SIMPLEST APPROACH TO QUANTUM GRAVITY HYPOTHESIS

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Abstract. In this short paper I will explore idea of quantazing gravity by using complex space-time and operators acting on wave vector field.

Contents

1. Complex space-time

Space-time in this paper is complex [1] it means that I can write a vector field of that space-time:

$$\psi^{\mu}(z) = \begin{pmatrix} \psi^{0}(z) \\ \psi^{1}(z) \\ \psi^{2}(z) \\ \psi^{3}(z) \end{pmatrix} \tag{1.1}$$

Where z is a complex coordinate that can be expressed:

$$(z) = (x + i\chi) = \left(x^{0} + i\chi^{0}, x^{1} + i\chi^{1}, x^{2} + i\chi^{2}, x^{3} + i\chi^{3}\right) \tag{1.2}$$

This space-time has to obey a field equation [2] [3] [4]:

$$\partial_{\mu} A^{\mu}_{\alpha} \psi^{\alpha}(z)\, \eta^{\mu\kappa} \partial_{\kappa} \left(A^{\dagger}\right)^{\alpha}_{\mu} \left(\psi^{*}(z)\right)_{\alpha} = \rho(x)\, g_{\mu\kappa} \delta^{\mu\kappa} \tag{1.3}$$

Where $g_{\mu\kappa}$ is metric tensor, $\rho(x)$ is probability of finding object at point x and A^{μ}_{α} is operator acting of wave vector field. That complex space-time has an interval or space-time distance equal to:

$$\rho(x)\, ds^{2}(x) = g_{\mu\kappa} \delta^{\nu\kappa} d\psi^{\mu}(z) \left(d\psi^{*}(z)\right)_{\nu} \tag{1.4}$$

It means that it's not one equation but for each point of space-time there is one equation, when there is measurement done it changes from probability of all possible states to just one position:

$$\rho(x)\, ds^{2}(x) \rightarrow ds^{2}(x) \tag{1.5}$$

Probability function needs to be normalized so:

$$\int \rho(x)\, d^{3}x = 1 \tag{1.6}$$

References

[1] https://mathworld.wolfram.com/ComplexVectorSpace.html

[2] https://mathworld.wolfram.com/MinkowskiMetric.html

[3] https://mathworld.wolfram.com/KroneckerDelta.html

[4] https://mathworld.wolfram.com/MinkowskiSpace.html