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Is the Rate of Expansion of Our Universe Really Accelerating?

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Abstract

I show here that due to the fact that time has a logarithmic increase as a function of the radius of curvature of our threedimensional universe, the rate of expansion of the universe is accelerating. The instantaneous pressure within this universe is negative (as predicted by the literature) because black holes lead to a leak of matter and light from our universe. Though, the total energy of the universe is increasing. The transition from a still fourdimensional universe with no physical laws to our threedimensional curved universe is due to Heisenberg's uncertainty principle.

Keywords: universe rate of expansion; negative pressure; Big Bang

1 Introduction

I make here the hypothesis that our three dimensional universe with physical laws is embedded in a fourdimensional space where no physical law exist. This is consistent with my former publication [1, 2].

Presently, the measure of the rate of expansion of our universe shows that its inflation is accelerating. But our theory [1, 2, 3] showed that the time measured in our universe is a function of the radius of curvature of the universe at the location where measurement is made; moreover this function is a logarithmic one. We will show in this paper that the only fact that time is a logarithmic function of the radius of curvature of the universe implies that the measured rate of expansion is accelerating. Black holes leads to a leak of matter and light leading to a instantaneous negative pressure within the universe and therefore solving the paradox of an inflating universe and a negative pressure given by the Friedmann equation.

But now, another question is arising: how can the universe expand? what is the 'force' which makes it expand? We will also show here that Heisenberg's uncertainty principle is a possible explanation of the transition from a four dimensional space with no physical laws to our universe with all presently physical known laws. This explanation is almost the same as for the Big Bang.

2 State of the art on the acceleration of the universe expansion

I will work here within the Friedmann cosmological model. The scale factor $a(t)$ [4] or cosmic scale factor of the Friedmann equations is a function of time which represents the relative expansion of the universe. It is the time dependent factor that relates the proper distance for a pair of objects moving with the Hubble flow in an expanding or contracting FLRW (Friedmann-Lemaitre-Robertson-Walker) universe.

The evolution of the scale factor is a dynamical question, determined by the equations of general relativity, which are represented in the case of a locally isotropic, locally homogeneous universe by the Friedmann equations.

The Hubble parameter is defined by:

$$H = \frac{\dot{a}(t)}{a(t)} \tag{1}$$

where the dot represents a time derivative.

Current evidence suggests that the expansion rate of the universe is accelerating which means that the first derivative of $a(t)$ is increasing over time. This implies also that any given galaxy recedes from us with increasing speed over time.

The Friedmannn scale factor relates the proper distance at an arbitrary time t to their distance at some reference time.

If I make the hypothesis that our three dimensional universe is embedded in a four dimensional euclidean space, distances are no more relative because we may define an absolute referential (x,y,z,w) where w is the fourth coordinate.

In a previous article by Olivi-Tran and Gauthier [1] we showed that time t is related to the local curvature k. In this case, time t may be written (see reference [1] for details of calculations):

$$t = \frac{1}{2H}\ln\left(\frac{k}{(-H^2 + \frac{8\pi G}{3}\rho + \frac{\Lambda}{3})}\right) \tag{2}$$

where G is the gravitational constant, ρ is the density (energy) of the fluid which increases [5], Λ is the cosmological constant, H the Hubble parameter.Because H is at square, time t increases but with a logarithmic behavior.

Therefore it is obvious that, as time t has a logarithmic behavior, that it is time which will decelerate. Straightforwardly, in the four dimensional space defined above, distances may be absolute. As a consequence an absolute distance divided by a decelerating time t leads to an appearing acceleration of the expansion of universe.

The fact that the Friedmann equation:

$$-\left(\frac{\frac{d^2a}{dt^2}}{a}\right) = \frac{4\pi G}{3}(\rho + 3p) \tag{3}$$

implies that there is a negative pressure p in our universe may be explained by the presence of black holes.

Let us make the hypothesis that black holes are real 'holes' within the hypersurface of our universe with boundaries oriented outside the universe (see for that reference [6]). Therefore, black holes will have a very large mass [6] and will attract light and matter (because of the curvature of their boundaries). Moreover, because the hypersurface of our universe is 'broken', black holes will make disappear matter and light that they attract because they are in contact with the fourdimensional space with no physical laws. Therefore, there is a leak of matter and energy which implies a negative instantaneous pressure. I have to add that paradoxically, the energy within our universe increases: see for that the paper by Darias and Olivi-Tran [5]

3 How can the universe expand itself?

Black holes, following my theory, make physical laws disappear (see above).

But, up to now, there have been no publications on how can the outside of our universe (where no physical laws exist, following my theory) transform into a part of our universe.

To help to understand that, a very simple way is Heisenberg's uncertainty principle (which is only strictly valid if time $t = 0$ [1], i.e. outside our universe):

$$\Delta E \Delta t >= \hbar/2 \tag{4}$$

where E is the energy and t the time. At the boundaries of our universe, if we take the limit from outside to the boundaries, time is equal to zero. So equation (4) is valid. Therefore, E will grow to ∞; but at the very moment where the limit of the boundaries is reached, equation (4) is no more valid, t will be a function of the radius of curvature of the universe and E will take a finite value.

The same phenomenon could have happened at the time $t = 0$ of the universe, i.e. the Big Bang, except that we do not know why the uncertainty principle becomes valid, maybe a perturbation in the still fourdimensional space in which our three dimensional universe has grown?

4 Conclusion

I showed here that the acceleration of the expansion of the universe is due to the logarithmic increase of time as a function of the radius of curvature of our universe. Pressure is negative , as predicted by Friedmann's equation because there is a leak of matter and light due to black holes. The transition from a fourdimensional space with no physical laws to a three dimensional curved universe which is embedded in the first, is due to Heisenberg's uncertainty principle.

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