MATHEMATICAL EQUIVALENCY OF THE ETHER BASED
GAVITATION THEORY OF JANOSSY AND GENERAL RELATIVITY

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Abstract

"There are several interpretations and approaches to relativity. All of them are characterized by
the fact that none of them is accepted by physicists without doubts, even the Einsteinian General
Relativity!
Only those theories can get into the spotlight that predicts something that is different from
predictions of other concurrent theories.
From this point of view the theory of Janossy [1] is not an excellent idea, as he tried to show that
his materialistic approach also corresponds to the general principles and equations of relativity.
As his program was basically successful there was not any additional result, except the
philosophical part."

Since the death of Janossy, his work has almost been forgotten. Both what he achieved and what he
was not succeeded in. He was one of the founders of KFKI (Central Physics Research Institute of
the Hungarian Scientific Academy) but his effort has not been carried over even there, however his
colleagues are still remember his name and his work. Luckily his books are still available in the
Hungarian libraries. Additionally the most informed etherists in the world who are lucky enough to
know his work are consider his work as a No1 reference.

This paper is designated to refresh the idea of the ether based gravitation theory of Janossy and
introduce a well founded way to adjust it to be equivalent with the experiences and General
Relativity.

1. Introduction

In his book „Theory of Relativity according to the physical reality” that was published in 1973 Janossy showed
that the relativistic effects described in General Relativity can also be described on euclidean space by Ether
theory. He described the gravity by the optical property of ether, more precisely the dependency of the speed of
light on the gravitation potential.
His results were qualitatively good, but in case of gravitational light deflection and the relativistic part of the
Mercury perihelion advance they were half of the expected value.

We found that by reviewing his assumptions and correcting the definitions we can also correct these errors and
create a description that is mathematically equivalent with the Einsteinian one.

1. Result and errors in the description of Janossy

Janossy described experiences beyond the Newtonian gravity differently from Einstein. He created a model on
Euclidean space and applied optic. He explained the gravitation light deflection and the relativistic perihelion
advance of Mercury based on the potential dependency of the speed of light.

In the introduction of his theory Janossy considers three relativistic effects; gravitation light deflection and the
relativistic perihelion advance of Mercury and the gravitational red-shift.

Calculations are based on the following metric:

\[ g(x) = \begin{bmatrix}
1 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 \\
0 & 0 & 1 & 0 \\
0 & 0 & 0 & -c^2(r)
\end{bmatrix} \]  \( (1) \)

, where \( c(r) \) refers to the position dependency of the speed of light.

The metric above defines the connection between the gravitational potential and the speed of light. From this
position dependency a value for light deflection and also for the relativistic part of the Mercury perihelion shift
can be calculated. The order of the result is correct in both case.

Upon these results Janossy concludes that Ether based description of the gravitation is qualitatively good.

Unfortunately all the results – except the gravitational red-shift that was defined by \( g_{44}(x) \) – are not accurate.
Assuming that the form of the metric is \( (1) \) [1-p367.18], where
\[ c(r)^2 = \text{constant} + 2\theta(r) \] \[(2)\]

[1-p367.21] and \( \theta(r) \) is the gravitational potential, value calculated for the light deflection [1-p372.37b] is exactly the half of the measured and the Einsteinian correction. The value calculated by Janossy for the relativistic perihelion advance was

\[ d\phi = 4\pi \frac{V^2}{c^2} \] \[(3)\]

The Einsteinian value that matches the experiments is

\[ d\phi = 6\pi \frac{V^2}{c^2} \] \[(4)\]

while Newtonian gravity with velocity dependent mass gives

\[ d\phi = 2\pi \frac{V^2}{c^2} \] \[(5)\]

It seems that (3) that contains coordinate deflection part is right between (4) and (5), therefore we can state that the coordinate deflection part in the perihelion advance is also the half of the right value. Janossy also mention that the proper value can be obtained from the theory by the sufficient change in the definition regarding to \( c(r)^2 \), but he considered this modification would not be well founded in the current state [1-p371]. He stated that any additional modification should be based on a well founded change in the correlation of the metric and the gravitational potential.

Let us notice that in case of the metric above the gravitational redshift is

\[ V_1 / V_2 = c(r_1) / c(r_2) \] \[(6)\]

[1-p372.39a]. It also defines the size of the particles being constant: independent of the gravitational potential.

2. **Proposed corrections in the theory**

The assumption that the size of the particle is independent from the gravitational potential is really useful from the perspective of the mathematical complexity but is not well founded restriction. However these kind of restrictions are more or less usual. For example in 1961 Brans and Dicke [3] dealt with the problem why we consider the rest mass of the particle being independent of the position in General Relativity.

In case of the theory of Janossy it would be better to define the gravitational red-shift with the

\[ V_1 d_1 / V_2 d_2 = c(r_1) / c(r_2) \] \[(7)\]

equation, where besides the atomic frequency the atomic size \( d \) may also change.

The proper link between the change of frequency, atomic size and the speed of light can be determined in at least two ways:

The easiest one if we consider the optical behavior of the light and conclude that in case of weak fields the change in the speed of light is twice as much as it was assumed by Janossy. Unfortunately it does not define the metric properly, additionally it does not explain the change at all.

Second approach – described below – is based on the assumption that physical laws are invariant:

Let us consider an object having spherically symmetric gravitation field and mass \( M \). We watch this object from two points defined by \( r_1 \) and \( r_2 \). Physical laws assumed being invariant at each points, therefore we are allowed to determine the transformation rule between the two points using the Einsteinian General Relativity.
Speed of light at \( r_1 \) is \( c(r_1) \), the mass of the object is \( M_1 \), the local atomic frequency is \( \nu_1 \) and the local size of the atom is \( d_1 \). These values at \( r_2 \) are measured to be \( c(r_2), M_2, \nu_2 \) and \( d_2 \). Let us assume that the gravitational red-shift between the two points is

\[
\nu_1 / \nu_2 = \alpha \tag{8}
\]

Then the observed mass of the body at \( r_2 \) is

\[
M_2 = M_1 / \alpha \tag{9}
\]

because the mass scale changes with the atomic frequency: we experience inverse of the mass defect.

The Schwarzschild radius of the body at \( r_1 \) using \( d_1 \) as a unit is

\[
r_{s1} = 2 M_1 G / c_0^2 = Nd_1 \tag{10}
\]

Where \( c_0 \) is the invariant speed of light. The Schwarzschild radius at \( r_2 \) substituting \( d_2 \) and \( M_2 \) from equation (9) and (10)

\[
r_{s2} = 2 M_1 G / \alpha c_0^2 = Nd_1 / \alpha \tag{11}
\]

The two values are certainly the same, therefore we get

\[
d_2 / d_1 = \alpha \tag{12}
\]

Multiplying the reciprocal value of (8) and the reciprocal value of (12) we get the left side of the equation (7)

\[
\nu_1 d_1 / \nu_2 d_2 = 1 / \alpha^2 \tag{13}
\]

We got a new equation for the correlation of the gravitational red-shift and the speed of light that replaces equation (6)

\[
\nu_1 / \nu_2 = \sqrt{c(r_1) / c(r_2)} \tag{14}
\]

Considering this new result we get a different metric instead of (1)

\[
g(x) = \begin{bmatrix}
\frac{c_0}{c(r)} & 0 & 0 & 0 \\
0 & \frac{c_0}{c(r)} & 0 & 0 \\
0 & 0 & \frac{c_0}{c(r)} & 0 \\
0 & 0 & 0 & -c_0 c(r)
\end{bmatrix} \tag{15}
\]

It means that particles in regions with lower speed of light are receive equivalent change in the atomic frequency and the atomic size. Let us remark that the form of the new metric is the same as the conform-euclidean approximation of the Schwarzschild metric.

3. Results of the changes

It is obvious that after our change we received double change in the speed of light for the same gravitational red-shift than Janossy. Therefore light deflection will be the proper value – twice as much as calculated originally by him.
Calculations regarding to the perihelion advance is more complex, therefore we have not applied it here. However we assume that the part that is caused by the relativistic change of the mass will be the same and the part caused by the deformation of the light-based coordinate system will be doubled. With this we assumed that this value will also be the same as the Einsteinian.

One of the achievements of the change that in this ether based description the relativistic corrections are the same as calculated using the Einsteinian approach. Besides – as $g_{kk}$ ($k = 1, 2, 3$) are also changing – the size of particle is also changing that causes not only additional mathematical complexity, but predicts a possible additional tidal effect during the free fall.

3.1. Cosmological results

Just like in Linear Brans-Dicke gravity [4] during the collapse of a spherical object there is a critical size near the Schwarzschild radius, where the inner region apparently inflates. This inflation is caused by the reduction of light-speed. This inflation means that approaching to the center of the object we measure bigger radius; in this region the meaning of inside and outside is inverted. The inside region can be interpreted as a new “inner” Universe. For this reason reaching the critical size for a collapsing start means a Big Bang for the inner Universe.

Note: I found recently that this idea has already been introduced in the 90s by Lee Smolin. It has been mentioned for example in a lecture of Woehler. [6]

4. Summary

We concluded that the ether based modified Janossy description of gravitation is also usable for calculating relativistic effects of the gravitation. There might be new predictions to validate, additionally as the new description is based on Euclidean geometry the mathematical complexity is reduced. The description also answers certain cosmological questions.

In this article we defined the way of correction to be applied for the description of Janossy to receive the proper value for the gravitational light deflection. Also the change in results regarding to the perihelion advance is as expected both in tendency and estimated value. Therefore we consider this approach being promising. The modified ether-based gravitation theory of Janossy as an approach equivalent to the Einsteinian is remarkable.

5. References

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