Space Expansion by Mass-Energy Conversion

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Abstract
This paper presents solution of calculating dark-energy and its distribution.

Start with two assumption.
1. Imagine the material that emit energy by state of light. It needs space because it has the characteristic of particle. In this situation, were if not for space, there is no energy.
2. Space expansion is kind of balloon expansion.

1 Sum of energy-expansion caused by mass-energy conversion

1.1 Definition of Sum of energy-expansion
"X distance" is the distance from energy-generating material before expansion that we can randomly set. "Y distance" is the distance from energy-generating material after expansion. "Sum of energy-expansion(∑exp)" is the distance value originated from the space that energy demands as minimum. And its value vary by "X distance”. Assume that X≤(the maximum extent of energy-generating material’s gravitational field). Then Y distance = X distance + distance change by decrease of mass + ∑exp. But in past, we didn’t consider third term and this cause error of predictable distance as known as dark-energy problem. So this time i will define this new term and predict change of astronomical unit for example.

1.2 Proportional expression of Sum of energy-expansion and its coefficient
In this paper, F denotes gravity formula of newton that expressed in $\frac{GMm}{r^2}$. M is the mass of energy-generating material and m is the other one. But in this paper we can define m in different way, "sum of loss of mass of point particles”. And let the point particles place in multiple of $R_s$(Schwarzschild radius)
or \( \sum \ exp \). \( F \) is proportionate in product of mass and is inversely proportional in square of distance. But if \( M \) and \( m \) are fixed, \( F \) is inversely proportional in square of distance. Thus, \( F \) is inversely proportional in square of \( \sum \ exp \). However, when we consider \( R_s \) as distance value, it is uncertain because its value vary by \( m \). But we can consider \( m \) as constants. For example, imagine certain \( R_{sa} \) that is 0.01m and set \( R_{sb} \) that is 0.1m determined by \( m \). Then \( F_b \) will be \( F_a \times \frac{1}{\sqrt{m}} \). Thus, if mass \( m \) fixed, \( F \) is inversely proportional in square of \( R_s \).

\[
F \propto \frac{1}{R_s} \text{ thus, } F = \frac{k}{X}
\]

\[
F \propto \frac{1}{R_s^2} \text{ thus, } F = \frac{k'}{R_s^2}
\]

\[
F^2 = \frac{kk'}{(XR_s)^2} \text{ thus, } F \propto \frac{1}{XR_s}
\]

\[
\sum \ exp \propto \frac{1}{XR_s} \propto \sqrt{XR_s} \text{ thus, } \sum \ exp = k'' \sqrt{XR_s}
\]

A negative binding energy greater than the mass of the system itself would indeed require that the radius of the system be smaller than:

\[
R \leq \frac{3GM^2}{5c^2} = \frac{3R_s}{10}[1,2]
\]

If it is smaller than \( \frac{3R_s}{10} \), outside get pressed by negative binding energy. Thus, stable state of energy can be the distance of \( \frac{3R_s}{10} \). According to assumption-1, energy (only if it is state of light) cannot escape out of \( R_s \). So \( R_s \) is the minimum distance without unnecessary space for light. So If we set \( R_s \) for \( X \) distance, we obtain \( \frac{3R_s}{10} \) for \( \sum \ exp \). Assign this result to \( \sum \ exp = k'' \sqrt{XR_s} \), we obtain \( k'' = \frac{3}{10} \). Thus, \( \sum \ exp = \frac{3\sqrt{XR_s}}{10} \).

### 2 Problems that we can solve using new term

1. Representatively we can explain why galaxy motion has error value.
2. 2004 analysis of radiometric measurements in the inner Solar System suggested that the secular increase in the unit distance was much larger than can be accounted for by solar radiation, 15 ± 4 meters per century[3,4]. This is same phenomenon with dark-energy problem and it can be calculated by \( \sum \ exp \) setting \( X = AU, R_s = \frac{2G\Delta m}{c^2} \).
3. We maybe can explain why inflation happen but it is uncertain expectation.
3 References