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A Simple Almost-Flat Variable c Cosmology

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Abstract: We revisit the cosmological scenarios of Zatrikean pregeometry, focusing on the results of a decreasing maximum attainable speed c and using the assumption of c being equal to the expansion rate of the universe. This preliminary qualitative study leads to a universe that is almost flat, but has small angular inhomogenities. It also leads to high-z objects that are further away than expected in the standard model, removing the need for decceleration.

Summary

We revisit the cosmological scenarios of Zatrikean pregeometry, focusing on the results of a decreasing maximum attainable speed c and using the assumption of c being equal to the expansion rate of the universe:

$$\dot{R} \equiv c$$

This simple assumption solves the horizon problem.

It is calculated that in this case, the fundamental quantities q and ρ are given by:

$$q \cong \frac{-3H^2}{4\pi G\rho}(1 - 4\pi\Psi_0\gamma\frac{G}{c^2}\rho R^2)$$

$$\rho \cong \frac{3H^2}{8\pi G}(1 - 4\pi\Psi_0\gamma\frac{G}{c^2}\rho R^2)$$

By bounding a photon in a circular orbit with the universe radius R, we get the equality:

$$\gamma\frac{GM}{c^2 R} = 1$$

A similar equation can be found in many theories of gravity.

By combining the basic pregeometric tranformation to the above we get for the whole universe:

$$r = r_T(1 + \Psi_0)$$

This means that in the universe as a whole its mass has no effect on the geometry; only the angular component of the dilation has universal effects. On the other hand, local variations from flatness can be significantly larger.

When $\gamma GM/c^2R = 1$ holds:

$$R\ddot{R} = -G\frac{M}{R}(1 + \Psi_0)^3$$

After some algebra, gives:

$$\dot{c} = -\frac{(1 + \Psi_0)^3}{\gamma^2 GM}c^4$$

and after integration:

$$c = \frac{1}{3(1 + \Psi_0)^3}\frac{R}{t}$$

This is a very simple relation between c, R and t.

Because of the redshift, the energy of each photon at Earth is smaller than the energy at its source. Using our assumptions, will finally lead to:

$$\frac{L}{\ell} \propto (1+z)^2$$

Thus, the apparent luminocity is connected to the surface luminocity in the same way as in General Gelativity.

From the definition of the redshift, and taking into that:

$$\lambda \propto R \quad , \qquad c \propto R^{-1/2} \quad , \qquad \nu \propto R^{-3/2}$$

we deduce:

$$z = (\frac{R_0}{R})^{3/2} - 1$$

Setting $R_0 - R \approx r$ the observed distance to a far away object:

$$\frac{r}{R_0} \approx 1 - (z+1)^{-2/3}$$

This relation predicts that the objects at cosmological distances are further away than in General Relativity, and changes the distribution of expansion velocities.

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