Comments on Lines and Circles w.r.t Analytic Geometry and Relativity

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The Relativistic Unit Circle

Proof of Fermat's Last Theorem

Short proof of Goldbach's conjecture

The Minkowski Metric (and expanded Electromagnetism with mass) 1/1/2020

Equation of a Line

$$x = x$$
$$y = Ax + b$$
$$A = \frac{y}{x} = \tan\theta$$
$$y = \left(\frac{y}{x}\right)x + b$$
$$y = x + b$$
$$b = 0$$
$$y = x$$
$$x \text{ -> } y$$

"SpaceTime"

(substitute $(x = t, y = x,)$

$$A = \frac{x}{t} = v = \tan\theta$$
$$t' = \left(\frac{x}{t}\right)t + b = x + b$$
$$etc.$$

Note that this effectively maps the x axis into the axis. The "slope" $A = dy/dx$ is often "fudged" as a variable, but A does not exist on either the x axis or the y axis.

Note that in the vector/scalar description (x, y) one can specify (x^n, y^n) as independent, but for

$$x' = x + x$$
$$(x')^n = (x)^n + (x)^n + \operatorname{Re} m(x, x, n)$$
$$(x + y)^n = (x)^n + (y)^n + \operatorname{Re} m(x, y, n)$$
$$(x + y)^n \neq (x)^n + (y)^n$$

and in particular, for $n = 2$:

$$(x + y)^2 = (x)^2 + (y)^2 + 2xy$$
$$\neq (x)^2 + (y)^2 = r^2$$

That is, the resultant of the linear system (Pythagorean theorem) is wrong, since it doesn't include the area of the triangle $(\frac{1}{2}xy)$ in each of the four quadrants of the RUC, where

$2xy = 4(\frac{1}{2}xy)$ where $A = (\frac{1}{2}xy)$ is the "entropy" (interaction energy, h^2, etc.

That is, calculus expresses a linear approximation that ignores interaction, so the derivative corresponds to a degenerate analysis, and is why Einstein is wrong in his application of tensor analysis in Physics, and why trigonometry (and hyperbolic functions) are wrong in the case where light and matter interact. (If independent the characterization

$\left(L, M\right) \triangleq \left(\text{Light, Matter}\right)$ but $(L+M)^2 = L^2 + M^2 + 2LM \neq L^2 + M^2$

Similarly, in the relation between mass and coordinate system (most simply designated by $r_{(x,y,x,t)}$),

$\left(r, M\right) \triangleq \left(\text{c}\tau, \text{Mass}\right)$ but $(r+M)^2 = r^2 + M^2 + 2rM \neq r^2 + M^2$ so the metric tensor does not apply, even for $\left(dr, dM\right)$

Radial Coordinates

Similarly, in radial coordinates:

$$r' = Ar + b$$
$$A = \frac{(\sin\theta)}{(\cos\theta)} r = \tan\theta$$
$$r' = (\tan\theta)r \ + \ b$$
$$C = 2\pi r' = 2\pi r(\tan\theta) \ + \ 2\pi b \quad)$$
$$b = 0$$
$$r' = r(\tan\theta)$$
$$C' = 2\pi r(\tan\theta)$$

(Setting b = 0 means the centers of the circle are at the same point (the origin).

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

Note that $(\tan\theta)$ is not dependent on r' or r', and therefore is a "direction without a radius", corresponding to Steve's question.

In Cartesian coordinates, a change in coordinates in a change in that of a position and thus the length of a line, but in radial coordinates, the change in r is a change in arc length $S = r\theta$. In three dimensions, this length changes with the radius of the sphere. However, a change in Riemannian coordinates (as vectors) on the surface of a manifold does not include the change in volume of the sphere, just as Cartesian coordinates (as vectors) do not include the change in volume of the Pythagorean triangle (or the volume of the cube in three dimensions.)

$$S = r\theta$$
$$\varphi = r + \theta$$
$$\varphi^2 = r^2 + \theta^2 + 2r\theta = r^2 + \theta^2 + 2S$$

Note that S does not exist if either $r = 0$ or $\theta = 0$

In both STR and GTR, Einstein tries to get around this by stating that all physical laws are independent of changes in coordinates, but in (e.g.) two dimensions, this amounts to ignoring Newton's Third law, and entropy (interaction energy, particle count). In all dimensions, the entropy will vary with (area, volume, time), and in four dimensions, these volumes can change in time, corresponding to changes in density.

An alternative model is that of the Multi-Nomial Expansion, parametrized in coordinates, but distinctions made in terms of the coordinates system interaction $\operatorname{Re} m(x_1, x_2, .., x_m, n)$ as well as the "linear (non-interacting part" $(x_1)^n + (x_2)^n + ...(x_m)^n$ where

$$\varphi_m(t) = x_1(t, \tau_1, \tau'_1) + x_2(t, \tau_2, \tau'_2) + ... + x_m(t, \tau_m, \tau'_m) = \sum_1^m x(t, \tau_m, \tau'_m)$$

$$(\varphi_m(t))^n = \left[\sum_1^m x(t, \tau_m, \tau'_m)\right]^n = \sum_1^m \left[x(t, \tau_m, \tau'_m)\right]^n + \operatorname{Re} m\left[(x(t, \tau_1, \tau'_1), ..., (x(t, \tau_m, \tau'_m), n\right]$$

where m is then number of physical systems, t (global time) expresses whether the systems are interacting or not in terms of (τ_m, τ'_m) at a single common instant of t. **Note that this model does not include coordinate position and time where there is "nothing there", so cannot model position and time even where there is "something there".**

For physics, of course, $n = 2$, which characterizes entropy as well as energy in the form of Newton's third law, and the masses of non-interacting particles when no longer interacting.

Locally, then, the distinction between Cartesian and radial coordinates is defined by π in terms of the RUC (i.e., interaction in two dimensions, either at the center of the RUC or at its circumference).

If the model is absorption, then the change continues until there is no longer an external field, at which point the change in entropy is zero, and the system is a "black hole" in the sense that it no longer interacts with its surrounding environment (because there isn't any).

If the model is radiation, the similar process occurs until stability is achieved (e.g, there is no matter at the top of a domed galaxy (whether there is gravity or not depends on the model), so no radiation, and a "black hole" means the circumference (and internal processes) are no longer visibly interacting (they have cooled off or been ejected into the surrounding space as "cosmic background noise). Contrary to GTR, such a galaxy would look like it had a "hole" in it, not because of a concentration of matter, but because it had been ejected (like looking at the surface of a whirlpool). Of course, this involves both macro and micro characterizations for a complete analysis.

Again, for Einstein gravity only attracts, but for the RUC it radiates as well, with both characterized by the interaction energy.

“Imaginary Addition of Areas of Circles”

$$\psi = r'' = r + ir'$$
$$\psi\psi^* = \left("r"\right)^2" = \left(r + ir'\right)\left(r - ir'\right) = r^2 + \left(r'\right)^2$$
$$\pi\left(\psi\psi^*\right) = \pi\left("r"\right)^2" = \pi\left(r + ir'\right)\left(r - ir'\right) = \pi\left(r^2 + \left(r'\right)^2\right)$$
$$\pi\left("r"\right)^2" = \pi\left(r^2 + \left(r'\right)^2\right)$$

Linear Relativistic Analysis

(From The Relativistic Unit Circle – see link above)

$$\left(vt_y\right) = \frac{vt_y}{ct_x}\left(ct_x\right) + b$$
$$vt' = \left(\frac{vt'}{ct}\right)\left(ct\right) + b$$
$$vt' = \left(\beta\gamma\right)\left(ct\right) + b$$

$$\frac{vt'}{\left(ct\right)} = \left(\beta\gamma\right) + \frac{b}{\left(ct\right)}$$
$$\left(\beta\gamma\right) = \left(\beta\gamma\right) + \frac{b}{\left(ct\right)}$$
$$b = 0$$
$$\left(\beta\gamma\right) = \left(\beta\gamma\right)$$
$$\left(\beta\gamma\right)^2 = \left(\beta\gamma\right)^2$$
$$\left(\beta\gamma\right)^n = \left(\beta\gamma\right)^n$$

Note that the interaction term $h^2 = 2\beta\gamma$ is NOT included.

The equation(s) should be

Absorption (Hyperbolic linear part)

$$\gamma = \frac{\tau'}{\tau} > 1, \quad \beta = \frac{v}{c} > 1$$
$$\gamma = 1 + \left(\beta\gamma\right)$$
$$\gamma^2 = 1^2 + \left(\gamma\beta\right)^2 + 2\left(\beta\gamma\right)$$
$$\left[\gamma^2 = 1^2 + \left(\gamma\beta\right)^2\right] \triangleq \left[\cosh^2\theta = 1^2 + \sinh^2\theta\right]$$

Radiation (Trigonometric linear part)

$$\gamma = \frac{\tau'}{\tau} < 1, \quad \beta = \frac{v}{c} < 1$$

$$1 = \frac{1}{\gamma} + (\beta)$$

$$1^2 = \left(\frac{1}{\gamma}\right)^2 + (\gamma\beta)^2 + 2\left(\frac{\beta}{\gamma}\right)$$

$$\left[1^2 = \left(\frac{1}{\gamma}\right)^2 + (\gamma\beta)^2\right] \triangleq \left[1^2 = \cos^2\theta + \sin^2\theta\right]$$

Interactive Forces cannot exist without Force Elements (e.g. Newton's Law of Gravity) .

$$\varphi = m + m'$$
$$\varphi^2 = (m)^2 + (m')^2 + 2mm' = 2Gm^2,\ m' = Gm$$
$$\varphi^2(r^2) = (m)^2 + (m')^2 + (2G)\frac{m^2}{r^2},\ r > 1$$
$$(m = 0) \text{ or } (m' = 0) \Rightarrow (2G)\frac{m^2}{r^2} = 0$$

$$\varphi^2 + (x + iy)(x - iy) = (x + y)^2$$
$$\varphi^2 + (x^2 + y^2) = (x^2 + y^2) + 2xy$$
$$\varphi^2 = (x^2 + y^2) - (x^2 + y^2) + 2xy$$
$$\varphi^2 = y^2 - y^2 + 2xy$$
$$\varphi^2 = 2xy \Leftrightarrow y^2 - y^2 = 0$$
$$-y^2 = (i)^2 y^2$$
$$y^2 - y^2 = y^2(1^2 + i^2)$$
$$y^2(1^2 + i^2) = 0 \Leftrightarrow (1^2 + i^2) = 0,\ y^2 > 0$$
$$\left(1^2 + \left(\sqrt{-1}\right)^2\right) = 1^2 + (-1)$$
$$\log_1 (1)^2 = 2 \neq \log_{(-1)} (-1) = 1$$
$$1^2 + (-1) \neq 0$$
$$\varphi^2 \neq 2xy$$

Consider the equation for arc length S on a surface in radial (or spherical) coordinates:

$$S = r\theta,$$

where θ is the angle from the center of a circle (or sphere) in radians.

$$\varphi = r + \theta$$
$$\varphi^2 = r^2 + \theta^2 + 2r\theta = r^2 + \theta^2 + 2S$$
$$\pi\varphi^2 = \pi r^2 + \pi\theta^2 + (2\pi r)\theta = \pi r^2 + \pi\theta^2 + 2\pi S$$

Note that if either $r = 0$ or $\theta = 0$, φ does not exist.

(for physics, $S = \frac{h_r}{\sqrt{2}}$, so that $\pi\varphi^2 = \pi r^2 + \pi\theta^2 + 2\pi\left(\frac{h_r}{\sqrt{2}}\right)$ For a sphere, $r^2 > 0$ and $\theta^2 > 0$ would represent a change in energy from a two dimensional surface bounded by a great circle to the radius of the sphere in the third dimension.

For Electromagnetism, four dimensions would have to be introduced

$$\varphi = r_\theta + r_\phi + r_\sigma + r_t$$

$$\pi\varphi^2 = \pi\left(r_\theta + r_\phi + r_\sigma + r_t\right)^2 = \pi\left(r_\theta\right)^2 + \pi\left(r_\phi\right)^2 + \pi\left(r_z\right)^2 + \left(r_\sigma\right)^2 + \pi\left[Rem(r_\theta, r_\phi, r_\sigma, r, 2)\right]$$

However, this is not a real function, since the Minkowski matrix is complex.

However, in three dimensions (of mass), if the radii were functions of time, one would have

$$\varphi(t) = r(t)_\theta + r_\phi(t) + r(t)_\sigma$$

And if the radii were also relativistic functions of $\{c, v.\tau, \tau'\}_i$, $i = 1,2,3$

$$\varphi\left(t, \{c, v.\tau, \tau'\}_i\right) = r\left(t, \{c, v.\tau, \tau'\}_i\right)_\theta + r_\phi\left(t, \{c, v.\tau, \tau'\}_i\right) + r\left(t, \{c, v.\tau, \tau'\}_i\right)_\sigma$$

The energy satisfying Newton's Third Law would then be characterized by $\pi\left[\varphi\left(t, \{c, v.\tau, \tau'\}_i\right)\right]^2$ (and, of course, would not include regions of space or time with no energy, so a position related metric cannot not be defined).

Lorentz Force

The Lorentz force is given as $F = mA = qE + v \otimes B$

Electromagnetic Interaction

$$c^2 = \frac{1}{\varepsilon_0 \mu_0}$$

$$\mathrm{E}_0 = m_0 c^2 = \frac{m_0}{\varepsilon_0 \mu_0} = \frac{1}{\varepsilon_0 \mu_0}$$

$$\varepsilon_0 \mu_0 = \frac{1}{c^2} \text{ per unit mass}$$

$$\mathrm{E}_0 = \left(1_0\right) c^2$$

Units are defined so that

$m_0 = 1_0 = q_0 = \varepsilon_0 = \mu_0$

The "Lorentz" Force is then re-written as:

$$\overrightarrow{F} = (m_0)\overrightarrow{A} = \varepsilon_0 E\vec{i} + \mu_0 B\vec{j}$$

For $B = 0$, $\overrightarrow{F} \cdot \overleftarrow{F} = (m_0)^2 \left(\overrightarrow{A} \cdot \overleftarrow{A}\right) = (\varepsilon_0)^2 E^2 \left(\vec{i} \cdot \overleftarrow{i}\right) = (\varepsilon_0)^2 E^2$

For $B > 0$,

$$\overrightarrow{F} \cdot \overleftarrow{F} = (m_0)^2 \left(\overrightarrow{A} \cdot \overleftarrow{A}\right) = (\varepsilon_0)^2 E^2 \left(\vec{i} \cdot \overleftarrow{i}\right) + (\mu_0)^2 B^2 \left(\vec{j} \cdot \overleftarrow{j}\right) + 2\left(\varepsilon_0 E\vec{i}\right) \otimes \left(\mu_0 B\vec{j}\right)$$

$$\left(\varepsilon_0 E\vec{i}\right) \otimes \left(\mu_0 B\vec{j}\right) = (\varepsilon_0\mu_0)\left[(EB)\left(\vec{i} \otimes \vec{j}\right) - (BE)\left(\overleftarrow{j} \otimes \overleftarrow{i}\right)\right] = (\varepsilon_0\mu_0)\left[(EB)\left(\vec{i} \otimes \vec{j}\right) + (BE)\left(\vec{i} \otimes \vec{j}\right)\right] = (\varepsilon_0\mu_0)(EB)\vec{k} = \frac{1}{c^2}$$

$$2\left(\varepsilon_0 E\vec{i}\right) \otimes \left(\mu_0 B\vec{j}\right) = h^2 = 2S^2,\ S^2 = (\varepsilon_0\mu_0)(EB)^2\left(\vec{k} \cdot \vec{k}\right) = (\varepsilon_0\mu_0)(EB)^2 = \frac{1}{c^2}(EB)^2$$

$$\overrightarrow{F} \cdot \overleftarrow{F} = (\varepsilon_0)^2 E^2 + (\mu_0)^2 B^2 + 2S^2 = (\varepsilon_0)^2 E^2 + (\mu_0)^2 B^2 + 2\frac{1}{c^2}(EB)^2 = (\varepsilon_0)^2 E^2 + (\mu_0)^2 B^2 + h^2,\ h^2 = 2S^2 = 2\frac{1}{c^2}($$

Poynting "vector"

$$\overrightarrow{\psi} = \varepsilon_0 E\vec{i} + i\left(\mu_0 B\vec{j}\right)$$

$$\left(\overrightarrow{\psi}\right)\cdot\left(\overrightarrow{\psi^*}\right) = \left[\varepsilon_0 E\vec{i} + i\left(\mu_0 B\vec{j}\right)\right]\cdot\left[\varepsilon_0 E\overleftarrow{i} - i\left(\mu_0 B\overleftarrow{j}\right)\right] = \left(\varepsilon_0 E\right)^2\left(\vec{i}\cdot\overleftarrow{i}\right) + \left(\mu_0 B\right)^2\left(\vec{j}\cdot\overleftarrow{j}\right) = \left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2$$

$$\left(\overrightarrow{\psi}\right)\cdot\left(\overrightarrow{\psi^*}\right) = E^2 + B^2,\ \varepsilon_0 = \mu_0 = 1 \Rightarrow c^2 = \frac{1^2}{\varepsilon_0\mu_0} = \frac{1^2}{1} = 1$$

Note: This is the imaginary scalar coefficient of an affine vector (pointing in any "direction"). (anywhere,anywhen)

The Pauli Matrices

Identifying $\overleftrightarrow{E}$ with $\overleftrightarrow{v}$, the σ_3 matrix has several interpretations, all describing the initial state, where the trace indicates equality of two "Particles: or "Fields, not that they are equal to zero individually:

$$\sigma_3 = \begin{vmatrix} 1 & 0 \\ 0 & -1 \end{vmatrix} \triangleq \begin{vmatrix} mv & 0 \\ 0 & -mv \end{vmatrix}, \begin{vmatrix} E & 0 \\ 0 & -E \end{vmatrix}, \begin{vmatrix} B & 0 \\ 0 & -B \end{vmatrix}$$

$$Tr\left(\sigma_3\right) = 1 - 1 = 0 \Rightarrow 1 = 1$$

$$\left(\sigma_3\right)^2 = \begin{vmatrix} 1^2 & 0 \\ 0 & 1^2 \end{vmatrix} \Rightarrow 1^2 = 1^2$$

This is the initial state of the Stern-Gerlach experiment. For a unit mass, in the frame moving toward the interaction point, the identification $m\overleftrightarrow{v} = \overleftrightarrow{v} \triangleq \overleftrightarrow{E}$ means that the particles can be characterized as moving toward the intersection from opposite ends of the lab with $\pm v$ or both from one end of the lab with $\pm qE = \pm E$ for a unit charge in the moving frame of the charges.

The σ_3 matrix then represents the two particles/fields before interaction with the B field at the point of interaction. If the particles are exchanged, then

$\left(\sigma_3\right)^2 = \begin{vmatrix} 1^2 & 0 \\ 0 & 1^2 \end{vmatrix} \Rightarrow 1^2 = 1^2$, and the initial condition remains the same.

The Lorentz force is $F = mA = qE + v \otimes B$

The initial state is then represented by

$\overrightarrow{F}\cdot\overleftarrow{F} = m\overrightarrow{A}\cdot m\overleftarrow{A} = \overrightarrow{A}\cdot\overleftarrow{A} = E^2$ for a unit mass and charge

The remaining Pauli matrices are

$\sigma_2 = \begin{vmatrix} 0 & 1 \\ 1 & 0 \end{vmatrix}$ and $\sigma_3 = \begin{vmatrix} 0 & -i \\ i & 0 \end{vmatrix}$, so that $\sigma_2 + \sigma_3 = \begin{vmatrix} 0 & 1-i \\ 1+i & 0 \end{vmatrix}$

If the direction of the initial condition was in the $\overleftrightarrow{(\pm)k}$ dimension, after the interaction with the B field in the $\overleftrightarrow{(\pm)j}$ dimension, the particles will be deflected in the $\overleftrightarrow{(\pm)i}$ dimension because of the $v \otimes B$ term where the $E\left(\overleftrightarrow{\pm k}\right)$ field has been replaced by the $v\left(\overleftrightarrow{\pm i}\right)$, since the E field no longer "exists" after the interaction.

This, however, is misleading, since the interaction means that the v particles have actually absorbed energy (mass) from the B field, so that the representation of the interaction should be (For $v = E = B = 1$:

$$|S| \triangleq \begin{vmatrix} 0 & -(1+1) \\ (1+1) & 0 \end{vmatrix} = \begin{vmatrix} 0 & -(v+B) \\ (v+B) & 0 \end{vmatrix}$$ where the "-" sign indicates equality as before

so that $\det|S| = (v+B)^2 = v^2 + B^2 + 2vB = \left(E^2 + B^2 + 2EB\right)$

Consider the matrix

$$|S| = |\sigma_2 + \sigma_3| = \begin{vmatrix} 0 & 1-i \\ 1+i & 0 \end{vmatrix} = \begin{vmatrix} 0 & 1-i \\ 1+i & 0 \end{vmatrix}$$ where E, v, and B are characterized by unit values.

Then $|SS^*| = \begin{vmatrix} 0 & E-iB \\ E+iB & 0 \end{vmatrix} \begin{vmatrix} 0 & E+iB \\ E+iB & 0 \end{vmatrix} = \begin{vmatrix} 0 & E^2+B^2 \\ E^2+B^2 & 0 \end{vmatrix}$

Or

$$|SS^*| = \begin{vmatrix} 0 & v^2+B^2 \\ v^2+B^2 & 0 \end{vmatrix}$$

Note that there are only two particles ($\log_{v^2+B^2}\left(v^2+B^2\right) = \log_{E^2+B^2}\left(E^2+B^2\right) = 1$), but the interaction energy $2EB$ has been eliminated by conjugation. One might think that this is a correct analysis classically, since E does not interact with B in vector electromagnetism, and the v's are in opposite directions, and therefore are no longer interacting, but this interaction is in reality characterized by $h^2 = 2S^2$ and cannot be eliminated except by conjugation (imaginary numbers) in a physical context.

Imaginary numbers are complex only for those who think they are somehow real.

$$(x+dx)^2 = x^2 + dx^2 + 2xdx$$

$$(x+idx)(x-idx) = x^2 + (dx)^2$$

Then

$$\begin{vmatrix} 0 & 1+1 \\ 1+1 & 0 \end{vmatrix}^2 = \begin{vmatrix} 0 & 1^2+1^2+2(1)(1) \\ 1^2+1^2+2(1)(1) & 0 \end{vmatrix} = \begin{vmatrix} 0 & 1^2+1^2+2(1)^2 \\ 1^2+1^2+2(1)^2 & 0 \end{vmatrix},$$

where $2(1)^2$ represents the interaction energy of the physical system.

Note: The Dirac matrices accomplish the same thing in four "dimensions" where the Dirac "0" matrix is:

$$\begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \end{vmatrix}$$ where the "-" signs are interpreted as above and represent

$$\begin{vmatrix} c\tau & 0 & 0 & 0 \\ 0 & -c\tau & 0 & 0 \\ 0 & 0 & v\tau' & 0 \\ 0 & 0 & 0 & -c\tau \end{vmatrix}$$

where the 8 matrices are scaled by the linear "Lorentz factor

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

However, deconstructing this equation results in

$(c\tau')^2 = (c\tau)^2 + (v\tau')^2$, or rather $(c\tau')(c\tau')^* = (c\tau)^2 + (v\tau')^2 = (c\tau + iv\tau)(c\tau - iv\tau)$

The physical (real) version is, well, you know (modestly):

The Relativistic Unit Circle

The Minkowski metric

The Minkowski Metric and expanded Electromagnetism (1/1/2020)

The Minkowski Metric is related to Quaternions for $a=1$:

$$|M|^2 = \begin{vmatrix} (\sqrt{1})^2 & 0 & 0 & 0 \\ 0 & i_x{}^2 & 0 & 0 \\ 0 & 0 & i_y{}^2 & 0 \\ 0 & 0 & 0 & i_z{}^2 \end{vmatrix} = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & -1_x & 0 & 0 \\ 0 & 0 & -1_y & 0 \\ 0 & 0 & 0 & -1_z \end{vmatrix} = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & -1_x & 0 & 0 \\ 0 & 0 & -1_y & 0 \\ 0 & 0 & 0 & -1_z \end{vmatrix}$$

$$Tr\left(|M|^2\right) = 1 - 1_x\overrightarrow{(i)} - 1_y\overrightarrow{(j)} - 1_z\overrightarrow{(k)}$$

Where the $(-1_x, -1_x, -1_x)$ refer to quarks and $a=1$ is the Higgs boson (Conjecture, but **Trust Me**.. :)

(Either that $\left((ih_x)^2, (ih_y)^2 (ih_z)^2\right)$, $h_{i,y,z} = 1$, etc., depending on who you ask ☺

Note that in this case the "-1" refers to "imaginary" numbers, NOT to equality as in the Pauli/Dirac matrices) and therefore is the metric for the Electromagnetic Field Equation for the Lorentz Force above).

(**Side note on Number Theory**)

It might help to make sure all calculations of sequences (e.g. Zeta sequence) are performed in terms of unit bases of logarithems….. (just an off the top of my head suggestion; I am not a number theorist except for my proof of Goldbach's conjecture … :)

However, this proof does have fundamental importance for physics, since it expresses the equivalence of counting in addition and multiplication in terms of even numbers for a non-interacting physical system (with anything else) for two fields, and so the concept of normalization with constant entropy. (Odd numbers correspond to a change in entropy)

(My proof of Fermat's Last Theorem is included in my pdf on the RUC, as it involves the Binomial Expansion).

@Steve - Do you mean by "base quantities" the basis of a coordinate transformation? (I don't see any coordinate transformations in your analyses, which I think is foundation of your confusion.) For three dimensions, the basis is (1,1,1), modified by trigonometry; for curvilinear coordinates modified by the Euler angles (and some of your confusion comes from trying to conceptualize Cartesian tangents at points on the surface of your sphere - which are modeled by quaternions, in which the radius does not affect the local coordinate system).

For trigonometry, if you lose a degree of freedom, the model collapses to two dimensions (1,1), which is what your model does in gimbal lock. That is, your model has nothing to do with relativity, only with dimension.

As far as relativity is concerned, it is important to know that time and space are irrelevant to Special Relativity (i.e., everything is defined in inertial frames, where v and c are primary concepts, and only t and ' (as scalars on mass) are concerned. But because the Pythagorean theorem is wrong, Special Relativity is wrong (since there is no mass interaction in its linear model), and therefore General Relativity (which is also based on Pythagoras - see Susskind's lecture 6) is also wrong.

It is interesting that the Trace of the EM field tensor =0, which says there is "nothing there" as a basis, only interaction (as the negative determinant (Jacobian). (This requires a lot of notation, which I'll do in a pdf...)

Consider the "vector" of two sets of real numbers (R,R) (a matrix in two dimensions) with bases (1,1). Then (R,R)^n=(R^n,R^n) (they don't interact.
However, if they do interact, the expression becomes c = r + r, so c^2 = r^2 + r^2 (Binomial Theorem) so the bases interact
c = 1 + 1 and c^2 = 2^2 + 1^2+ 2((1)^2 = 4; that is, a 2 dimensional space with interaction and two dimensions of "non" interaction.
(here interaction is modeled by multiplication)

Now consider the matrix "spacetime" vectors (x,t) and its alternative |A|=(x,1/t)
Det(|A|) = v = x/t so that momentum P = mv = m[det(A)] (Newton)

Similarly A^2 = (x^2/t^2) so det(|A|)^2 = v^2 and E = m[det|A|)^2 (Newton)

Relativity

For STR, these definitions of v and c are retained, but their underlying "spacetime" **interaction** is factored out in G_L by conjugation.

Suppose space and time interact, a la GTR

Then phi = (x + 1/t), so phi^2 = x^2 + (1/t)^2 + 2x(1/t) where the interaction 2x(1/t) = 2v characterizes h^2 in the mass interpretation/ and is the source of gravitation with x = m1 and 1/t = m2 (phi^2 = m1^2 + m2 ^2 + 2(m1)m2)
(Phi = e0E + u0B)

Phi^2 = (e0E)^2 + (u0B)^2 + 2(E0u0)EB where the interaction 2(E0u0)EB = 2(EB)/(ct)^2
= 2(E0u0)EB/r^2, c^2 = E0u0, r = ct, t =1

For STR, (vt') is ALREADY an "acceleration" (change) of (ct) as an initial condition, so is already modeled (by Fermat's theorem for n=2)

Since the interaction already exists, it is redundant for GTR no matter how additional "coordinates" are introduced (again by Pythagoras),
and time squared doesn't make much sense in a "spacetime" diagram.

So the STR parameters are actually mass with G_L interpreted as a density, where m' = m(G_L) (increasing v increases mass via G_L)
If interpreted as wave functions (a la Maxwell), the model does not include the energies of the source and sensor, only the "signal" between the displacement of the plates of Maxwells imaginary capacitor (where the length of the dialectric c is defined in Cartesian (massless) coordinates. The model is absorption in the dialectric, NOT radiation from it.

The source and sensor are modeled in the RUC, where the interaction now models the source and sensor by h^2. The proof of Goldbach's conjecture models the source'sensor as 2N = 2(p1p2) while the displacement current is modeled by L = (p1)^2 + (p2)^2 so that L=2N shows that particle count is preserved via particle count (prime numbers) in two particle interactions. (ct')^2 - L characterizes odd numbers).

You read it here first.... :)