Newton's Third Law (and related topics)

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Newton's Third Law

A particle of mass $m_0 = c_0\tau_0$ in terms of its own origin in an otherwise empty vacuum must be constant even if created outside that vacuum $m_0 = m_v v = P$ (defined by a universe outside in term of other particles, where the change ceases at the edge of the vacuum. (If it was accelerating outside the vacuum, when acceleration ceases, the particle then has a constant momentum relative to the boundary conditions, but to an observer on the particle, the Universe is invisible, since it no longer interacts with the particle.

Then $m_{a=v=0} := m_0 = c_0\tau_0$ where c_0 is defined as the local mass creation rate and τ_0 is the local mass creation time at the position $x_{m_0} = 0$; (local origin) where no other coordinate length is defined.

If a second (identical) particle is created at a different origin ($x'_{m_0} = 0'$) then a length between the particles can be defined so that $l = 0' - 0$ where $x = 0'$ which is always positive for $x > 0$ (Note that the definition of length omits $\pm\infty$ by construction for x a real number.

If the length (relative position of the particles) changes with time, the rate of change of length with time is called velocity, and is positive if the particles are approaching each other, negative otherwise.

$x = vt$ where $v := \frac{x}{t} = v\left(\frac{t}{t}\right) = v\left(1_t\right)$ and $\left(\frac{t}{t}\right) := 1_t$ is a single "clock tick" to its own base, and so $t\left(1_t\right) = t$ is an invariant prime number, since $\left(1_t\right) = \left(1_{t'}\right) \leftrightarrow t' = t$

Non-Interacting particles

If the particles are retreating from each other, there is no interaction (i.e. they have not interacted), and the physical momentum is described by

$$\# := P = \frac{P}{2} + i\frac{P}{2}$$

$$(\#)(\#)^* := ("P")^2 = \left(\frac{P}{2}\right)^2 + \left(\frac{P}{2}\right)^2$$

Note that classical photons do not interact; any such interaction (sometimes) modeled as "gravity"; this is only possible if one of the particles are imaginary (see below)

Interacting particles

Then the relative momentum can be defined as $P = \frac{P}{2} + \frac{P}{2}$

$$P^2 = \left(\frac{P}{2} + \frac{P}{2}\right)^2 = \left[\left(\frac{P}{2}\right)^2 + \left(\frac{P}{2}\right)^2\right] + 2\left(\frac{P}{2}\right)\left(\frac{P}{2}\right) = 4(\frac{P^2}{4})$$

Note that in both one and two dimensions, the existence of the two particles with relative motion implies that they must interact with each other; even in the ever-present "now" or "sooner or later".

This is a two dimensional space that includes both the group operations if addition ("existence"; $2a = a + a$) and multiplication (change) ($a \times a = a^2$, $a \times b = ab = ba = b \times a$). Most importantly, a and b are not vectors, but the quantity $(a+b)^2 = \left[a^2 + b^2\right] + 2ab$ cannot be represented by a set of vector operations in one dimension.

For two dimensions, one can assign:

$$\# = a\vec{i} + b\vec{j}$$
$$\#^2 = \left[\vec{a} \cdot \vec{a} + \vec{b} \cdot \vec{b}\right] + a \otimes b - b \otimes a = \left[a^2 + b^2\right] + 2\left[a \otimes b\right]\vec{k}$$

but this is just $\#^2 = \left[a^2 + b^2\right] + 2\left[ab\right]$ including both "left" and "right" hand rules for curl.

Since momentum only means there is no further acceleration to the particles, (i.e., force was required in order for the particles to be accelerated outside the vacuum). Momentum can be thought of as a final state of force "outside" of the vacuum.

For positive forces, both acceleration and momentum are irrelevant at the instant of contact (where relative motion ceases), and so the interaction can be represented as an equal and opposite force as a final interaction state.

The concept of forces interacting at a single common point is analogous to Einstein's concept of "simultaneity", since STR has no definition of distance $x = vt$ is omitted from the "time dilation" equation.

Newton's Third Law (Equal and opposite forces f)

There are no negative numbers : $-c = a - b, \left(b > a\right) \leftrightarrow b - c = 0 + a = a$

$$f = 0 + f$$
$$2f = f + f,\ f = \frac{f}{2} + \frac{f}{2}$$

$f = f(f/f) = f(1_f)$ is a prime number ("invariant";) where

$(1_f) = 1_{f'} \leftrightarrow f' = f$ ("unity" to the base f)

"Every number is prime to its own base:"

$n + n = 2n$ (Goldbach's conjecture, every even number is the sum of two primes.)

$f := ct = \lambda$ ("wavelength as optical force")

(sign in LLNL Optics lab – "Please do not gaze into laser with remaining eye."

f = f(f/f) = f(1_f) is a prime number (invariant)

1_f := "Unity to the base f"

Binomial Expansion, Fermat's Last Theorem for $n = 2$

$$f = \frac{f}{2} + \frac{f}{2} = 2\left(\frac{f}{2}\right)$$

$$f^2 = (\frac{f}{2} + \frac{f}{2})^2 = [\left(\frac{f}{2}\right)^2 + \left(\frac{f}{2}\right)^2] + 2\left(\frac{f}{2}\right)^2 = \left\{2\left(\frac{f}{2}\right)^2\right\} + \left\{2\left(\frac{f}{2}\right)^2\right\}$$

$$= Tr\begin{vmatrix} \left(\frac{f}{2}\right)^2 & 0 \\ 0 & \left(\frac{f}{2}\right)^2 \end{vmatrix} + Det\begin{vmatrix} \left(\frac{f}{2}\right) & \left(\frac{f}{2}\right) \\ -\left(\frac{f}{2}\right) & \left(\frac{f}{2}\right) \end{vmatrix} = 4\left(\frac{f^2}{4}\right)$$

In this expression, "+" represents "existence" and "x" represents "change"; "Existence" (addition) must precede "change" (multiplication). That is $1 + 1 \neq 2\left(1^2\right)$ "Existence precedes Essence" (J. P Sartre, Existentialism)

Russell's Paradox – "A barber in a village shaves all those and only those that don't shave themselves. Does the barber shave himself?" Ans. A barber cannot both shave and not shave himself (such a barber cannot exist.) That is, $1 + 1 \neq 1,\ 1^2 \neq 1$

Note that even though $Tr\begin{vmatrix} \frac{f}{2} & 0 & 0 & 0 \\ 0 & \frac{f}{2} & 0 & 0 \\ 0 & 0 & \frac{f}{2} & 0 \\ 0 & 0 & 0 & \frac{f}{2} \end{vmatrix}^2 = Tr\begin{vmatrix} \left(\frac{f}{2}\right)^2 & 0 & 0 & 0 \\ 0 & \left(\frac{f}{2}\right)^2 & 0 & 0 \\ 0 & 0 & \left(\frac{f}{2}\right)^2 & 0 \\ 0 & 0 & 0 & \left(\frac{f}{2}\right)^2 \end{vmatrix} = 4\left(\frac{f^2}{4}\right) = f^2$

This is a 4D matrix which involves only self-multiplication, but not existence or inter-dimensional multiplication, and so is not mathematically equivalent to the 2D expression.

Radial “coordinates”)

$$\pi(f^2) = \pi\left[\left(\frac{f}{2}\right) + \left(\frac{f}{2}\right)\right]^2 = \pi[\left(\frac{f}{2}\right)^2 + \left(\frac{f}{2}\right)^2] + \left(\frac{f}{2}\right)[2\pi\left(\frac{f}{2}\right)]$$

pi(f^2) = pi(f/2 + f/2)^2 = pi[(f/2)^2 + (f/2)^2] + (f/2)[2pi(f/2)]

Note that $\pi\left(\frac{f}{2}\right)^2$ can represent areas of "circles" (energies), $\left(\frac{f}{2}\right)$ is a "radius" (string), $2\pi\left(\frac{f}{2}\right)$ is a "circumference" (loop)

Unequal Forces

Suppose the two forces are not equal, where $vt' < ct$

$$f' := vt' = \delta < ct$$
$$nf' := nf + vt' = nf + \delta$$
$$(nf')2 = \left[(nf)^2 + \delta^2\right] + 2\delta(nf)$$

That is, $(n\lambda')^2 = \left[(n\lambda)^2 + \delta^2\right] + 2\delta(n\lambda)$

So that $(n\lambda')$ and $(n\lambda)$ modified slightly by δ, with $(n\lambda') \approx (n\lambda')$ for increasing n

This is the approximation made for "wave" (linear) equations, that agree with experimentation in all but extreme cases (e.g. gravitational optics)

Complex Analysis

$\psi \;:=\; a \;+\; ib$
$\psi^* \;:=\; a - ib$

$\psi\psi^* = a^2 + b^2 \leftrightarrow i = \sqrt{-1}$

but $i^2 = \left(\sqrt{-1}\right)\left(\sqrt{-1}\right) = \sqrt{(-1)(-1)} = \sqrt{1^2} = 1 <> -1$

Note: If there are no negative numbers, there are no square roots of negative numbers.

(Imaginary numbers are complex only for those that think they are somehow real)

Complex Conjugates

$\# := a + b$
$\#^2 = [a^2 + b^2] + 2ab = [a^2 + b^2] + 2ab = [\psi\psi^*] + 2ab$
$\#^2 \neq [a^2 + b^2] = c^2$

This is true for any Pythagorean triple $\{c, a, b\}$

Note that $\psi\psi^* = c^2 = a^2 + b^2$ is the resultant of the vectors $\left(\overrightarrow{ai}, \overrightarrow{bj}\right)$

This analysis can be extended to multinomials, higher powers (etc.); e.g. quaternions:

$(1, i, j, k)$ (Minkowski basis)

Imaginary Force

$$f=\frac{f}{2}+i\frac{f}{2}$$

$$f^*=\frac{f}{2}-i\frac{f}{2}$$

$$ff^*=\left(\frac{f}{2}+i\frac{f}{2}\right)\left(\frac{f}{2}-i\frac{f}{2}\right)=\left(\frac{f}{2}\right)^2-i\frac{f}{2}\left(\frac{f}{2}\right)+i\frac{f}{2}\left(\frac{f}{2}\right)+\left(\frac{f}{2}\right)^2$$

$$=\left(\frac{f}{2}\right)^2+\left(\frac{f}{2}\right)^2\leftrightarrow i=\sqrt{-1}$$

$$ff^*=\left(\frac{f}{2}\right)^2+\left(\frac{f}{2}\right)^2$$

$$2\left(ff^*\right)=\left(f\right)^2+\left(f\right)^2\neq\left(f\right)^2+\left(f\right)^2$$

$$\left(ff^*\right)=\frac{1}{2}\left[\left(f\right)^2+\left(f\right)^2\right]\neq\frac{1}{2}\left[2\left(f\right)^2\right]=f^2=\frac{1}{2}\left[\left(f\right)^2+\left(f\right)^2\right]$$

Where $\left[\left(f\right)^2+\left(f\right)^2\right]=2(f)^2$ so that by Goldbach's conjecture, f is a prime number:

$$f=f\left(\frac{f}{f}\right)=f\left(1_f\right)$$