ALLOWING SUPERPOSITION IN CLASSICAL RELATIVISTIC GRAVITATION

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Abstract

In our previous paper [1] we showed that an ether based description of gravitation can be equivalent to General Relativity. The result metric of the theory was formally the same as the conform approximation of the metric in General Relativity, however it was mapped to a property of the ether: the speed of light.

Here we assume, that the gravitational potential is the consequence of the change in the speed of light, therefore we can define a better metric. Since we are working on flat space we need not care with the restriction of General Relativity that yields for a constant zero scalar curvature. We will show that Rosen metric is the solution even in ether based description if we would like to ensure that superposition of mass and energy is possible and no singularity occurs at finite r. Additionally we will show that superposition of the gravitational field of multiple objects can be calculated unambiguously on flat space.

1 Introduction

Space-time descriptions are based on measurements corresponding to time, distance and speed. The artifacts we would like to describe are time, space, speed of light and other properties, like gravitation or rest mass of an elementary particle. Our actual measurements are based on instruments, like clock, light, free falling particle and rest mass of particle.

Defining a coordinate system is only the first step of building an actual description. Even there are several possible approaches depending on the preferences: the order of defining time (T), speed of light (L) and geometry of space (S). There are great number of possible coordinate definitions, however we mention only three self evident approach here: TLS – Einsteinian General Relativity, LTS – Linear Brans-Dicke approach [5] and SLT – Ether based description.

Spacetime and gravitation could be described using any of these approaches, but mathematical difficulties will occurre at differrent points of the description. For example nonlinearity and sigularity is a problem in General Relativity while advanced complexity occurres when measuring distance in Ether based description.

All of these descriptions will give the same answer for questions of physics while they are within the limitations of the actual theory – we might say – for weak fields. Slight modifications that still match the experimental data and may extend the limitations of the description are to be considered. Some of these modifications are driven by a certain requirements, just like in our case: enable superposition of mass and energy and get rid of singularity at finite distance.

2 Background information and previous results

In our previous paper [1] we showed how to correct the ether based gravitation theory of Janossy. We showed that correcting one of the basic assumptions of Janossy, his ether based description leads to the conform approximation of the Einsteinian metric in General Relativity, however it gives a deeper understanding of the ether based physical reality.

More precisely in this ether based description we expressed the metric on Euclidean space with the speed of light as follows:

$$g(x) = \begin{bmatrix} \frac{c_0}{c(r)} & 0 & 0 & 0 \\ 0 & \frac{c_0}{c(r)} & 0 & 0 \\ 0 & 0 & \frac{c_0}{c(r)} & 0 \\ 0 & 0 & 0 & -c_0 c(r) \end{bmatrix} \tag{1}$$

This metric describes what a particle experiences on a flat Minkowskian space-time in the field of a single spherical massive object.

Here $c(r)$ was to substitute with $c_0(1-M/r)$ that leads to a singularity at finite r.

3 No singularity and applying superposition

Using the assumption (1) we defined the metric and so the gravitation potential with the speed of light. As Janossy [2] defined a usable way to calculate relativistic effects of the gravitation from the position dependency of the speed of light on flat Minkowskian space-time, we are allowed to adjust the position dependency of the speed of light slightly without spoiling the weak field predictions of the theory.

Our aim is to get rid of the singularity and nonlinearity, therefore we assume that relative change of the speed of light is multiplied for each objects, while masses can be added when their position is identical.

Upon these assumptions g_{00} has to be the following form:

$$g_{00} = C1\, e^{C2\, m/r} \tag{2}$$

Substituting the boundary conditions in the infinity for g_{00} and its first derivative we got a new metric, that we found to be known since the 70s as Rosen-metric.[3] Applying this metric the position dependency of speed of light from (1) is found to be

$$c(r) = c_0 e^{-2mG/rc_0^2} \tag{3}$$

This approach do has additional gain comparing to the original foundation of Rosen-metric if we consider the handling of distances. In ether based description distance is measured on Minkowskian flat space, therefore superposition is mathematically possible.

Superposition means the usage of the integral introduced for the case of solid body and described by Itin in [4] as

$$c(r) = c_0 e^{-f(x,y,z)} \tag{4}$$

$$f(x,y,z) = \int_V \frac{\rho}{|r - r'|} dV' \tag{5}$$

4 Unambiguous superposition

Here we can apply the integral for multiple objects using the common understanding of r. This statement is not self evident, therefore we refer to the metric transformation described in [1] that is experienced in a certain background potential.

Let’s place a smaller object into the field of a spherical gravitational shield. Inside the shield there is no gravitation force, but space has a potential described by the retardation of light as follows:

$$\frac{c(r)}{c_0} = \alpha^2 \qquad (6)$$

The effect of this object to a test particle is described by r and M in the global system, while we express it with r’ and M’ as measured in the coordinate system of the body. According to [1]

$$M' = M / \alpha \qquad (7)$$

additionally if we consider r expressed with the atomic size d, we get

$$r' = r / \alpha \qquad (8)$$

In case we substitute either value pairs in (3) we calculate the same potential of the test particle that was caused by this particular massive object. Therefore the superposition can be applied on flat Minkowskian space coordinates as already stated above.

5 Conclusions

We described that applying the Rosen metric on the ether based description of relativistic effect of gravity, superposition of fields of multiple bodies is possible of flat space.

We also remark, that this theory is still a weak field approximation, just like the Einsteinian General Relativity. It does not take quantum gravitation effects into consideration, therefore it can not be applied for extreme fields, like the inner region of a black hole or near the event horizon.

6 References

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[5] György Szondy, *Linear Relativity as the Result of Unit Transformation*, physics/0109038