The Fisher flow and guantum gravity

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We consider the general geometric structures of the unification of general relativity and quantum field theory based on modification of the gauge principle. The basic structure will be gauge geometry based on structure the Fisher metric.
In this work, we use an innovative approach based on gauge flows. For example, in the differential geometry is used to prove the Poincaré conjecture of the Ricci flow. We will use for gauge geometry of the Fisher metric. For the first time, we use the concept of Fisher flow for gauge geometry.

$$\frac{\partial^3 S}{\partial t^3}+\frac{\partial S}{\partial t}\frac{\partial^2 S}{\partial t^2}=k\cdot e^{\mu\beta\gamma}\partial_\mu\partial^\alpha\Gamma_{\alpha\beta\gamma}$$

The flow will describe the nonlinear quantum evolution of the gauge metric on phase space.
The metric Fisher and connection the gauge geometry

$$f_{\mu\nu}=\partial_\mu\partial_\nu S+\partial_\mu S\ \partial_\nu S$$

$$\Gamma_{\alpha\beta\gamma}=\frac{1}{2}(\partial_\alpha f_{\beta\gamma}+\partial_\beta f_{\alpha\gamma}-\partial_\gamma f_{\beta\alpha})+\partial_\alpha S\ \partial_\beta S\ \partial_\gamma S$$

$$k=G\hbar$$

The quantum state and local phase (action)

$$\psi=A\cdot e^{S(x,y,z,t)}$$

$$S=S(x,y,z,t)$$

The theory is clearly non-linear in time. This model distinguishes between the past and the future on a fundamental level. In quantum gravity, there is a problem of time, its direction and absence in the Wheeler de Witt equation.
This model solves the problem of asymmetry between the past and the future on fundamental the Planck scale.

In addition, the Fisher flow describes the topology of gauge geometry as a space-time foam.

Under the selected gauge condition in quantum field theory (limit in interaction speed)

$$\frac{\partial^2 S}{\partial t^2} = c^2 \partial_\alpha \partial^\alpha S$$

We get a linear equation in time

$$\frac{\partial f_{\mu\nu}}{\partial t} = \chi \cdot e^{\alpha\beta\gamma} \partial_\alpha \partial_\gamma \Gamma_{\beta\mu\nu}$$

$$\chi = \frac{G\hbar}{c^2}$$

This equation is clearly symmetric in time. This flow can be seen as the evolution of a nonlinear gauge field of a more complex species near Planck scale. Obviously, modern research establishes a deep connection between gravity and quantum field theory, especially in light of the duality of AdS/CFT.

1.Relativity and Fisher flow

Consider the density of states in quantum geometry in the first approximation for connection

$$n = e^{\alpha\beta\gamma} \partial_\alpha S \ \partial_\beta S \ \partial_\gamma S \approx e^{\alpha\beta\gamma} \Gamma_{\alpha\beta\gamma}$$

Then a nonlinear scalar equation is obtained in explicit form

$$\frac{\partial^3 S}{\partial t^3} + \frac{\partial S}{\partial t} \frac{\partial^2 S}{\partial t^2} = k \cdot \partial_\alpha \partial^\alpha n$$

When integrating by coordinates

$$\int \frac{\partial^3 S}{\partial t^3} dx^2 \approx k \int \partial_\alpha \partial^\alpha n \ dx^2$$

$$\int \partial_\alpha \partial^\alpha n \ dx^2 \to n$$

$$\int \frac{\partial^3 S}{\partial t^3} dx^2 \to \frac{q \upsilon^2}{4} = \frac{q}{4} \frac{dx^2}{dt^2}$$

We get the determination of the speed through the selected parameters in the equation

$$\upsilon = 2\sqrt{k\frac{n}{q}}$$

Decompose the left and right sides of the equation into specified functions

$$\frac{\partial S}{\partial t} = \omega$$
$$\frac{\partial^2 S}{\partial t^2} = \omega q$$

$$\partial_\alpha \partial^\alpha n = -p^2 n$$

We get the quadratic equation

$$q^2\omega + \omega^2 q = -k\,p^2 n$$

We solve it in the form of

$$q + 2\omega = q\sqrt{1 - 4k\frac{p^2 n}{q^3}}$$

$$q^| = q + 2\omega$$

When determining the usual speed and fundamental speed

$$\upsilon = 2\sqrt{k\frac{n}{q}}$$

$$V^2 = \frac{q^2}{p^2} = c^2$$

We are half the relativity for the cross-sectional effect

$$q^| = q\sqrt{1 - \frac{\upsilon^2}{V^2}}$$

Which corresponds to the kinematic effect of time dilation and non-linear in time the Fisher flow. Obviously, in this case, we should consider the wave perturbation of the Fisher metric as a fundamental limitation on the speed of information transmission.

Topological defects and non-linearity of time

In general, a nonlinear modular equation makes it possible to make an asymmetric time modification of quantum field theory

$$\frac{\partial^3 S}{\partial t^3} + \frac{\partial S}{\partial t}\frac{\partial^2 S}{\partial t^2} = k\,\Delta n$$

$$n = e^{\alpha\beta\gamma}\,(\partial_\alpha S\ \partial_\beta S\ \partial_\gamma S + \partial_\alpha \partial_\beta S\ \partial_\gamma S)$$

To do this, consider higher order gauge derivatives

$$\partial_\alpha^3\,(\partial_t^3 S + \partial S_t^2 \partial_t S) \approx k \cdot \partial_\alpha^3 \partial^\alpha \partial_\alpha n$$

After general transformations, the gauge tensions of the topological field string in three-dimensional space

$$e^{\alpha\beta\gamma} T_\alpha T_\beta T_\gamma \approx -k \cdot F^4$$

$$F_{\alpha\beta} = \partial_\alpha \partial_\beta S$$

$$T_\alpha = \partial_\alpha \partial_t S$$

The topological string is specified by the action

$$I = -\int T_\alpha dx_\alpha dt$$

This allows us to formulate a general action for this topological string model in the form of a gauge field line

$$I = -\int (e^{\alpha\beta\gamma} T_\alpha T_\beta T_\gamma + k \cdot F^4)^{\frac{1}{3}} dx\ dt$$

Our action thus yields a new formulation of topological field string defects in quantum field theory. In addition, this model is defined in a nonlinear representation and indicates a problem of dimension in string theory.

Collapse wave function condensate quantum gravity

The problem of quantum theory and quantum gravity is phenomenal. The reduction of the wave function and the direction of time is the fundamental problem of the final theory. Roger Penrose believes that the arrow of time is related to the non-linearity in time of the equations of quantum gravity. This also affects the collapse of the wave function. Many approaches consider the nonlinearity of the Schrödinger equation as a solution to the problem of dynamic collapse. However, the nature of quantum theory is related to the principle of superposition, the linearity in the equation. To get around this problem, it is necessary to clearly separate the superposition of the wave function and dynamical collapse in the Schrödinger equation. To begin with, let us consider a modification of the quantum theory for nonlinear time without violating the principle of superposition. The right side should contain a negligible correction from dynamic collapse without seriously violating the superposition principle. The Schrödinger-Newton equation seriously violates the principle of superposition. We need a different approach. In an earlier paper [1], we first considered a possible modification of unitarity based on non-linear time to describe the general dynamics in quantum gravity.

$$\frac{\partial^3 S}{\partial t^3} + \frac{\partial S}{\partial t}\frac{\partial^2 S}{\partial t^2} = k \cdot \partial_\alpha \partial^\alpha n$$

If written in the form of a wave equation when determining the general reduction

$$n \to |\psi|^2$$

Then we obtain a modification of the Schrödinger equation based on nonlinear time and a given reduction in the form of the curvature of the quantum potential.

$$i\frac{\partial^3 \psi}{\partial t^3} = k \cdot R \ \psi$$

Gravitational reduction wave function

$$k = G\hbar$$

$$R = \frac{\partial^2 \ |\psi|^2}{\partial x_\alpha \partial x^\alpha}$$

$$|\psi|^2 = \psi^* \psi = \frac{dP}{dV}$$

This model is non-local in space and time, the collapse of the wave function is closely related to the nonlinearity of time, providing the fundamental nature of the arrow of time in the measurement. In this equation, the violation of the principle of causality is extremely weak due to the implicit influence of collapse on the nonlinearity of unitary evolution. This equation has a general character for quantum theory and quantum gravity, since the input parameters gravitational constant and Planck's constant describe a non-relativistic model of the world.

Nonlocality is the extreme opposite of the nature of special relativity. And from this we consider the modification of the quantum theory and the non-fundamental nature of relativity itself. Further the model shows the time arrow needed in the final reality.

Let us consider in this work the possibility of determining the degree of influence of time nonlinearity on the evolution of the statistical function in the general configuration space.

Determine the probability density in the configuration space

$$\Phi = \Phi(t, x_\alpha, k_\alpha)$$

$$dP = \Phi \, d\Omega$$

$$d\Omega = dx\, dy\, dz\, dk_x dk_y dk_z$$

$$\rho = \int \Phi \;\; dk_x dk_y dk_z$$

Taking into account our model with respect to the nonlinear of time and the collapse of the wave function, an equation is obtained for the nonlinear evolution of the probability functional in the configuration space

$$\frac{\partial^3 \Phi}{\partial t^3} + \lambda \cdot \Phi = \eta \cdot \Delta \rho$$

$$\Delta = \frac{\partial^2}{\partial x_\alpha \partial x^\alpha}$$

$$\eta \sim G\hbar$$

This equation defines the nonlinear dynamics of the wave function of the configuration space in non-relativistic quantum gravity.

$$\rho = \left| \psi(t, t^3) \right|^2 = \frac{dP}{dV}$$

We believe that probabilities are an approximation to the algorithm for calculating the effect of vacuum fluctuations on a system.

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