Accelerating Expanding Universe or Slowing Down Clocks ?

Mueiz Gafer KamalEldeen

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mueizphysics@gmail.com

Abstract

It is shown that the assumption that the rate at which our clocks are running is decreasing with the cosmological time in a universe with steady expansion rate is preferable to the assumption of the accelerating expansion of the universe.

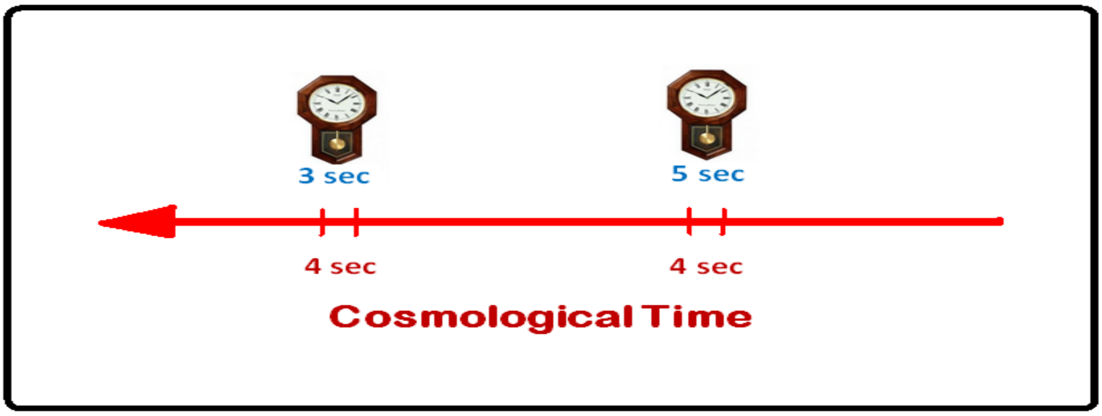
Introduction

There is no need to prove the clear mathematical fact that the observed apparent increasing of the rate of the expansion of our universe can be explained by the assumption that the expansion rate is constant but , as parts of our universe , the clocks we use is affected by the increase of the age of the universe and become slower .

What is important here is that we will show that this is not only a playful equivalent alternative of the existing explanation, but it is in fact another choice that leads to more simple cosmological model with more predictive power.

Our Clocks and the Cosmological Time

The idea that the clocks slowdown may seem confusing because the clocks are used to measure the time by which the rate of the running of the clocks is known to be steady or changing , but we do not face this difficulty if we know the true meaning of this idea which is that ; the concept is used to account for the possible differences in measurements of identical clocks used to measure identical intervals at different cosmological time.



It seems reasonable to define the dimensionless quantity which compares the rates of our clocks at different moments in the cosmological time . This is the equivalent of the quantity referred to as the *scale factor* in the accelerating explanation .

Now, the important advantage of this explanation over the accelerating explanation is that ; the effects of the (apparent) acceleration of the expansion is isolated from the relation between *the Hubble time* and *the age of the universe* , because the age of a universe with constant rate of expansion is equal to the Hubble time. So we gained much simplicity with the same number of assumptions without any contradictions with any observational fact.

The Average Density of the Universe and the Global Curvature

In another direction we can obtain more simplicity if we manage to free ourselves also from another false association between the average density of the universe and the global curvature which is possible using the following analogical reasoning :

Suppose that a spherical balloon inhabited by a creature who want to study the relation between the topological factors and the elasticity factors on his universe in the large scale . It is not a very good balloon, in that it has different values of elasticity factor across the surface in a way analogous to the distribution of mass and energy in our universe . After covering enough area of his universe, the creature can find the relation between the local elasticity factor and the local topology of the surface of the balloon to be in the following form: (C = E + A). Where (C) is a topological quantity (E) is a quantity that depends on the local elasticity factor , and (A) is a constant cosmological function of the radius of the spherical balloon .

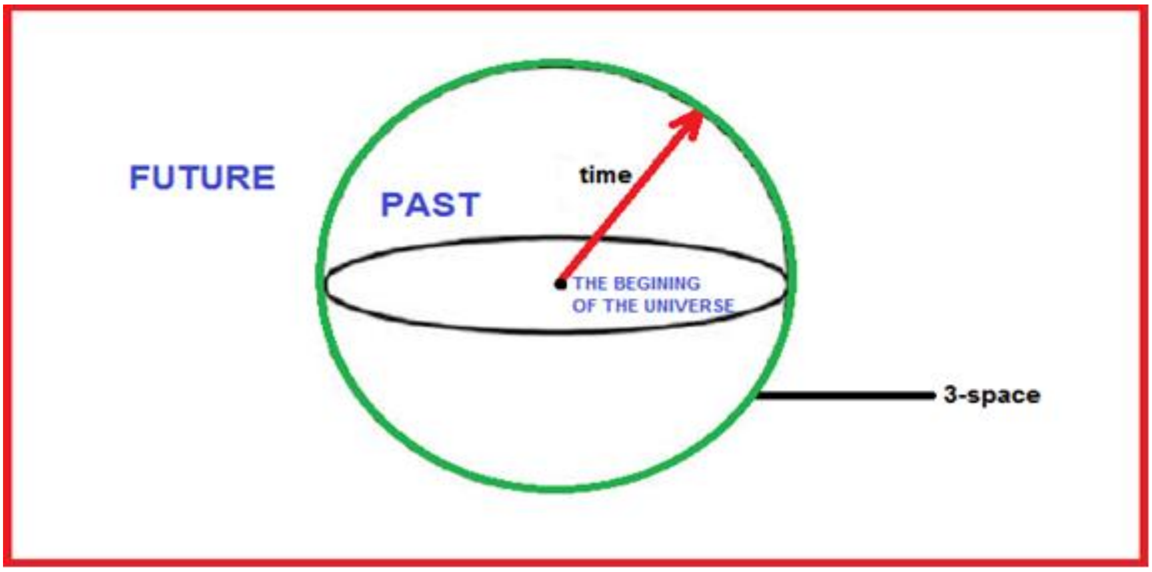
Now when this creature want to apply his equation in his large-scale universe he may assume total homogeneity of elasticity across the surface of the balloon and by generalizing his local relation between elasticity and the topology he is led to a global relation between the average elasticity and the global topology of his universe although we know that this is not correct , for the global topology of the balloon depends only on the radius of the balloon and has nothing to do with the average value of elasticity factors and likewise the fact that the local density is related to the local curvature as stated by the Einstein's Field Equation does not mean that the average density of our universe is related to the global curvature by the same equation.

This show that it could be a dangerous risk to generalize any kind of field equations from regions of distinguishable properties to a universe of total homogeneity .

Then after becoming free of the association with the average density , without hesitation , our choice for the space must be the nature's favorite shape (spherical) .

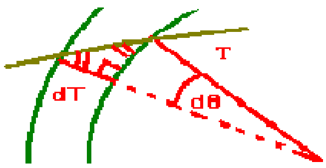
The Relation between the 3-Space and the Cosmological Time

Now after overcoming the two problems of acceleration and the shape of the universe , our road is without obstacles. It is easy to make our final step in the process of simplification of the cosmological model which is to put the time in the simplest relation with the Spherical 3-Space in which the time dimension in any point in the 3-space is the line from the center to that point



This relation between the space and time affects the bath of light as follows: The world line of light (c = 1) as it travel through the 4-dimensional space-time between the source of light and the observer is a logarithmic spiral (tends to straight line in large values of the age of the universe) this is because it keeps making an angle (Π / 4) with the 3-dimensional surface in every time because the speed is equal to the tangent of this angle.

Thus the relation between the time of emission (T*e*) and the time of observation (T*o*) and the angle between the world lines of the observer and the source (ɵ) can be obtained as follows :



We have : ($dT = T\ d\theta$) then by integration (from $T = T_e$ to $T = T_o$) we arrive at the important result:

$$T_o = T_e (e^{\theta})$$