The matter in fixed spacetime: Dark Matter mystery is solved

Dmitri Martila (eestidima@gmail.com)

Former Tartu University

Lääne 9-51, Tartu 50605, Estonia

(Dated: December 16, 2015)

Abstract

What did Einstein? He took action S and by varying metric of spacetime and by varying matter functions, he found in the minimum of S the Einstein Equations. What we suggest? Simply fix the metric, do not vary it, but vary the matter functions. In result we can describe what ever Dark Matter case of observations. Hereby Dark Matter is not matter, but a chosen form of metric. This is not trivia. Because one can hard calculate within this theory. You can study the evolving dust cloud, but holding arbitrary metric fixed. The number of dust particles is fixed. Then in the zero of energy-momentum covariant divergence, one can check is Martila's idea correct or not. Martila's idea can be verified, thus, it is very scientific.

Consider dust solutions without annihilation, without radiation, without pressure. Then you can be sure, what for given situation the number of dust particles remains the same throughout the coordinate time. This number is found by integral

$$N = \frac{1}{m_0} \int T_{\nu\mu}\, u^\nu\, u^\mu\, d\hat{x}\, d\hat{y}\, d\hat{z} = const\,, \tag{1}$$

where u^ν is velocity of observer, hereby the $d\hat{x}\, d\hat{y}\, d\hat{z}$ is volume element of the observer (found by ON-thetrad, e.g., $d\hat{x} = e^{(x)}_\nu\, dx^\nu$), hereby observers $d\hat{t} = 0$ while the measurements.

In case of co-moving diagonal metric of dust collapse the

$$d\hat{x}\, d\hat{y}\, d\hat{z} = \sqrt{g_{11}\, g_{22}\, g_{33}}\, dx^1\, dx^2\, dx^3\,. \tag{2}$$

In viXra:1304.0086 (the alternative arXiv paper) the spherical dust collapse with arbitrary initial distribution of dust velocities has given the $N = const$. One can apply this integral of motion for the complex cases of the galaxies.

A. Can Martila be right?

In the book (Dmitri Martila, "Simplest Explanation of Dark Matter and Dark Energy", 2013, LAP LAMBERT Academic Publishing, ISBN 978-3-659-50275-0) Martila proposed following way (there is the second way, which we will not discuss here: spent your money to get the book!) to get information about the Dark Matter. One can try following. The minimum action principle starts with varying spacetime and varying energy-momentum of matter, and one arrives at General Relativity. But let now the spacetime is fixed in the minimum action principle. Then we are left with equations for matter:

$$T^{\nu\mu}_{;\mu} = 0\,. \tag{3}$$

Let us check, will here be satisfied the $N = const$ in dust solutions?

Let start with spherical metric in curvature coordinates

$$ds^2 = -A(t,r)\, dt^2 + B^2(t,r)\, dr^2 + W^2(t,r)\, d\Omega^2 \tag{4}$$

with arbitrary functions A, B, W. Then by coordinate transformation $t = t(R,T)$, $r = r(R,T)$ you get the metric

$$ds^2 = -a(T,R)\, dT^2 + b^2(T,R)\, dR^2 + w^2(T,R)\, d\Omega^2\,, \tag{5}$$

it is co-moving now, because in energy-momentum tensor the $u^\nu(T, R) = (1/\sqrt{a},\, 0,\, 0,\, 0)$. The zero of covariant divergence of energy-momentum tensor require $a(T, R) = 1$ (also holds for simplicity the $g_{TR} = 0$ and, thus, we have two equations for two transformation functions). Hereby the

$$m_0\, N = 4\pi \int \rho(T, R)\, |b(T, R)|\, w^2(T, R)\, dR = const\,. \tag{6}$$

Because the positive functions are under the integral, then holds

$$\rho(T, R)\, |b(T, R)|\, w^2(T, R) = f(R)\,. \tag{7}$$

Inserting this ρ into zero divergence, one gets the success of Martila: $0 = 0$. It is identical true!

Details of calculation

Let the denotations f_t, f_R and f_r be the t, the R and the r partial derivatives of any function f.

We are so closely related to General Relativity, what we think, what the Einstein Equations hold. But they do not hold in this paper! Namely we take any metric tensor. This metric tensor is fixed: the matter does not bent the spacetime at all! It is revolution of XXI century, which could perfectly match any Dark Matter problem. The Dark Matter is just the chosen metric, not the matter. We consider spherical collapse (for simplicity) of pressure-free dust, so the starting fixed metric is spherical:

$$ds^2 = -A(t, r)\, dt^2 + B^2(t, r)\, dr^2 + W^2(t, r)\, (d\theta^2 + sin^2\theta\, d\phi^2)\,. \tag{8}$$

The energy-momentum tensor one has not found from the Einstein Equations, but it is outside knowledge: $T^{\nu\nu} = \rho(t, r)\, u^\nu\, u^\mu$, where $u^\nu = (u^t(t, r),\, u^r(t, r),\, 0,\, 0)$. Let us make coordinate transformation $R = R(r, t)$. This way:

$$u^R = R_r\, u^r + R_t\, u^t = 0\,. \tag{9}$$

Latter is differential equation, which relates the $u^\nu(t, r)$ and the $R(t, r)$. Suppose it has solutions. Thus, from $R = R(r, t)$ you have extracted function $r = r(R, t)$. Let us insert latter into the metric

$$ds^2 = -A(t, r(R,t))\, dt^2 + B^2(t, r(R,t))\, (r_R\, dR + r_t\, dt)^2 + W^2(t, r(R,t))\, (d\theta^2 + sin^2\theta\, d\phi^2)\,. \tag{10}$$

Therefore you have non-diagonal element $g_{t\,R} = r_R\, r_t\, B^2$. Let us make second coordinate transformation $t = t(R, T)$, so what non-diagonal elements are zero $g_{T\,R} = g_{t\,R}\, t_T - A\, t_R\, t_T = 0$. It is differential equation, which relates $r(R, t(T, R))$ and $t(R, T)$. Suppose it has solutions. Note, what velocities of dust are not restricted yet. This restriction one meets from the zero of covariant divergence. After previous two coordinate transformations we have metric in form

$$ds^2 = -a(T, R)\, dT^2 + b^2(T, R)\, dR^2 + w^2(T, R)\, (d\theta^2 + sin^2\theta\, d\phi^2)\,, \tag{11}$$

it is co-moving now, because in energy-momentum tensor the $u^\nu(T, R) = (1/\sqrt{a}, 0, 0, 0)$. This satisfies the norm $u_\nu\, u^\nu = -1$. We have zero tensor $Z^\nu := T^{\nu\mu}_{;\mu} = 0$.

$$Z^T = \frac{1}{a\, b\, w}\Big(\frac{\partial\, (\rho\, b\, w)}{\partial T} + \rho\, b\, w_T\Big)\,, \tag{12}$$

$$Z^R = \rho\, a_R/(2\, a\, b^2)\,. \tag{13}$$

Thus, $a = 1 = const$, because the time transformation $T = f(\hat{T})$ lefts the form of equations unchanged. The equation ($Z^T = 0$) one has produced from my idea: Dark Matter is not matter, but the chosen metrical tensor. Thus, if this equation is correct, then my idea is correct. To prove this equation one uses the novel integral of motion $N = const$, which is conservation of dust-particles' number. And indeed, this has no contradiction what's or ever. Thus, we are correct.

I. SUCCESS FROM LOWER DIMENSIONAL GRAVITY

In the world of lower number of spatial dimensions (the $(1+1)$ Gravity: coordinates are only t, x), the Einstein's Equations can not hold. But remains the zero of covariant divergence while the metric is fixed. Thus, it is prove, what Dark Matter is not matter, but a chosen metric of spacetime.