Interactions of dimensions on the space-time continuum and quantum gravity

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Abstract:

Simple geometric algebra, logarithmic functions and equations will be used in the paper to present new quantum gravity aspects such as: curving and expansion of the space-time continuum and subsequently the acceleration of the expansion, dark matter, dark energy and that particles known as “gravitons” are a quantum of dark matter as well as relations of dimensions of space and the dimension of time regarding space-time curving and its expansion.

Introduction

We have a celestial body P with coordinates x, y and z.

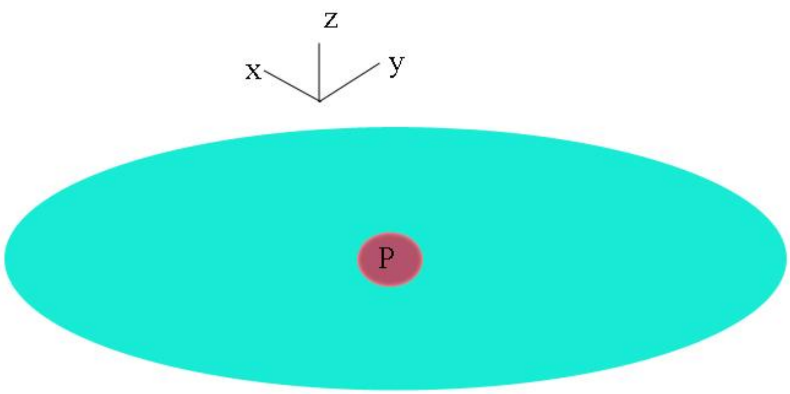

Figure 1: Celestial body P (red) on the space-time continuum (blue)

We know the location of the celestial body P

(1) $P(x, y, z)$

But we need to know the curvature it makes on the space-time continuum as well.

In order to achieve this we need to apply the following method:

(2) $P(x, y, z) = P(l^t, m^t, n^t)$

Having in mind that in relativistic conditions there are three dimensions of space and one dimension of time, we develop the following equations:

(3) $P(x, y, z) = P(l^t, m^t, n^t)$

(4) $x = l^t$

(5) $y = m^t$

(6) $z = n^t$

Therefore:

(7) $t = log_l x$

(8) $t = log_m y$

(9) $t = log_n z$

l, m and n equal e, which stands for Euler's number, therefore:

(10) $l = m = n = e$

(11) $t = log_e x$

(12) $t = log_e y$

(13) $t = log_e z$

Finally:

(14) $t = \ln x$

(15) $t = \ln y$

(16) $t = \ln z$

Although we have three equations we only need two in order to define the curvature.

Now we draw the function graphs for the equations 14 and 15.

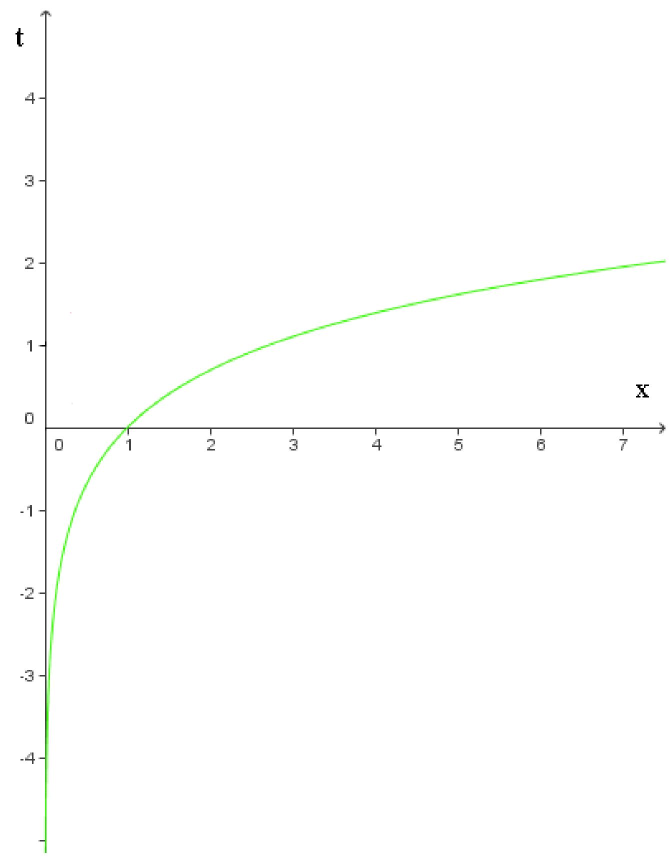

Figure 2: function graph for the equation 14

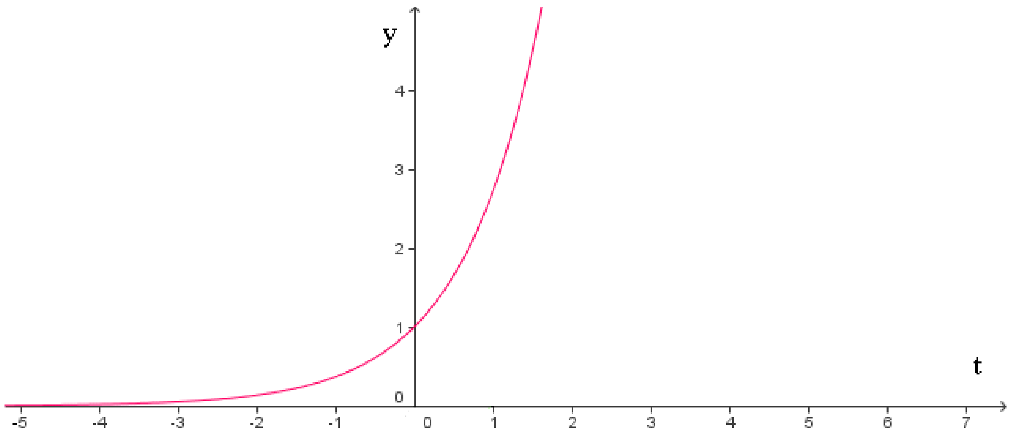

Figure 3: function graph for the equation 15

However, as we know from the general theory of relativity there is only one dimension of time and it is not the same as dimensions of space, therefore we combine the two and form a single graph, showing them as two mutually inverse natural logarithmic functions.

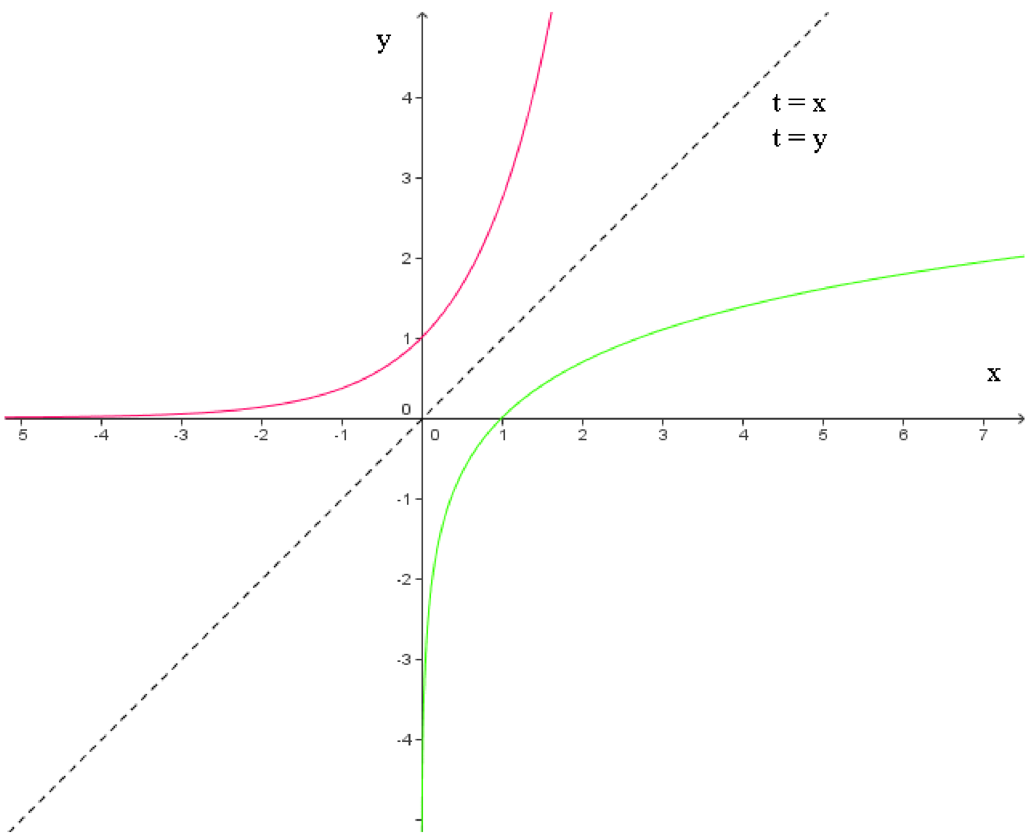

Figure 4: Curvature in a two dimensional coordinate system

Now we will remove the negative part of the graph since there is no negative space and we will add the celestial body P so we could see how it curves the dimensions x and y.

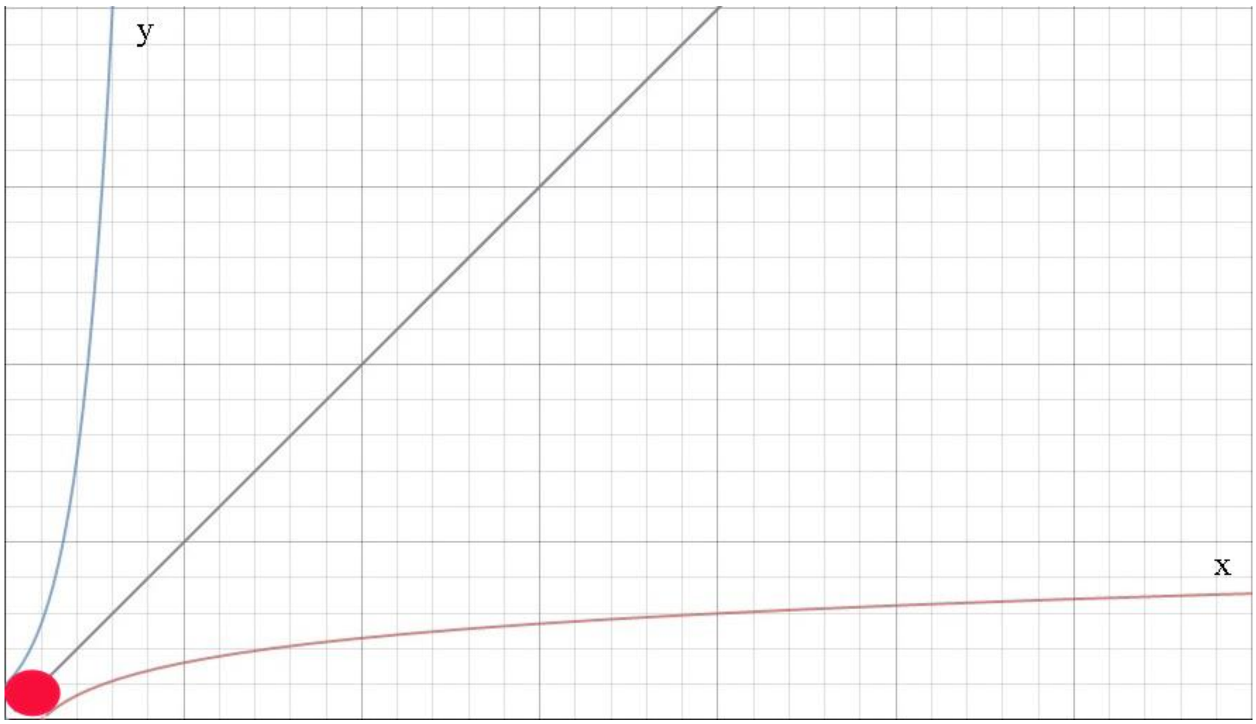

Figure 5: curving of the dimensions of space by the body where the dimension of time behaves as the central axis dimension of the curvature

However, in 3D it looks like this:

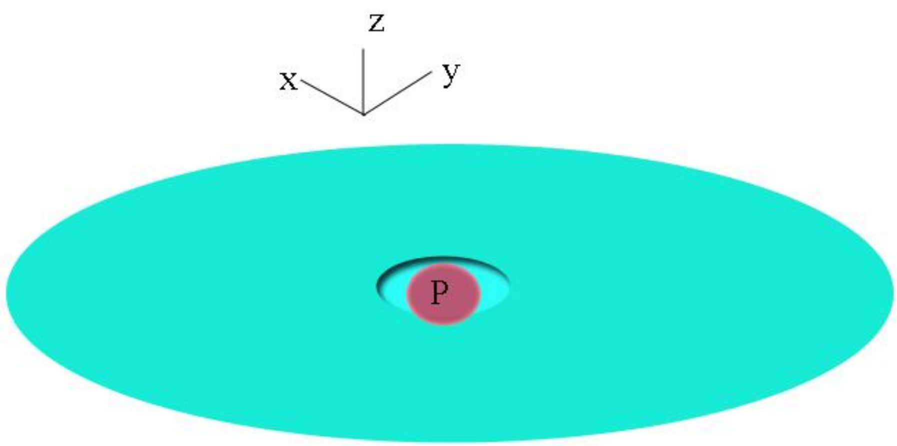

Figure 6: the curvature in the space-time continuum around P

Celestial bodies curve the space-time continuum with their mass and shape (volume) by curving the dimensions of space and the dimension of time functions as the axis of that curvature.

As we see, the shape (volume) of the body and its mass are crucial to the size of the curvature as well as the equations 14, 15 and 16 that describe how the dimension of time curves dimensions of space around the body.

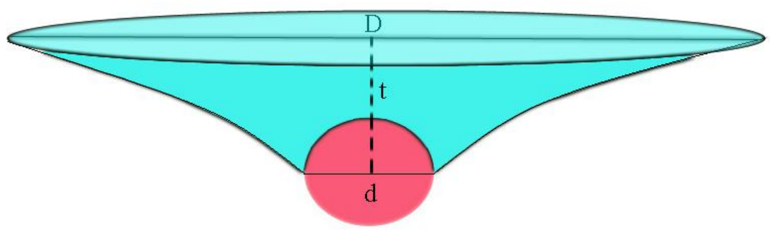

Figure 7: Space-time curvature; D is the diameter of the curvature, d is the diameter of the body

A great example would be the Sun. The curvature directly around it, on Figure 7 it is the curvature around d, is observable during an eclipse. Diameter D represents Sun's influence on the flat space-time continuum. However if the celestial body is massive enough, as the Sun is, its curvature can be such that close proximity to that body causes what is known as "gravitational time dilatation" (1). The reason is, as mentioned above, that every curvature of the space-time continuum functions by the dimension of time functioning as the axis for the curving of the dimensions of space, therefore the gravitational influence of a massive body can cause gravitational time dilatation at relatively small distances from that body.

(17) $\frac{t_r}{t} = \sqrt{1 - \frac{r_s}{r}}$

However, as a reaction to the dimension of time curving dimensions of space, dark matter releases gravitational waves (2) forcing the celestial bodies to interact with each other in the form of a very weak force of gravity. Although weak its range is infinite.

Bodies are then set on approximately the same plane due to their gravitational interactions, but the axis remains the same as it was and as the curvature is bent back the body will have a tilted axis (3). This is the reason planets are arranged as they are, in nearly the same plane but at different distances as they interact with the Sun and with different axis tilt angles. Even though a planet can have an axial tilt of 98 degrees like Uranus, or more, it still has the same axis as before, causing the axial tilt. The diameter D then becomes immeasurably long and the bodies are aligned into a Solar system. Since every celestial body makes a curvature in space-time and the range of gravity is infinite, it is very hard to form a practical equation to calculate the axial tilt; it is much simpler to do it by observation.

Dark matter alters the geometry of space-time via gravity.

Black holes curve space-time in a similar manner but not the same. Due to their nature, most of the mass of black holes is in the point of singularity (4).

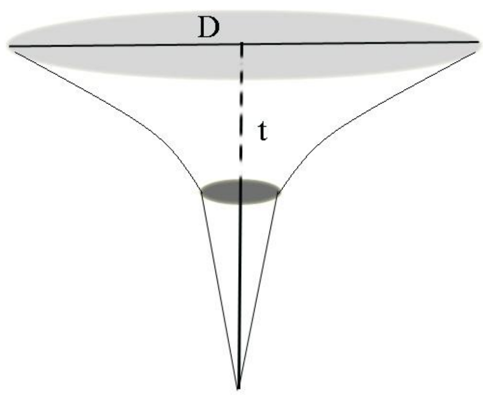

Figure 8: Black Hole, darker shade of gray is the event horizon

From the center of the event horizon to the point of singularity dimension t, functioning as the axis of the curvature increases its effect that, eventually, causes what is known as "spaghettification" or the "noodle effect" (5).

In the early age of the Universe, when celestial bodies where yet to form, the curving of the space-time continuum, as described above, was crucial since it defined the Universe as we know it. When the formation of the first celestial bodies began, they began gaining mass and thus curving the space-time continuum, and since the process of curving functions with an axis, all the celestial bodies took elliptical shape. However this also led to an uneven distribution of mass and energy in the Universe and as a consequence of that gravity became the most influential and definitive aspect of the Universe. Existence of the axis in the space-time curvature is the reason for the rotations of celestial bodies during their interactions.

The reason for the curving of space-time is the expansion of the Universe that functions as the negative part of the graph for equations 14 and 15, shown on Figure 4. The Universe is expanding to infinity at an accelerated rate (6).

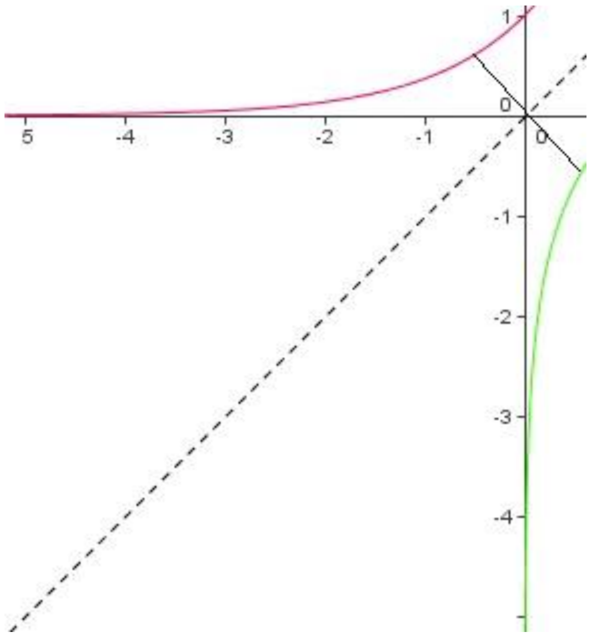

Figure 9: Negative part of the function graph for equations 14 and 15

Due to this, curving happens as the positive part of the function graph. However, the curving of the space–time continuum is the reason that the acceleration rate of expansion is slower than it was during the Big Bang, due to the substantial rise of the gravitational influence in the Universe. Dark matter couldn't emit the same amounts of dark energy as before, due to emitting gravitational waves, which is why the acceleration rate of expansion was much larger during the Big bang.

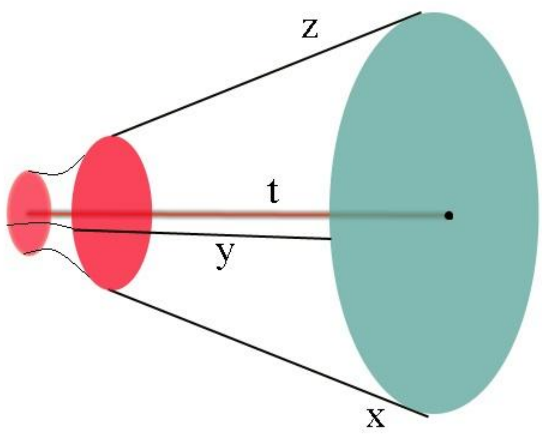

Figure 10: the smaller red ellipse is the cosmic inflation, the larger red ellipse is the end of the Big Bang and the blue one is the current space-time of the Universe

Space-time expands by the dimension of time functioning as the axis that expands dimensions of space which forces dark matter to emit dark energy that accelerates the expansion process. Since curving of space-time happens as reverse to that process, which is how celestial bodies affect space-time with their mass and shape, this lowered the rate of expansions acceleration due to gravity.

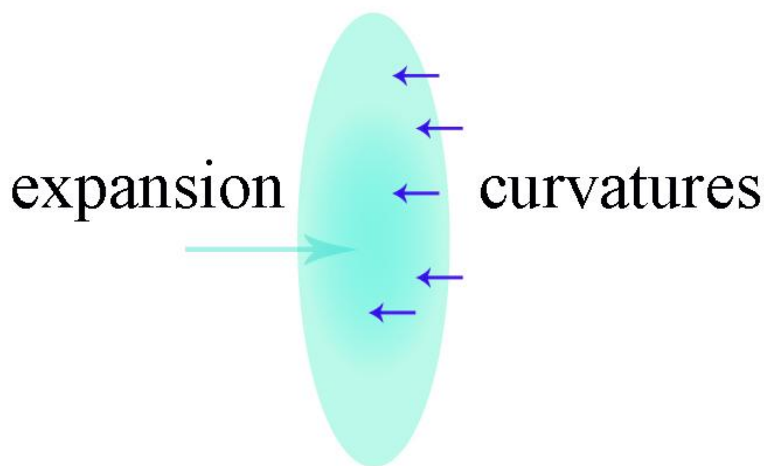

Figure 11: relation of expansion and curvatures of the space-time continuum

A good possibility to explain all of this is from the quantum aspect, using a quantum of dark matter that is known as a theoretical particle named "the graviton" (7). Although a more suiting name would be "the dark particle", the name "graviton" will be used further on.

Gravitons are considered to be extra-dimensional particles and their own anti-particles that have a spin 2 boson and have no mass, additionally they travel at the speed of light which is why it is the maximal speed possible to achieve (8). Using this information there is a possibility to form equations that can explain the phenomena mentioned above.

We will use Einstein's famous equation:

(18) $E = m \cdot c^2$

Therefore:

(19) $c^2 = \frac{E}{m}$

Seeing as the c squared is a perfect description of the graviton, we can use it to form an equation:

(20) $c^{gs} = \frac{E}{m}$

gs stands for “graviton’s spin”, in this individual case we can use it to form the equation:

(21) $gs = log_c\left(\frac{E}{m}\right)$

Here we see how gravity affects the expansion of the Universe to decrease since every celestial body forces dark matter to emit gravitational waves. This is especially influential due to massive black holes being at the center of every galaxy (9), due to which galaxies have a strong gravitational influence and form halos of dark matter around them. This further increases interaction between galaxies due to which they form clusters and further on super clusters (10).

In my previous paper I’ve named this “the graviton effect” (11), however the subject is more complex than I originally thought which is why I formed the assumption that “gravitons” aren’t a quantum of gravity but rather a quantum of dark matter hence they emit both gravitational waves and dark energy that accelerates the expansion of the Universe.

Having in mind that every celestial body that influences dark matter (galactic centers are the most influential) has a velocity it moves with and rotates around its own axis, having angular velocity, we can form an equation:

(22) $v^{\omega} = \frac{E}{m}$

Therefore:

(23) $\omega = log_v\left(\frac{E}{m}\right)$

Now we can define gravity, using the equations above, as waves emitted from dark matter reacting to the curving in the space-time continuum by celestial bodies.

(24) $G_u = \frac{gs}{\omega}$

Therefore:

(25) $\mathrm{G_u} = \frac{\log_{\mathrm{c}}\left(\frac{\mathrm{E}}{\mathrm{m}}\right)}{\log_{\mathrm{v}}\left(\frac{\mathrm{E}}{\mathrm{m}}\right)}$

Gu is universal gravity.

Meaning that the acceleration of the expansion of the Universe would be:

(26) $a = log_c(t)$

t is the axis dimensions of expansion.

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