Energy and SpaceTime

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Abstract

Referring to special theory of relativity led by Albert Einstein, we define some properties of gravitons derived by the motion of mass. Based on this concept, we define the geometrical description of mass. Furthermore, we consider the wave function of energy by following these definitions and conclude the eternal universe.

1 Properties of gravitons

In this section, we define the energy of gravitons g with a postulate that gravitons are massless particle moves with the velocity c which is defined as the velocity of photons in the special relativity. Here we consider a collision that a graviton G collides a mass object M whose mass is m_0. After the collision, M starts to move in the same direction of graviton, with the velocity v by absorbing graviton completely. We derive its energy by applying this collision to the energy-momentum equation, $E^2 = m_0^2 + p^2 = \gamma^2 m_0^2$, where E is energy, p is momentum, $\gamma = 1/\sqrt{1-v^2}$ and we set $c = 1$. The left-hand side represents the energy before the collision and the right-hand side is the one after the collision. With the conservation of energy, the collision of G and M could be expressed to

$$g + m_0 = \gamma m_0. \tag{1}$$

Now we find the energy of graviton in this case is followed,

$$g = m_0(\gamma - 1). \tag{2}$$

We can find this collision breaks the conservation of momentum however if graviton has another property which mass and moving mass haven't, the conservation of it would also break. These law of conservation might consist with their breaks by the amount as followed,

$$p - g = 1 - \frac{\sqrt{1-v}}{\sqrt{1+v}}. \tag{3}$$

We have derived two gravitational properties by the two inertial frames of reference split by the collision of mass and graviton. Now we consider how this graviton model works on the earth as the gravitons are falling from the sky to the ground. We observe this collision with a segment of gravitational filed so called graviton, if we are not be affected by this graviton, we can be fixed at rest on the ground like the observer who placed far from the earth. After the collision, the mass moves toward the ground with a certain velocity.

We point out two observable facts about gravitation that any of objects accelerate with the same rate on the earth regardless any of mass, and another fact is that the object under another object accelerates with the same rate like a mouse feels the same acceleration under or on a table. To satisfy these facts we consider the graviton model again. Here we apply the hypothesis that the graviton could pass though the object when its mass is less than the specified mass. Now we set this amount as m_0. We fix a mass M' whose mass is $m' < m_0$ on the ground and later we fix another mass M" whose mass is $m'' < m'$. Now we consider graviton G collides to M' and M" and graviton pass through after collision. As both mass should move with the same velocity, these would be expressed as below,

$$g + m' = \gamma m' + g', \tag{4}$$

$$g + m'' = \gamma m'' + g'', \tag{5}$$

where $g > g'' > g'$. If we consider $m \gg m' \approx m''$, these would satisfy the latter fact that the mouse feels the same accelerates under and on the table. As the result, the energy of graviton is equivalent to $\gamma - 1$, therefore it could be expressed as followed when $m < m_0 = 1$,

$$g = \gamma - 1. \tag{6}$$

Within this gravitational model, the energy of graviton would only determine the acceleration rate of mass hence the Newtonian gravitational constant G_n would not still a constant but can be a variable includes negative value, $-a < G_n < a$, $a = const$. This implies the presence of mass would not create its own fixed gravitational field by itself and the presence of energy would not create its own energy field around it. This means constant G_n would consist with the partial universe and the repulsive gravitational fields can also exist where G_n is negative values. Hence this can be a framework of gravitational symmetry. On the other hand, the combination of the Newtonian gravitational constant G_n and a certain negative constant value can be another symmetrical framwork. These possibile models could be determined by exprimemntal or observed data.

2 The origin of mass

Now we consider a gravitational field as a spacetime curvature. We can find a free falling frame of reference at any point in this field. Now we set the components of a vector V, (t, x, y, z) in 4 dimensional spacetime. If we describe the free failling frame of reference as the flat spacetime which is represented by the norm-squared of a vector V, $V^2 = -t^2 + x^2 + y^2 + z^2$, we can consider the norm-squared of the rest frame of reference described as below,

$$V^2 = \eta t^2 + x^2 + y^2 + z^2 \tag{7}$$

where $-1 < \eta \leq 0$. If mass can be decsribed within 4 dimensional spacetime curvature, it can be described within the range of η. hense in the process of the unification of gravitation and all other observed phenomenons, all mass terms could be assigned in time dimension when embedded in gravitational 4 dimensional spacetime.

3 Wave function of Energy

Let us consider a point particle P which is a simple harmonic oscillator in 2 dimensional spacetime with conserved energy. By converting energy state, P carries only mass when its velocity $v = 0$. While $0 < v < 1$, it carries mass and kinetic energies and when $v = 1$, it carries only kinetic energy. Here we consider P is located $x = 0$ with $v = 1$ when $t = 0$. While t is $0 \leq t < T/4$, $T/2 \leq t < 3T/4$, kinetic energy converts to mass completely, where T is period. On the other hand, mass converts to kinetic energy completely while $T/4 \leq t < T/2$, $3T/4 \leq t < T$. The simple harmonic oscillation of P could be expressed to

$$x = \frac{T}{2\pi} \sin 2\pi \frac{t}{T}. \tag{8}$$

If we can say energy is equivalent to spacetime with the definition of mass described by the last section, T is equivalent to P's energy E, therefore the relation between its frequency $f = 1/T$ and E with the constant value R is represented by the equation

$$E = \frac{R}{f}. \tag{9}$$

The relativistic combination of plural oscillations in multi dimensional spacetime would describe more.

4 No boundaries of time

Let us consider equation (8) again. This equation is a time symmetry. Therefore, if positive and negative time could run back and forth in the range $T/4 \leq t \leq 3T/4$, we could not tell whether t would run in the closed range or opened by observing the displacement of x. However when the displacement of x is formed by the combination of plural oscillations and this formation results time symmetry broken, we are able to tell that the range of t is opened. If the arrow of time which we recognize is essentially formed by the time symmetry break, we might be able to consider the arrow would fly in the eternal sky.

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