The Concept of Fields in Physics

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Synopsis – A field theory refers to all particles of the same type, where any change happens to all such particles identically. It is an extension of Newton's force laws (which are characterized only in terms of velocity, which is described by Einstein as an "Inertial Frame", but where a coordinates system is irrelevant up to General Relativity, where it is re-introduced by Einstein in the Field Equations as a degenerate approximation. It is therefore inconsistent with the preservation of the LaGrangian since it attempts to use a non-linear characterization in terms of differential geometry as a description of space and time by forcing it into a tensor (linear) characterization. This is a failed approach, since each dimension of the unit tensor is complete in its own real number system; if quantized particles are assumed, then the interactions and initial/final conditions are characterized by "nomials" in which the identity of particles are preserved by eliminating the multiplicative laws of association and distribution.

In Einstein's case, the postulate of the constancy of the "speed" of light in the Special Theory introduces a preferred coordinate frame $m_0 = c\tau_0$ for any given (non-interacting) photon equivalent wavelength (that of the atmosphere at earths surface in which we observe the Universe, but it is all we have, and we are forced to interpret the Universe in terms of our local "constants", $\{c, h, g, G\}$ where coordinates only enter in the relation of a $\left(1/R^2\right)$ law where

$\varphi^2(R) = \left(m_0 + m_2\right)^2 = \left(m_0 + m_1\right)^2 = m_0{}^2 + m_1{}^2 + 2m_0m_1 = m_0{}^2 + m_1{}^2 + h^2$, where

$h^2 = G\left(\frac{m_0 m_1}{R^2}\right) = \left(\frac{m_0\left[Gm_0\right]}{R^2}\right)$, and $m_0 = c\tau_0$ for any given mass $\lambda = m_\lambda = \left(c\tau\right)_\lambda = \left(c_\lambda \tau_\lambda\right)$.

For all other approaches, space or time (but not both) characterize mass change in the relation of an excitation $\beta = \frac{v}{c}$ to $\gamma = \frac{\tau'}{\tau}$ as an initial or final state ($\tau' = \tau$), to be defined below. Imaginary boundaries can be set in terms of groups of particles, all with the same density separated by empty space, where ALL particles of a given type and excitation change the same way everywhere, every when from an initial state to a final state, before and after which there is no excitation, so $\beta = 0$

The creation and destruction of matter in an empty Universe

Imagine a pure "vacuum" of the Universe; no matter, no light, nothing, which is characterized by the number 0.

Into that Universe I (believe me or not) introduce a single particle, which I call "Unity" and assign it a mass $m_0 = +1$ The subscript zero means there are no other particles, so it is not interacting with anything. The number "1" is interpreted as an initial condition or state of the particle. The "$+$" sign characterizes its existence, so that the mass is positive definite $m_0 = \sqrt{(m_0)^2} = \sqrt{(1)^2} = +1$. The only way to destroy the particle is by creating an imaginary counterpart, with a mass $m_0^{-} = m_0 = \left(\sqrt{-1}\right)^2 = i^2 = -1$, so that $m_0 + m_0 = m_0 + (-m_0) = 1 + (-1) = 1 - 1 = 0$, so the Universe is completely empty again.

I call the number "1" the **basis** of the matter in the Universe that I just created and destroyed…

Note that I can't destroy the empty Universe by itself, since there is nothing there to begin with, even though I am conscious of it; to destroy the Universe would be equivalent to destroying me, so there would not even be knowledge of any possible Universe.

The second particle

I now bring back my original particle and create a second identical particle, which I can count by relating them with the sign of existence, "$+$", so that $2 = m_0 + m_0 = 1 + 1$, where "2" is the "count" of the number of existing particles, that are not related in any other way; that is, they do not **interact**.

The two particles make up a single system of mass, which is distinguished from the count by assigning $\varphi \triangleq m_0 + m_0$ which is now distinguished from the bases of individual masses in the system.

Energy

If the masses interact with each other, the system is then characterized by its energy

$\varphi^2 = (m_0 + m_0)^2 = \left[(m_0)^2 + (m_0)^2\right] + \left[2(m_0)(m_0)\right] = 4(m_0)^2$, which has an energy count equal to 4

Note that φ^2 has two sections, $\psi^2 \triangleq \left[(m_0)^2 + (m_0)^2\right]$ where each mass has a non-interacting energy, and $h^2 \triangleq \left[2(m_0)(m_0)\right]$ characterizing the interaction, where I have kept the contribution of the individual particles distinct by the use of parenthesis, which defines the interaction as multiplication without a distributive law so that $2(m_0)(m_0)$ is distinct from $2(m_0)^2$ in the characterization of the interaction, and the individual contributions of the otherwise identical particles is retained. (Note: In this context, the masses are referred to as "nomials")

Then

$\varphi^2 = (1+1)^2 = \left[(1)^2 + (1)^2\right] + \left[2(1)(1)\right]$ where the masses ψ^2 are self-interacting, and the masses in h^2 are interacting with each other. The terms that are squared (φ^2, ψ^2, h^2) , and the quantity $s^2 \triangleq (1)(1) = 1^2$ is called "spin", so that $s = \frac{h}{\sqrt{2}}$, where the identities of the particles are no longer retained and in that context is equivalent to an energy as well.

The total energy of the system is then

$\varphi^2 = (E_0 + E_0)^2 = \left[(E_0)^2 + (E_0)^2\right] + \left[2(E_0)(E_0)\right] = \left[(E_0)^2 + (E_0)^2\right] + \left[h^2\right]$, where the count of the energies has increased to 3 because of the interaction. An change where the interaction is an increase will be designated by the color blue (h^2), and the case where the interaction is a decrease will be designated by the color red $(h^2) = (ih) = -(h^2)$ (In context, these are referred to as "blue" and "red" shifts of energy, respectively.

It is important to note that there are two interpretations of the effect of the interaction on the total energy of the system.

1. φ^2 changes with the interaction to a new total system energy $\varphi^2 -> (\varphi')^2$. In this case, h^2 is an "outside" perturbation that increases or decrease φ^2. If the interaction results in a negative value for φ^2, then the basis itself decreases $(\varphi')^2 = \left[1^2 + 1^2\right] - h^2 = \left[1^2 + 1^2\right] + h^2$ until finally there is "nothing" $\varphi^2 + \varphi^2 = 0$.
2. φ^2 is invariant (energy is "conserved". In this case, E_0 changes to a lesser value $(E_0)'$ to compensate for the interaction.

Distinguishable Particle/Fields

I now wish to modify the initial two particles to the Universe by endowing them with separate masses, defined by $(v,c)=(v*1,c*1)$

The count is then characterized by $\varphi \triangleq v+c=2$, and the energy by $\varphi^2=\left[v^2+c^2\right]+\left[2cv\right]$, where $\psi^2=\left[v^2+c^2\right]$ and $h^2=\left[2cv\right]$, noting that the v and c are interchangeable, and commute in both addition and multiplication. These variables are independent, since their bases are independent, and so both are complete in their respective real number systems $(\mathbb{R},\mathbb{R})$

It is now desired to specify an initial and a final state within a single real number system, which can be done via the scaling factors τ and τ' where the initial state is defined as $s_0=(c\tau)$, the final state as $s'=(c\tau')$ and the change in state as $s_v=(v\tau')$ so that $\varphi=s'=s_v+s_0$; that is,

$$(c\tau')=(v\tau')+(c\tau) \tag{1.1}$$

Since $(v\tau')$ and $(c\tau)$ are independent, they are characterized by their individual bases $(1_{v\tau'})$ and $(1_{c\tau})$, but $(c\tau')$ is characterized by the single basis $1_{c\tau'}$ so in terms of the bases, equation (1.1) is expressed by $1_{c\tau'}=1_{v\tau'}+1_{c\tau}$.

Then the energies are characterized by the relations

$$(1_{c\tau'})^2=(1_{v\tau'})^2+(1_{c\tau})^2+2(1_{v\tau'})(1_{c\tau}) \tag{1.2}$$

and

$$\varphi^2=(c\tau')^2=(v\tau')^2+(c\tau)^2+2(c\tau)(v\tau') \tag{1.3}$$

where the rules of multiplicative association and distribution are not allowed to preserve nomial identity.

Note that equation (1.3) is the parameterized Binomial Expansion $(x+y)^2 = x^2 + y^2 + 2xy$

for the case $n = 2$ expressed as the parameterized value $z^2 = (x+y)^2 = x^2 + y^2 + 2xy$ where $z = (c\tau')$ and all parameters are positive definite. For $n > 2$ the proof of Fermat's theorem immediately follows:

The Relativistic Unit Circle (and proof of Fermat's theorem) (Ref. 1)

Equation (1.3) is then quasi-complete in a single positive real number system since it includes all real numbers and mathematical operations for positive real numbers except for the rules of multiplicative association and distribution.

Final State

To further express equation (1.3) as a final state, both sides of the equation can be divided by $(c\tau')^2$ so that

$$(1')^2 = (\beta)^2 + \left(\frac{1}{\gamma}\right)^2 + 2\left(\frac{\beta}{\gamma}\right) = (\beta)^2 + \left(\frac{1}{\gamma}\right)^2 + h^2 \text{, where } h^2 = 2\left(\frac{\beta}{\gamma}\right) \quad (1.4)$$

where the energy basis of the single field is expressed as $(E')^2 = (1')^2$, and

$$\text{and } \gamma = \frac{\tau'}{\tau} \text{, and } \beta = \frac{v}{c} \quad (1.5)$$

Initial State

To express (1.3) as an initial state, both sides of the equation can be divided by $(c\tau)^2$ so that

$$(\gamma)^2 = (\beta\gamma)^2 + (1)^2 + 2\beta\gamma = (\beta\gamma)^2 + (1)^2 + h^2 \text{, where } h^2 = 2\beta\gamma \quad (1.6)$$

where γ and β are defined as in (1.5)

Equation (1.6) can be expressed in terms of its energy basis $(E_0)^2 = (1)^2$ so that

$$(1)^2 = (\gamma)^2 - (\beta\gamma)^2 - 2\beta\gamma \quad (1.7)$$

Elimination of the Interactions (Special Relativity)

The interactions $h^2 = 2\frac{\beta}{\gamma}$ and $h^2 = 2\beta\gamma$ can be eliminated in several ways:

1. Conjugation
   Setting $\psi = (\gamma + i\beta)$ so that $(\psi)(\psi^*) = (\psi^*)(\psi) = (\gamma + i\beta)(\gamma - i\beta) = \gamma^2 + \beta^2$. This can then be identified with the complex function $\varphi^2 = \gamma^2 + \beta^2$
   This equation can be expressed as

$$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 \tag{1.8}$$

which can be solved for the so-called "time dilation equation" so that

$$\tau' = \tau(\gamma_L), (\gamma_L) = \frac{1}{\sqrt{1-\beta^2}}, \beta = \frac{v}{c} \text{ , where } (\gamma_L) \text{ is called "the Lorentz factor"} \tag{1.9}$$

2. Degeneracy

   If the interaction term is subsumed φ^2 by redefining it so that $(\varphi')^2 = \left(\frac{1}{\gamma'}\right)^2 + (\beta')^2$ or $(1)^2 = (\gamma')^2 - (\gamma'\beta')^2$ where the internal parameters have been modified to account for the degeneracy. The degeneracy can be removed arbitrarily but further altering the parameters so that for an arbitrary (usually taken to be infinitesimal) $(\in'')^2$, where setting

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

$$(1)^2 = (\gamma'')^2 - (\gamma''\beta'')^2 + (\in'')^2$$

   The degeneration can be removed by setting $(\in'')^2 = h^2$ restores equations (1.6) and (1.7) back to their original condition.

The relationship of State Change to γ and β

If there is no change of state, then $(v\tau')=0$, so that $(\beta)^2=0$ $(c\tau')^2=(c\tau)^2$ and $(\tau')^2=(\tau)^2$, so that $(\gamma)^2=1^2$ and $\frac{(\tau')^2}{(\tau)^2}=\frac{(\tau)^2}{(\tau')^2}=\frac{{1_{\tau}}^2}{{1_{\tau'}}^2}=\frac{{1_{\tau'}}^2}{{1_{\tau}}^2}={1_{(c\tau')}}^2$ as the bases for the positive real "nomials".

1. The Relativistic Unit Circle (and proof of Fermat's Theorem