GEOMETRIC APPROACH TO QUANTUM GRAVITY IDEA

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ABSTRACT. I will explore in brief a simple geometry that could
unify quantum physics with general relativity.

1. Clock model as proper time

Clock is basic idea in all physics, but time that clock shows is observer dependent. Goal of physics is to find things that are invariant and don't depend on frame of reference. Let's say i have a set of rules that measure distance in space and clock that measures distance in time, they can be both combined into one object that is proper time, it says how much ticks of a observer clock it takes to get from one point of space-time to another. Now i want to make thinking about it as much general as possible, to do it let's say i only have rules and clock and i want transform rules and clock into distance, there are two way transform i can do, one transforms clock and rules into number second one transforms number into set of rules and clocks. So to capture all information about space-time i need object that does both. Invariant has to be not the one way transformation but both way transformation for all possible frame of reference. Let's say i have a set of rules and clocks that are vectors assign to some point of space-time, in $N + 1$ dimensions of space time i need $N + 1$ vectors of space-time to match every direction that space-and time can change. So i need a tensor of rank $N + 1$ in covariant and contravariant components. I will denote it τ and invariant is number that is equal to contraction:

$$\tau^{\alpha_1....\alpha_{N+1}}_{\alpha_1....\alpha_{N+1}} = \tau \tag{1.1}$$

Without contraction this tensor has $(N + 1)^2$ independent components. So all reference frame will agree on τ but not all of them will agree how space-time look. I can write that tensor as:

$$\tau^{\beta_1....\beta_{N+1}}_{\alpha_1....\alpha_{N+1}} \tag{1.2}$$

2. Field equation for empty space-time

I will exam an equation that could be solution to creating a field equation of gravity that has a quantum physics build in it. It has a geometrical meaning behind it, first i will use two objects to create it, rotation matrix in tensor form for each space dimension and proper time tensor that takes a set of $N + 1$ rules and clocks where $N + 1$ is number of space and turns proper time or it takes a proper time and turns it into a set rules and clocks . We live as far as we know in four dimension space-time but in this model i will explore four dimension space-time. I can formally write field equation as:

$$R_{\alpha_1...\alpha_4}^{\gamma_1...\gamma_4}(\phi)\tau_{\gamma_1...\gamma_4} = \partial_{\beta_1}...\partial_{\beta_4}\tau_{\alpha_1...\alpha_4}^{\beta_1...\beta_4} \tag{2.1}$$

Where R is rotation tensor and τ is proper time tensor. Lets first examine equation geometrical meaning without rotation so equation reduces to:

$$\tau_{\alpha_1...\alpha_4} = \partial_{\beta_1}...\partial_{\beta_4}\tau_{\alpha_1...\alpha_4}^{\beta_1...\beta_4} \tag{2.2}$$

Each index runs form zero to three, on left side i will have tensor that takes a set of four rules and clocks $\beta_1\beta_2\beta_3\beta_4$ and turns them into proper time. It has $4^4 = 256$ components, generally for $N + 1$ dimensions of space-time i have $(N + 1)^{N+1}$ components. On right side of equation i have proper time tensor that takes a set of four rules and clock $\alpha_1\alpha_2\alpha_3\alpha_4$ and turns them into proper time and it takes proper time and turns into four rules and clocks $\beta_1\beta_2\beta_3\beta_4$. Now i take how those four clock and rules change with respect to their coordinate and im left with how four a set of rules and clock $\alpha_1\alpha_2\alpha_3\alpha_4$ change to proper time. Now it generates static space-time whee object always follow determined trajectories. It's a classical field. But if i add rotation tensor that comes from rotation matrix of four dimensions space and assume that field can be rotated by some angle in any direction now it becomes a quantum field, object can move in any direction and it's all equal state of system. Now ruler and clock can point in any direction in space-time. Rotation can be in both directions positive and negative angle that should be good enough to explain spin states.

3. Energy tensor

Now i have complete view of how space-time works i still lack how matter affects it. Energy tensor is object that takes a $N + 1$ a set of rules and clock and says how much energy is stored in those rules and clock. From conservation of energy comes that how that tensor changes has to equal to zero. Lets first write tensor in covariant components from conservation of energy comes that:

$$\partial_{\beta_1}...\partial_{\beta_4} T^{\beta_1...\beta_4} = 0 \tag{3.1}$$

But covariant tensor says how much energy is stored in matter not in gravity field. For gravity only field tensor will go to zero i can express it as where it's equal to free-falling observer:

$$R^{\gamma_1...\gamma_4}_{\alpha_1...\alpha_4}(\phi)\tau_{\gamma_1...\gamma_4} - \partial_{\beta_1}...\partial_{\beta_4}\tau^{\beta_1...\beta_4}_{\alpha_1...\alpha_4} = \kappa T_{\alpha_1...\alpha_4} \tag{3.2}$$

$$R^{\gamma_1...\gamma_4}_{\alpha_1...\alpha_4}(\phi)\tau_{\gamma_1...\gamma_4} - \partial_{\beta_1}...\partial_{\beta_4}\tau^{\beta_1...\beta_4}_{\alpha_1...\alpha_4} = 0 \tag{3.3}$$

In gravity field only it reduces to field equation for empty space-time. When i have matter in it that tensor is not a zero tensor. Energy can be negative or positive, if energy is positive there is normal gravity effect, when i stand for example on earth surface gravity does not change so energy tensor is equal proper time:

$$R^{\gamma_1...\gamma_4}_{\alpha_1...\alpha_4}(\phi)\tau_{\gamma_1...\gamma_4} = \kappa T_{\alpha_1...\alpha_4} \tag{3.4}$$

$$\partial_{\beta_1}...\partial_{\beta_4}\tau^{\beta_1...\beta_4}_{\alpha_1...\alpha_4} = 0 \tag{3.5}$$

Constant κ in equation can be either $\frac{1}{\hbar^4}$ or $\frac{1}{\hbar^4 c^4}$ depending do i use time units or space units.