Hypothesis of oscillation field of spacetime

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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 $\zeta_\alpha, \zeta_\beta$ 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.

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1 Equation of field

Scalar function $\Psi^2(\sigma^0,...,\sigma^3)$ where variables σ means proper time for coordinate $\sigma^0,...,\sigma^3$ i will call function that comes from product of any vector-covector product $\Psi_a(\sigma^0,...,\sigma^3)$ $\Psi^a(\sigma^0,...,\sigma^3)$ writing it :

$$\Psi_a(\sigma^0,...,\sigma^3)\Psi^a(\sigma^0,...,\sigma^3) = \Psi_a\Psi^a = \Psi^2(\sigma^0,...,\sigma^3) = \Psi^2 \tag{1.1}$$

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:

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

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 :

$$\frac{\partial\Psi^a}{\partial\zeta^\alpha}\frac{\partial\Psi^b}{\partial\zeta^\beta}T_{ab} - \frac{\partial\Psi^a}{\partial\sigma^\alpha}\frac{\partial\Psi^b}{\partial\sigma^\beta}g_{ab} = 0 \tag{1.3}$$

Equation (1.3) 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:

$$\frac{\partial\Psi^a}{\partial\zeta^\alpha}\frac{\partial\Psi^b}{\partial\zeta^\beta}T_{ab} - \frac{\partial\Psi^a}{\partial\sigma^\alpha}\frac{\partial\Psi^b}{\partial\sigma^\beta}g_{ab} = K^{\alpha\beta} \tag{1.4}$$

Because more comfortable is to write this tensor in covariant form than contravariant, changing all indexes in equation (1.4) i get:

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

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 (1.2) it has symmetry of space and time (massless), for two systems equation expands with two metric tensors and two energy tensors:

$$\frac{\partial\Psi_a}{\partial\zeta_\alpha}\frac{\partial\Psi_b}{\partial\zeta_\beta}\frac{\partial\Psi_c}{\partial\zeta_\gamma}\frac{\partial\Psi_d}{\partial\zeta_\delta}T^{ab}T^{cd} - \frac{\partial\Psi_a}{\partial\sigma_\alpha}\frac{\partial\Psi_b}{\partial\sigma_\beta}\frac{\partial\Psi_c}{\partial\sigma_\gamma}\frac{\partial\Psi_d}{\partial\sigma_\delta}g^{ab}g^{cd} = K_{\alpha\beta}K_{\gamma\delta} \tag{1.6}$$

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:

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

2 Speed of light limit in field equation

For systems that satisfy symmetry of space and time which means equation (1.2) 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 (1.2) 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 (1.2) 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 (1.2) 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:

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

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