fields/particles

A pair of non-interacting fields/particles are represented by the matrix $|C| \triangleq \begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix}$ where

$Tr(C) = (c\tau) + (v\tau')$ represents the count of elements in the system for $\{c, \tau, v, \tau'\}$ integers, and

where $|C|^n \triangleq \begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix}^n = \begin{vmatrix} (c\tau)^n & 0 \\ 0 & (v\tau')^n \end{vmatrix}$ and where $n = 2$ in the current context.

Two Interacting fields/particles

Consider the expression

$(c\tau') = (c\tau) + (v\tau')$ for interacting fields, so that

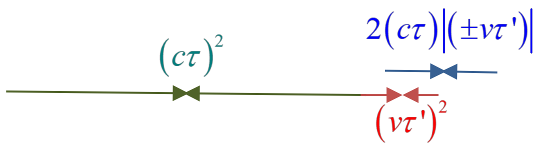
$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau') = (c\tau)^2 + (v\tau')^2 + h^2$, where $h^2 \triangleq 2(c\tau)(v\tau') \triangleq 2(c\tau)(v\tau')$

In this context, $(c\tau)$ represents the local "vacuum" interaction (force) between (interacting atoms in the atmosphere (via fields from valence electrons) subjected to the $1/r^2$ displacement law. At any instant in time, $(c\tau)^2$ represents the "equal and opposite" force at that point if there are no perturbations (non-interacting atoms or parts thereof add to the global "gravity" of the mass of the earth). Therefore, $(c\tau)^2$ represents an initial state: $(v\tau')^2 = 0, (c\tau)^2 = (c\tau')^2$, and $(v\tau')^2$ the proposed perturbation.

At any instant at time, the perturbed total "vacuum" will have a very large value relative to any photon/electron perturbation, since it is determined globally by it's interaction with the mass of the earth ("gravity"), so that $(c\tau)^2 \gg (v\tau')^2$. In this model, $(v\tau')$ will represent a small interacting disturbance in the field $(c\tau)$ where $(c\tau')^2$ represents the equal and opposite force.

Then the final state represented by the equal and opposite force $(c\tau')^2$ represents the instantaneous state of the interacting system, where $(c\tau)^2$ and $(v\tau')^2$ are reduced from their non interacting values $(c\tau)^2$ and $(v\tau')^2$ because they are both less than unity and scale each other in the interaction term h^2

For $(c\tau)^2 \gg (v\tau')^2$, $(c\tau)^2 \gg 2(c\tau)(v\tau') \gg (v\tau')^2$ In second order, the system is represented in the diagram



Note that $2(c\tau)|(\pm v\tau')|$ is positive definite relative to $(c\tau)^2$, and that $(c\tau)^2 = (c\tau')^2$ if and only if , so that $h^2 = 0$

The Normalized Final State is represented by the expression:

$1_{(c\tau)^2} = \left(\frac{1}{\gamma}\right)^2 + \beta^2 + 2\left(\frac{\beta}{\gamma}\right)$, where $\gamma \triangleq \frac{\tau'}{\tau}$, $\beta \triangleq \frac{v}{c}$, and $2\left(\frac{\beta}{\gamma}\right)$ is the (equal and opposite) interaction force (charge to mass ratio), and $1_{(c\tau)^2} \triangleq \frac{(c\tau')^2}{(c\tau')^2} = \log_{(c\tau')^2}(c\tau')^2$ at any instant in time. Note that $2\left(1_{(c\tau)}\right) = 2\left(\frac{(c\tau)}{(c\tau)}\right) = \log_{(c\tau)}(c\tau)^2$ in this context.

Note also that if $(\pm v\tau')$ is oscillatory, so are all the other term. In this case, the “zero point” of the oscillation is represented by the midpoint of the oscillation $(c\tau)^2 + (v\tau')^2$ where the radiation phase is characterized by $(-v\tau')$ and the absorption phase by $(+v\tau')$, where the former is characterized by the (above) relation

$1_{(c\tau)^2} = \left(\frac{1}{\gamma}\right)^2 + \beta^2 + 2\left(\frac{\beta}{\gamma}\right)$ where the term $1_{(c\tau)^2} = \left(\frac{1}{\gamma}\right)^2 + \beta^2$ is trigonometric by the representation

$1_{(c\tau')^2} \triangleq \cos^2\theta + \sin^2\theta$, $\cos^2\theta \triangleq \left(\frac{1}{\gamma}\right)^2$, $\sin^2\theta \triangleq (\beta)^2$

and the latter by the expression

$\gamma^2 = 1_{(c\tau)^2} + (\gamma\beta)^2 + 2(\gamma\beta)$ where the term $\gamma^2 = 1_{(c\tau)^2} + (\gamma\beta)^2$ is hyperbolic but $(c\tau)^2 \le (c\tau')^2$ for $\gamma\beta = m$ (increasing in integer increments), $n^2 \triangleq m^2 + 1^2$ so that $\lim_{m^2\to\infty}\left(m^2 + 1^2\right) = n^2$

$\cosh^2\theta \triangleq 1_{(c\tau)^2} + \sinh^2\theta$, $\cosh^2\theta \triangleq \gamma^2$, $\sinh^2\theta \triangleq (\gamma\beta)^2$ but the reference point is $(v\tau') = 0$ so that $1_{(v\tau')^2} = \frac{0^2}{0^2}$ so that the oscillation varies around this zero point, and the rate of change is given by $\tan\theta = \left(\frac{(v\tau')^2}{(c\tau)^2}\right) = (\gamma\beta)^2$ for both absorption and oscillation.

This analysis can then be expended to multiple fields/particles (e.g. 3 "dimensions" for quarks and 4 "dimensions" for quaternions (involving complex numbers .. or not))