Hypothesis of oscillation field of spacetime

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May 4, 2019

Abstract

In this hypothesis i will present possible mathematical model which describes gravity as consequence of tensor $K_{\alpha\beta}$ and symmetry associated with it. That tensor satisfies the equation:

$$\frac{\partial\Psi_a}{\partial\zeta_\alpha}\frac{\partial\Psi_b}{\partial\zeta_\beta}T^{ab}-\frac{\partial\Psi_a}{\partial\sigma_\alpha}\frac{\partial\Psi_b}{\partial\sigma_\beta}g^{ab}=K_{\alpha\beta}$$

Where Ψ_a is a vector in four dimensional spacetime, which has four variables (proper time) , $(\sigma^0,...,\sigma^3)$ while g^{ab} is the metric tensor,co-curvilinear coordinates are presented as ζ_α,ζ_β and T^{ab} is tensor that says how much energy there is in system.

This hypothesis allows moving at a speed greater than the speed of light, but only if the length of the smallest change in time can be less than the Planck time, the relationship between the transformation of two different reference systems with different permissible length of the smallest time is determined by the equation:

$$K_{\alpha_n\beta_n}=\left(\left(K_{\alpha_m\beta_m}K^{\alpha_m\beta_m}_{\alpha_{m+1}\beta_{m+1}}\right)...K_{\alpha_{n-1}\beta_{n-1}}K^{\alpha_{n-1}\beta_{n-1}}_{\alpha_n\beta_n}\right)$$

Where subscripts (n,m) mean speed of light to the power of subscripts , for $m=1$ result is just normal spacetime with speed of light being the speed limit and smallest possible time is Planck time, for $n>1$ it means speed of light to the power n and power of smallest possible time.For each system speed of light limit is locally preserved which means that both system in their reference frame still measure speed of light and Planck time as smallest possible time and the highest possible speed.

This hypothesis connects spins of particle with symmetries which that system meets or breaks, first symmetry says that if system is massless -it has same movement in space and time(it travels at speed of light), that is, the part of the equation $\frac{\partial\Psi_a}{\partial\sigma_\alpha}\frac{\partial\Psi_b}{\partial\sigma_\beta}g^{ab}$ is equal to zero. Second symmetry says about how much contribution of energy from system is equal to it's gravity energy or greater, if that symmetry is not meet , it means that contribution of energy is less so $K_{\alpha\beta}$ is negative. When symmetry is meet tensor has positive value or zero.

In this hypothesis i will use Einstein summation convention and tensor product of two vectors, everywhere where there are two or more vector with same rank (covariant or contravariant) it means their tensor product, same with tensors if there is two or more tensors one after another with same rank it means their tensor product.

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1 Equation of field

I write wave function in covariant form by $\Psi_a(\sigma^0,...,\sigma^3)$ where it's variables $\sigma^0...\sigma^3$ means proper time, measured for curvilinear coordinates ζ_a and i write wave function in contravariant form by $\Psi^a(\sigma^0,...,\sigma^3)$, where proper time is measured for curvilinear coordinates ζ^a. In whole that paper i will just use notation Ψ_a or Ψ^a. Each coordinate has four proper times that imply four sigma variables. At zero energy getting to count only geometry of field , that wave function satisfy equation for indexes (a,b), where g_{ab} is metric tensor and this system is massless:

$$\frac{\partial\Psi^a}{\partial\sigma^\alpha}\frac{\partial\Psi^b}{\partial\sigma^\beta}g_{ab}=0 \tag{1.1}$$

Where energy is not equal zero, it has to be taken into equation by energy in curvilinear co-ordinates that come from geometry of a fied $(\zeta^0,...,\zeta^3)$ and tensor of energy of a system, field satisfy this equation for massive and massless systems :

$$\frac{\partial\Psi^a}{\partial\zeta^\alpha}\frac{\partial\Psi^b}{\partial\zeta^\beta}T_{ab}-\frac{\partial\Psi^a}{\partial\sigma^\alpha}\frac{\partial\Psi^b}{\partial\sigma^\beta}g_{ab}=0 \tag{1.2}$$

Equation (1.2) describes a symmetrical condition that comes from energy contribution to geometry of spacetime is equal to it's total energy, but if it's not fulfilled there is need for another object, tensor $K^{\alpha\beta}$ which it replaces zero to right side of equation it says what is difference between energy contribution to geometry of spacetime and it's total energy, put that in equation:

$$\frac{\partial\Psi^a}{\partial\zeta^\alpha}\frac{\partial\Psi^b}{\partial\zeta^\beta}T_{ab}-\frac{\partial\Psi^a}{\partial\sigma^\alpha}\frac{\partial\Psi^b}{\partial\sigma^\beta}g_{ab}=K^{\alpha\beta} \tag{1.3}$$

Because more comfortable is to write this tensor in covariant form than contravariant, changing all indexes in equation (1.3) i get:

$$\frac{\partial\Psi_a}{\partial\zeta_\alpha}\frac{\partial\Psi_b}{\partial\zeta_\beta}T^{ab}-\frac{\partial\Psi_a}{\partial\sigma_\alpha}\frac{\partial\Psi_b}{\partial\sigma_\beta}g^{ab}=K_{\alpha\beta} \tag{1.4}$$

This equation is for one system , if tensor $K_{\alpha\beta}$ is equal to zero then it's only gravity system, if it meets equation (1.1) it has symmetry of space and time (massless), for two systems equation expands with two metric tensors and two energy tensors:

$$\frac{\partial\Psi_a}{\partial\zeta_\alpha}\frac{\partial\Psi_b}{\partial\zeta_\beta}\frac{\partial\Psi_c}{\partial\zeta_\gamma}\frac{\partial\Psi_d}{\partial\zeta_\delta}T^{ab}T^{cd}-\frac{\partial\Psi_a}{\partial\sigma_\alpha}\frac{\partial\Psi_b}{\partial\sigma_\beta}\frac{\partial\Psi_c}{\partial\sigma_\gamma}\frac{\partial\Psi_d}{\partial\sigma_\delta}g^{ab}g^{cd}=K_{\alpha\beta}K_{\gamma\delta} \tag{1.5}$$

For N this equation will have N metric tensors and N energy tensors , from that comes N tensors K, writing it all but this time using letters $a_1...a_{2N}$ for function Ψ and for metric and energy tensors but letters $\alpha_1...\alpha_{2N}$ for tensor K i get equation:

$$\frac{\partial\Psi_{a_1}}{\partial\zeta_{\alpha_1}}\frac{\partial\Psi_{a_2}}{\partial\zeta_{\alpha_2}}...\frac{\partial\Psi_{a_{2N-1}}}{\partial\zeta_{\alpha_{2N-1}}}\frac{\partial\Psi_{a_{2N}}}{\partial\zeta_{\alpha_{2N}}}T^{a_1a_2}...T^{a_{2N-1}a_{2N}}$$
$$-\frac{\partial\Psi_{a_1}}{\partial\sigma_{\alpha_1}}\frac{\partial\Psi_{a_2}}{\partial\sigma_{\alpha_2}}....\frac{\partial\Psi_{a_{2N-1}}}{\partial\sigma_{\alpha_{2N-1}}}\frac{\partial\Psi_{a_{2N}}}{\partial\sigma_{\alpha_{2N}}}g^{a_1a_2}...g^{a_{2N-1}a_{2N}}=K_{\alpha_1\alpha_2}...K_{\alpha_{2N-1}\alpha_{2N}}$$

2 Speed of light limit in field equation

For systems that satisfy symmetry of space and time which means equation (1.1) is valid , they have to move with speeed of light, it means that in fudamental unit of time (Planck time)there can't be more than one oscillation of field(frequency multiplied by Planck time can't be more than one) and change of oscillation can't be faster than change by an valuve in one unit of time.

This limit can be bypassed if there is speed greater than speed of light that means unit time smaller than Planck time. But locally in reference frame speed of light is always greatest, but it's possible to write transformations that describe greater than speed of light and time smaller than Planck time. If co-curved coordinate ζ_{α_1} means that greatest speed is speed of light and ζ_{α_2} that that speed is c^2 i will write transformation of wave function as:

$$\Psi_{\alpha_2} = \Psi^{\alpha_1}_{\alpha_2} \frac{\partial \Psi_{\alpha_1}}{\partial \sigma_{\alpha_2}} \frac{\partial \zeta_{\alpha_1}}{\partial \zeta_{\alpha_2}} \tag{2.1}$$

When that transformation goes from number m to number n, where $n > m$ i can write it as:

$$\Psi_{\alpha_n} = \left(\Psi^{\alpha_{n-1}}_{\alpha_n} \frac{\partial}{\partial \sigma_{\alpha_n}} ... \left(\Psi^{\alpha_{m+1}}_{\alpha_{m+2}} \frac{\partial}{\partial \sigma_{\alpha_{m+1}}} \left(\Psi^{\alpha_m}_{\alpha_{m+1}} \frac{\partial \Psi_{\alpha_m}}{\partial \sigma_{\alpha_{m+1}}} \frac{\partial \zeta_{\alpha_m}}{\partial \zeta_{\alpha_{m+1}}} \right) \frac{\partial \zeta_{\alpha_{m+1}}}{\partial \zeta_{\alpha_{m+2}}} \right) ... \frac{\partial \zeta_{\alpha_{n-1}}}{\partial \zeta_{\alpha_n}} \right) \tag{2.2}$$

For two wave functions $\Psi_{\alpha_n}\Psi_{\beta_n}$ that come in field equation, this transformation takes form:

$$\Psi_{\alpha_n}\Psi_{\beta_n} = \left(\Psi^{\alpha_{n-1}}_{\alpha_n} \Psi^{\beta_{n-1}}_{\beta_n} \frac{\partial}{\partial \sigma_{\alpha_n}} \frac{\partial}{\partial \sigma_{\beta_n}} ... \left(\Psi^{\alpha_m}_{\alpha_{m+1}} \Psi^{\beta_m}_{\beta_{m+1}} \frac{\partial \Psi_{\alpha_m}}{\partial \sigma_{\alpha_{m+1}}} \frac{\partial \Psi_{\beta_m}}{\partial \sigma_{\beta_{m+1}}} \frac{\partial \zeta_{\alpha_m}}{\partial \zeta_{\alpha_{m+1}}} \frac{\partial \zeta_{\beta_m}}{\partial \zeta_{\beta_{m+1}}} \right) ... \frac{\partial \zeta_{\alpha_{n-1}}}{\partial \zeta_{\alpha_n}} \frac{\partial \zeta_{\beta_{n-1}}}{\partial \zeta_{\beta_n}} \right) \tag{2.3}$$

In field equation key role plays tensor $K_{\alpha\beta}$, transformations of that tensor can be understand as q transfrmations where $q = n - m$, so there is necessary tensor that has $2q$ indexes or equivalently q tensors that transform tensor $K_{\alpha\beta}$. Writing then tensor $K_{\alpha_n\beta_n}$ relative to transformation of tensor $K_{\alpha_m\beta_m}$ where $n > m$:

$$K_{\alpha_n\beta_n} = \left(\left(K_{\alpha_m\beta_m} K^{\alpha_m\beta_m}_{\alpha_{m+1}\beta_{m+1}} \right) ... K_{\alpha_{n-1}\beta_{n-1}} K^{\alpha_{n-1}\beta_{n-1}}_{\alpha_n\beta_n} \right) \tag{2.4}$$

For many systems that tensor has total $2N$ indexes, where N is number of systems, equations takes form:

$$K_{\alpha_n\beta_n} ... K_{N_nM_n} =$$
$$\left(\left(K_{\alpha_m\beta_m} K^{\alpha_m\beta_m}_{\alpha_{m+1}\beta_{m+1}} ... K_{N_mM_m} K^{N_mM_m}_{N_{m+1}M_{m+1}} \right) ... K_{\alpha_{n-1}\beta_{n-1}} K^{\alpha_{n-1}\beta_{n-1}}_{\alpha_n\beta_n} .... K_{N_{n-1}M_{n-1}} K^{N_{n-1}M_{n-1}}_{N_nM_n} \right)$$

If tensor $K_{\alpha\beta}$ is equal to zero, it is equal to zero in every transformation, if it satisfy equation (1.1) and it's equal zero, it does do it in every transformation, writing it all as one:

$$K_{\alpha_m\beta_m} = 0$$
$$K_{\alpha_n\beta_n} = \left(\left(K_{\alpha_m\beta_m} K^{\alpha_m\beta_m}_{\alpha_{m+1}\beta_{m+1}} \right) ... K_{\alpha_{n-1}\beta_{n-1}} K^{\alpha_{n-1}\beta_{n-1}}_{\alpha_n\beta_n} \right) = 0$$
$$\frac{\partial \Psi_{\alpha_m}}{\partial \sigma_{\alpha_m}} \frac{\partial \Psi_{\beta_m}}{\partial \sigma_{\beta_m}} g^{\alpha_m\beta_m} = 0$$
$$\frac{\partial \Psi_{\alpha_n}}{\partial \sigma_{\alpha_n}} \frac{\partial \Psi_{\beta_n}}{\partial \sigma_{\beta_n}} g^{\alpha_n\beta_n} = 0$$

3 Symmetries: gravitons, photons and massive particles

Tensor $K_{\alpha\beta}$ can satisfy the basic symmetry that says energy of system is greater or equal to it's contribution into geometry of spacetime (gravitation) then that tensor has valuve equal to zero or greater than zero, but if it breaks this symmetery it has less than zero. Second symmetry is equation (1.1) that says system is symemetric in space and time from that follows it's massless, those two symmetries are basic idea in that hypothesis.

Any system can satisfy those symetry ,break them or it's not applicable, this symmetry is strongly related with spin. If i write that first symmetry as S_1 and second symmetry as S_2 when first symmetry is satisfied value that system takes is $+S_1 = \frac{1}{2}$ or $+S_2 = \frac{1}{2}$. Similarly when symmetry is broken it takes vaule $-S_1 = -\frac{1}{2}$ or $-S_2 = -\frac{1}{2}$, but because those symmetries have to go with pairs it means four combinations:

$$\{(+S_1, +S_2), (+S_1, -S_2), (-S_1, +S_2), (-S_1, -S_2)\}$$

To each combinations it comes number Q that can have valuve equal to, 0 (not applicable) or $+1$ (symmetry is active) and (-1 it can have that symmetry but it is in a state without it) combining it all in matrix i can write it as:

$$Q_{ij} = \begin{bmatrix} +S_1 Q_{11} & +S_2 Q_{12} \\ -S_1 Q_{21} & +S_2 Q_{22} \\ +S_1 Q_{31} & -S_2 Q_{32} \\ -S_1 Q_{41} & -S_2 Q_{32} \end{bmatrix}$$

For every spin of system i can get it's value by summing elements that have same column but for each sum there is the absolute value of their sum, spin can be negative. Writing that when i writie spin as ϕ:

$$\phi = \sum_{i,j \in S} \left| Q_{i1} + Q_{j2} \right| \tag{3.1}$$

Rule is that system can't satisfy same symmetry pair two times , for example photon has spin equal to one because only matrix elements Q_{11} and Q_{12} are satisfy and number is equal to $Q = 1$ always, in contrast electron has matrix element Q_{11} in first line and elements Q_{21} and Q_{22}, electron is not applicable by symmetry $-S_2$, electron moving with speed of light had to have spin third-two. Graviton has spin two that means it satisfy matrix elements and symmetry related with them Q_{11} and Q_{12} , Q_{41} and Q_{42} , it exist in two states both of them have spin two, one of them is masless and it's contribution to gravity is equal or greater than his energy, second has mass and his contribution to gravity is less than it's energy. Formally i write symmetry S_1 when equation (1.1) is equal to zero or when it's not equal to zero when it's broken:

$$S \in +S_1 \Leftrightarrow \frac{\partial \Psi_a}{\partial \sigma_\alpha} \frac{\partial \Psi_b}{\partial \sigma_\beta} g^{ab} = 0 \tag{3.2}$$

$$S \in -S_1 \Leftrightarrow \frac{\partial \Psi_a}{\partial \sigma_\alpha} \frac{\partial \Psi_b}{\partial \sigma_\beta} g^{ab} \neq 0 \tag{3.3}$$

For symmetry $\pm S_2$ condition for tensor $K_{\alpha\beta}$ is when it's equal or greater than zero it satisfy or when it's less than zero it breaks that symmetry:

$$S \in +S_2 \Leftrightarrow \sum_{\alpha,\beta} K_{\alpha\beta} \geq 0 \tag{3.4}$$

$$S \in -S_2 \Leftrightarrow \sum_{\alpha,\beta} K_{\alpha\beta} < 0 \tag{3.5}$$

4 Geometry and measurement in field equation

In General Theory of Relativity, metric for solving field equation is understand as scalar quantity (ds^2) it's differential of space-time interval. In my field equation is not possible derive exactly this quantity, because field equation requires ten solutions like it (sixteen but only ten independent), so metric quantity is define as tensor in covariant form:

$$U_{\alpha\beta} = \int_{\alpha,\beta} \sum_{a,b} d\Psi_a d\Psi_b g^{ab} d\sigma_\alpha d\sigma_\beta \tag{4.1}$$

It can be written in contravariant form by changing the indexes in equation, where every part of equation is solution to field equation (1.3 and 1.4):

$$U^{\alpha\beta} = \int_{\alpha,\beta} \sum_{a,b} d\Psi^a d\Psi^b g_{ab} d\sigma^\alpha d\sigma^\beta \tag{4.2}$$

From both of this tensors i can approximate differential of space-time interval (ds^2), by summing indexes (α, β) so i get:

$$ds^2 \approx \sum_{\alpha,\beta} U_{\alpha\beta} \approx \sum_{\alpha,\beta} U^{\alpha\beta} \tag{4.3}$$

In quantum physics measurement play key role, in my model there is need for a special tensor quantity that is approximation of classical probability of system being in some state. I will write this tensor quantity as $P_{\alpha\beta}$ in covariant form:

$$n(\alpha,\beta)\left(\left|\int_{\alpha,\beta} \sum_{a,b} \Psi_a \Psi_b T^{ab} d\zeta_\alpha d\zeta_\beta\right| + \left|\int_{\alpha,\beta} \sum_{a,b} \Psi_a \Psi_b g^{ab} d\sigma_\alpha d\sigma_\beta\right|\right) = P_{\alpha\beta} \tag{4.4}$$

Where function $n(\alpha, \beta)$ is a normalization function that fulfills need that whole function is equal to one. For some part of function that goes from part of spacetime X_a to another part X_b this equation will be just range in equation (4.4):

$$n(\alpha,\beta)\left(\left|\int_{\alpha,\beta} \sum_{a,b} \Psi_a \Psi_b T^{ab} d\zeta_\alpha d\zeta_\beta\right| + \left|\int_{\alpha,\beta} \sum_{a,b} \Psi_a \Psi_b g^{ab} d\sigma_\alpha d\sigma_\beta\right|\right)\Bigg|_{X_a}^{X_b} = P_{\alpha\beta}\Big|_{X_a}^{X_b}$$

Normalization condition means that for whole spacetime where wave function is spread, tensor $P_{\alpha\beta}$ is equal to one. Writing it where X means whole spacetime i get:

$$n(\alpha,\beta)\left(\left|\int_{\alpha,\beta} \sum_{a,b} \Psi_a \Psi_b T^{ab} d\zeta_\alpha d\zeta_\beta\right| + \left|\int_{\alpha,\beta} \sum_{a,b} \Psi_a \Psi_b g^{ab} d\sigma_\alpha d\sigma_\beta\right|\right)\Bigg|_{X} = P_{\alpha\beta}\Big|_X = 1 \tag{4.5}$$

That condition just means for whole spacetime probability of finding system for specific coordinate is equal to one, which need comes from simple probability theory. Writing same tensor but this time in contravariant form i get:

$$n(\alpha,\beta)\left(\left|\int_{\alpha,\beta} \sum_{a,b} \Psi^a \Psi^b T_{ab} d\zeta^\alpha d\zeta^\beta\right| + \left|\int_{\alpha,\beta} \sum_{a,b} \Psi^a \Psi^b g_{ab} d\sigma^\alpha d\sigma^\beta\right|\right) = P^{\alpha\beta} \tag{4.6}$$

5 Appendix A: Particles and forces of standard model

In this appendix i will write which elements of symmetry each force of standard model fulfills and states (symmetrical,anti-symmetrical) of that forces. I will start by writing how to calculate electric charge , electric charge contribution comes only from elements of symmetry matrix (Q_{ij}) that are: $Q_{21}, Q_{22}, Q_{31}, Q_{32}$. To calculate value of electric charge i sum absolute valuve of those matrix elements -each valuve can have minus sign or plus sign charge, i will write it by:

$$e^{\pm} = \sum_{i=2\vee 3} |Q_{i1}| + |Q_{i2}| \tag{5.1}$$

Relation between matrix Q_{ij} and as it follows from it which symmetry field equation (1.3) fulfills i will write in table , in which beyond states i will present condition that is needed to make field emit particle of that field. I will write states as element of matrix where S value will be written as plus or minus signs. This table describes fields (forces) and it's corresponding emited particle, but does not describe particles of standard model, it has form:

Symmetry and standard model			
Force	Symmetrical state	Anti-symmetrical state	Emission
Strong	$+Q_{11}, Q_{22}, Q_{12}; -Q_{31}, Q_{21}$	$+Q_{31}, Q_{21}; -Q_{11}, Q_{22}, Q_{12}$	Both states
Electromagnetic	$\pm Q_{21}, \pm Q_{22}, \pm Q_{31}, \pm Q_{32}$	$\pm Q_{21}, \pm Q_{22}, \pm Q_{31}, \pm Q_{32}$	$-Q_{k\wedge l,1} \rightarrow Q_{k\wedge l,1}\big\|_{k\neq l}$
Weak	$+Q_{11}, Q_{12}, Q_{22}; -Q_{21}$	$-Q_{11}, Q_{12}, Q_{22}; +Q_{21}$	$Q_{1\vee 2,1} \rightarrow -Q_{1\vee 2,1}$ $Q_{1\wedge 2,1} \rightarrow -Q_{1\wedge 2,1}$
Gravity	$+Q_{11}, Q_{12}; -Q_{41}, Q_{42}$	$-Q_{11}, Q_{12}; +Q_{41}, Q_{42}$	Always/Breaking symmetry state
Higgs Field	$+Q_{11}; -Q_{12}$	$+Q_{12}; -Q_{11}$	Both states

Each fundamental particle or composite particle fulfills one of those written in table forces. Gravitons are only field that in symmetrical state is always present and does not depend on other fields (forces). Change from one symmetry to another one in some system always creates emission of particle that balances that change and keeps system in original symmetry state or changes it by interaction. For example electron that emits photon for a short moment changes state of matrix element Q_{11} from sign minus to plus sign and same with matrix element Q_{21} , from that change photon is created that is emited and electron goes to orginal state but it gains additional energy, this pattern works for any other field (force). I will write table that describes all fundamental particles and symmetrical state or anti-symmetrical state of them:

Fundamental particles		
Particle	Symmetrical state	Anti-symmetrical state
Neutrino	$+Q_{12}, Q_{42}; -Q_{41}$	$+Q_{12}, Q_{42}, Q_{41}$
Electron/Moun/Tau	$+Q_{21}, Q_{22}; -Q_{11}$	$+Q_{21}, Q_{22}, Q_{11}$
Quarks/Gluon	$+Q_{11}, Q_{22}, Q_{12}; -Q_{31}, Q_{21}$	$+Q_{31}, Q_{21}; -Q_{11}, Q_{22}, Q_{12}$
Graviton	$+Q_{11}, Q_{12}; -Q_{41}, Q_{42}$	$-Q_{11}, Q_{12}; +Q_{41}, Q_{42}$
Higgs Boson	$+Q_{11}; -Q_{12}$	$+Q_{12}; -Q_{11}$
Photon	$+Q_{11}, +Q_{12}$	$+Q_{11}, +Q_{12}$
Boson$W^{\pm}$	$+Q_{11}, Q_{12}, Q_{22}; -Q_{21}$	$+Q_{21}; -Q_{11}, Q_{12}, Q_{22}$
Boson Z	$+Q_{11}, Q_{12}$	$-Q_{11}, Q_{12}$