Theory of Original Gravity

Amal Kumar Ghosh

ABSTRACT

This paper aims to present foundational concept of gravity based on my intuitive idea. I have assumed that every particle is subject to the influence of its own hyperbolic space surface (that I would like to say is a tiny universe of this respective particle). Here I have derived the wave function of hyperbolic surface of my space heuristically where hyperbolic surface has been treated as a hyperbolic surface particle in order to reach my goal. On the question of how I have calculated gravitational energy has been explained in 'Analytical Treatment' section. How this gravitational energy is expected to be valid ranging from planck's scale to macroscopic scale has been discussed in the conclusion section.

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ABSTRACT

This paper aims to present foundational concept of gravity based on my intuitive idea. I have assumed that every particle is subject to the influence of its own hyperbolic space surface (that I would like to say is a tiny universe of this respective particle). Here I have derived the wave function of hyperbolic surface of my space heuristically where hyperbolic surface has been treated as a hyperbolic surface particle in order to reach my goal. On the question of how I have calculated gravitational energy has been explained in 'Analytical Treatment' section. How this gravitational energy is expected to be valid ranging from planck's scale to macroscopic scale has been discussed in the conclusion section.

I. INTRODUCTION

Out of many proposals the general theory of relativity has been regarded as the best theory of gravity which is a classical theory of space-time continuum being curved by matter. In Einstein's equation, geometry has been assumed as coarse matter. But matter is fundamentally quantum mechanical. So the ultimate question arises in the context of quantization due to approximation of continuum description of his geometric object. Again the discovery of the Bekenstein- Hawking entropy of black holes, the Hawking radiation, and information paradox puts an unanswered questions on the relation between quantum mechanics and the GR concepts of space-time. Even the most advanced quantum theories including super-symmetry, super-gravity, and super string have attempted to unify all fundamental forces but no attempt has succeeded.

This problem is therefore not only technical. This is again a non- renormalizable and low energy theory. As for GTR, major conceptual problem is how this theory has considered stress-energy tensor ($T\mu\nu$) as a significator of gravity which is actually a classical extension of Newton's stress-energy that has been poured into space-time continuum pot. Here matter is creating energy in the way of deforming space- time continuum. My opinion is that the stress-energy thus assumed by Einstein is not the true energy to understand gravity. This is purely incomplete theory. Both of GR and quantum theory are therefore problematic in the context of gravity. That is why they have broken down after travelling some path. Hence my motivation has hailed from the curiosity of how to solve this problem.

II. MY PROPOSAL AND ANALYTICAL TREATMENT

"Every particle is always subject to the tended energy of their respective elementary hyperbolic space surface, and this energy operates on the Schrodinger's particle wave function when placed in hyperbolic space to provide gravitational energy"

III. ANALYTICAL TREATMENT

Hyperbolic geometry occurs on surfaces that have negative curvature. Hyperbolic plane that exists within hyperbolic space is termed as hyperboloid model.

Suppose n-dimensional hyperbolic space sits inside Rn+1 as a hyperboloid, i.e Hn = {$x \in Rn$+1 } : x∗ x = - 1} [Cannon 1997]. This definition is for general space Hn. Here for instance if I consider when n=4 and then this is as H3,1. This means that space and time have been treated classically i.e as an independent quantities.

Suppose H is a path metric space in Lorentz 3-space. It can be shown that the hyperbolic distance function dH is a metric on H [See details, Hayter 2008].

dH metric has not been discussed in detail in this paper because the detailed discussion is already in different existing text.

This is important to note that hyperbolic space surface has been assumed as an elementary hyperbolic surface particle in my work. My heuristic derivation of wave function of hyperbolic surface particle is:

$$\Psi_A = \frac{1}{\Omega} e^{-i d_H k^2 x} \tag{1}$$

where dH is a metric on H , $|\psi A|^2 = \psi A * \psi A$ = Probability of defining universe in hyperbolic space $H4 = H3,1 = (H3, t = dH = original\ time\ as\ accepted\ in\ this\ paper)$. Thus, space and original time has been taken independently. Here hyperbolic metric distance dH can be thought of as a real-time rather than our conventional time when the explanation calls for. Therefore, original time is some metric distance unlike our conventional time we deal with. This real time is associated with the equation of hyperbolic space surface (Eqn. 1). Our conventional time evolution is associated with the equation of wave function of particle (Eqn 5).

Dimension of $|\psi_A|^2 = [\frac{1}{H^4}] = [\frac{1}{H^{3,1}}] = [\frac{1}{H^3, d_H}]$
$= [\frac{1}{L^4}] = [L^{-4}]$

Dimension of amplitude ($\frac{1}{\Omega}$) of wave function = $[L^{-2}]$

Differentiating equation (1) w.r.t. x, we get

$$\frac{\partial \psi_A}{\partial x} = \frac{1}{\Omega} \frac{\partial}{\partial x} e^{-i d_H k^2 x}$$

$$= -i d_H k^2 \Psi_A$$

$$= -i d_H \frac{p^2}{\hbar^2} \Psi_A \quad \text{where } p = \frac{h}{\lambda} = \frac{h}{2\pi} \frac{2\pi}{\lambda} = \hbar k$$

$$= -i\, d_H \frac{2m}{\hbar^2} \frac{p^2}{2m} \Psi_A$$

$$= -i \frac{2m\, d_H}{\hbar^2} E_A \Psi_A \quad \text{taken } E_A = \frac{p^2}{2m}$$

$$\frac{\partial}{\partial x} = -i \frac{2m\, d_H}{\hbar^2} \hat{E}_A \tag{2}$$

$$\hat{E}_A = i \frac{\hbar^2}{2m\, d_H} \frac{\partial}{\partial x}$$

This is my energy operator.

Now, this energy operator acts on the wave function of Schrodinger's equation when placed in hyperbolic space of my interest. Schrodinger's wave function is given by

$$\Psi\ (x, t) = A\, e^{i\ (kx-wt)} \tag{4}$$

Now let me represent this wave function by hyperbolic coordinates which is the following:

$$\psi_h\ (x,t) = A\ e^{hi(kx-wt)}$$

= A [Coshi(kx-wt) + i Sinhi(kx-wt)]

= A [Cos(kx-wt) + $i2$ Sin(kx-wt)]

Given that Cosh(it) = Cost and Sinh(it) = iSint

= A [Cos(kx-wt) - Sin(kx-wt)]

$$= \frac{A}{2}\ [\ e^{i(kx-wt)} + e^{-i(kx-wt)}]\ -\ \frac{A}{2}[\ e^{i(kx-wt)} - e^{-i(kx-wt)}]$$

= A $e{-}i(kx-wt)$ which is the hyperbolic version of Schrodinger's particle wave function. Eqn.(5)

Suppose x is a position vector of a particle found somewhere in a space of differential volume element $d3$x ($d3$x= $dx1 \wedge dx2 \wedge dx3$).

Now integrating over (Vol) where (Vol) is the space volume over which integration is to be carried out

$$< \hat{E}_A\ > = \int_{(Vol)} \psi^*_h\ (x,t)\ \hat{E}_A\, \psi_h\ (x,t)\ d^3x$$

$$= \frac{\hbar 2\ A2\ k}{2m\ d_H} \int_{(Vol)} d^3x = \frac{\hbar^2\ A^2 K}{2d_H} \times \frac{1}{\rho_s}$$

= Gravitational Energy Eqn (6)

Where $\boldsymbol{\frac{1}{\rho_s} = \frac{1}{m} \int_{Vol} d^3\ x}$ **and** $\boldsymbol{\rho_s}$ Space density

IV. CONCLUSION

1. If we analyse my energy operator carefully we can understand how technically the discreteness has arisen in my operator where hyperbolic surface geometry has been treated as hyperbolic surfaces particle. Here space time has been taken independently.
2. My energy is conceptually and technically different from Einstein's energy. In my case, surface energy operator provides gravitational energy in the way of acting on the particle wave function.
3. The presence of ħ term indicates that this energy is quantized and hence it is valid on planck's scale. Again this energy preserves the hyperbolic surface geometry term. It is therefore valid on larger scale. This energy is therefore expected to be valid ranging from smaller scale to macroscopic scale.
4. It is evident from equation (1) that the space of my interest is not aware of our conventional time (t) but the metric distance dH has been considered technically so as to it fulfills the criteria of metric distance and real time as well in accordance with the demand of explanation. Thus I have drawn a line of control between our conventional time and original time in brief. Time evolution operator can be obtained from Eqn.(5) since this equation is a hyperbolic version of Schrodinger's wave function.

5. Static or infinite d_H signifies zero energy and dynamic d_H is a real time whose dimension is the dimension of length.

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