How generalized minkowski four-force leads to Scalar-Tensor gravity

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Abstract

General Relativity is considered so far the **best gravitation theory**. However it is well known, that "**nonlinearity** of the EFE [einstein field equations] distinguishes general relativity from many other fundamental physical theories" [1]. And also the enormous number (50+) of **alternative theories** (scalar-tensor, and quantum gravity), approximations and extensions indicates that it is not our final theory of gravitation.

In our study we go back to special relativity and Minkowski four-force and recall its generalization suggested by Karoly Novobatzky in the '50s. We use several well-known and "should be known" results from the last century (including the results of Brans and Dicke) to construct a **scalar-tensor gravitation** theory with unambiguous time and mass scale, and to get rid of nonlinearity as well as to support the coordinate system used by satellite navigation (GPS). We will also explain how this scalar-tensor gravitation theory related to Newtonian gravity any General Relativity. The main difference is that in this self-evident scalar tensor-theory the Newtonian gravitational force is not an inertial force any more but a real **force-field** that **interacts** with the **rest-mass** of the particles as indicated by Dicke in 1959. At the same time general relativistic effects still remain the consequence of the curvature derived from the metric tensor.

We also argue for replacing standard coordinate system with isotropic, which supports conform-transformation and so it makes possible (at least in case of Schwarzschild solution) transforming results of General Relativity to this Scalar Tensor theory. But it is not the only advantage. Isotropic coordinate system induces **different cosmological consequences** on the basis of General Relativity, like the natural extension of space-time beyond the event horizon, additional support for both big-bang and multiverse theory.

Additionally by using isotropic coordinates we reveal the **correspondence** between the **scalar curvature** of the metric (Ricci scalar) and the scalar field (**gravitation potential**) required for the Scalar-Tensor Gravity.

The above mentioned non-standard approach in describing relativistic effects in gravity is mainly a systematic review of the results of the last century motivated by partly a simple **theoretical quantum-particle**, which rest mass is depending on the local curvature of the background space,

partly the need of the **unambiguous** (special relativistic) **measurements** of time, mass, distance.

The mentioned theoretical quantum-particle is based on a well-known construction from the two characteristic sizes – the **Schwarzschild radius** and the **Compton-wavelength**. This model is extended with the assumption that the background curvature might change. According to our calculation Schwarzschild radius is **affected by** the **background curvature** which causes the **rest mass** of such particle **decrease** with higher background curvature.

According to our model and our calculations this relative change of rest-mass depends on the size of the particle that also predicts the **change of the mass ratio** of different kind of elementary particles as it was predicted by Dicke in his paper from 1959.

In our presentation we scratch this complex review and alternative interpretation of old results describing a basis of a “food for thought” approach for a kind of relativistic quantum gravity.

1. Wikipedia, Einstein field equations
2. R. h. Dicke, Am. J. Phys. 29, 344 (1960)