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Finite Theory of the Universe, Dark Matter Disproof and Faster-Than-Light Speed

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Abstract

The mathematical representation of General Relativity uses a four dimensional reference frame to position in time and space an object and tells us time is a linear variable that can have both a negative and positive value.

In this paper a new mathematical model is being suggested which is based on the classical mechanics. The theory is objective and predicts low scale GPS gravitational time dilation, the perihelion precession disparity for all planets, the gravitational light bending, up to the rotation curve for all galaxies, the natural faster-than-light galactic expansion, even the constitution of a black hole and the center of the Universe.

PACS:

Keywords: Dark Matter, Dark Energy, Galactic Rotation Curve, Perihelion Precession, Hubble, Faster-Than-Light Speed

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1. Introduction

FT defines a new representation of the actual formulas derived from GR. Where it differs from it is how time is defined and will help understand the implications previously stated.

Indeed in contrast to GR where the space-time is represented using the non-Euclidean geometry in order to keep the speed of light constant, FT considers time to be a positive variable within a space that is characterized by the Euclidean geometry. No effective results deriving from GR are in violation.

FT postulates time dilation to be directly proportional to its energy, which is later shown to be sufficient to explain all anomalies:

1. The kinetic energy of body relative to its maxima induces dilation of time
2. A gravitational time dilation is the direct cause of the superposed gravitational potentials

Nomenclature

FT	Finite Theory
GR	General Relativity

1.1 Black Hole Radius

The Schwarzschild radius defines the event-horizon where the gravitational pull exceeds the escape velocity of the speed of light. This is given by:

$$r_s = \frac{2GM}{c^2} \tag{1}$$

Given that Schwarzschild radius derives from GR formulation, FT will need its own definition. Satisfyingly, this event horizon can easily be found with the amount of kinetic energy needed to overtake the gravitational potential energy:

$$\frac{1}{2}mv^2 = \frac{GMm}{r_b} \tag{2}$$

By solving the equation with the maximum escape velocity a photon can have, where the mass is of non-importance we get:

$$r_b = \frac{2GM}{c^2} \tag{3}$$

Despite the fact the resulting equation is exactly the same as the Schwarzschild radius, we will use a different notation given that its origin differs.

1.2 Composition of a Black Hole

Given that nothing can cross the event horizon because the mass basically freeze in time, halts and thus gradually cumulate layer by layer. At an infinitesimal level we can calculate the smallest event horizon with the mass of a proton:

$$r_b = \frac{2GM}{c^2} \tag{4}$$

Where:

- $M = 1.674{\times}10^{-25}\ kg$ (mass of a proton)

Thus:

$$r_b = 2.483 \times 10^{-54}\, m \tag{5}$$

The radius of a normal proton is:

$$r_{p^+} = 8 \times 10^{-16}\, m \tag{6}$$

If we compare both radiuses we will see that matter will never be able to reach the compression of a black hole. Therefore a black hole by its definition can never exist. Only a close-by counterpart made up of very unstable subatomic particles can exist according to FT.

1.3 Gravitational Time Contraction

Gravitational time contraction will be used interdependently with the non-trivial ambient gravity field of the observer, or fractionalized.

1.3.1 Outside a Sphere

Since an inertial body being subject to a specific gravitational force is responsible for gravitational time dilation and that gravity is a superposable force, we will translate the same conditions of all gravitational potentials into the sum of all surrounding fields of an observed clock and the observer:

$$t_o = \frac{\Phi(r)}{\Phi(r_o)} \times t_f \tag{7}$$

$$t_o = \frac{\sum_{i=1}^{n} \frac{m_i}{|r_i - r|}}{\sum_{i=1}^{n} \frac{m_i}{|r_i - r_o|}} \times t_f \tag{8}$$

Where:

- r is the location of the observed clock
- r_i is the location of the center of mass i
- r_o is the location of the observer (typically 0)
- m_i is the mass i
- t_o is the observed time of two events from the clock
- t_f is the coordinate time between two events relative to the clock

By juxtaposing the same spherical mass with its external gravitational time dilation factor and internal counterpart we have the following, for a spherical mass of 20 meters in radius (Knill):

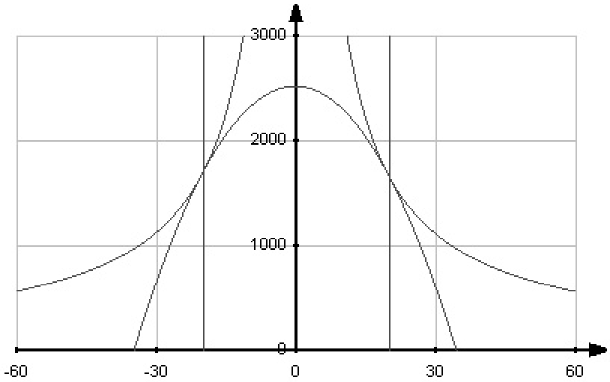

Fig. 1. Inner & Outer Gravitational Time Dilation Factors vs. Radius *(m)*

2 Implications

Herein are enumerated all consequences FT will lead to and highlights important differences from GR. No precise mathematical proof is being made in this matter; only logical observation, deductions and estimates are necessary to disjoint many hypotheses.

At this level only complex computer research can be proposed to simulate a modeling of the Universe under this umbrella in order to match its behavior with measurements such as the constant of the HubbleÑ Law. Potentially, simulators can also be used to reverse time and estimate an early Universe according to the current velocities of the superclusters, solve the scaling factor of the observed Universe which will lead to an estimation of the real volume of the Universe and solve local focal points of gravitational lenses.

2.1 GPS

The gravitational time dilation is actively subjecting the GPS system and needs to be considered in its corrections. The observed relativistic effects or both the kinetic and gravitational time dilations contribute in adding around 38 nanoseconds to the satelliteÑ clock every day, which in turn orbits the Earth with an altitude of 20,200,000 m.

2.1.1 General Relativity

By examining what GR suggests in terms of gravitational time dilation, we can account its importance in function of the altitude of the satellite according to the following equation:

$$t_o = \frac{\sqrt{1 - \frac{2Gm}{|i|c^2}}}{\sqrt{1 - \frac{2Gm}{(x + |i|)c^2}}} \times t_f \tag{9}$$

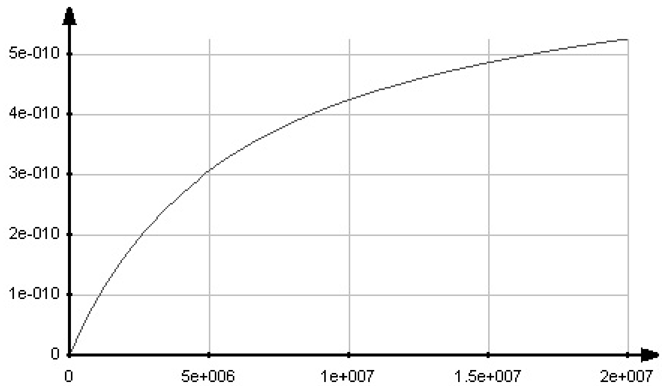

Fig. 2. GR Gravitational Time Dilation Factor *(×10^{-1}-1)* vs. Altitude *(m)*

$$t_o = 99.99999994714\% \times t_f \tag{10}$$

2.1.2 Finite Theory

In contrast with GR, to get the anticipated gravitational time dilation factor of any artificial satellite in proximity with the Earth, we first need isolating the most influential gravitational masses surrounding our probe. That will be the Earth itself, the Sun and the Milky Way. Consequently the simplified summation of the juxtaposed gravitational acceleration amplitudes for a satellite with an altitude of 20,200,000 m will give us a gravitational time dilation factor of:

$$t_o = \frac{\frac{m}{|x-i|} + \frac{n}{|x-j|} + h}{\frac{m}{|i|} + \frac{n}{|j|} + h} \times t_f \tag{11}$$

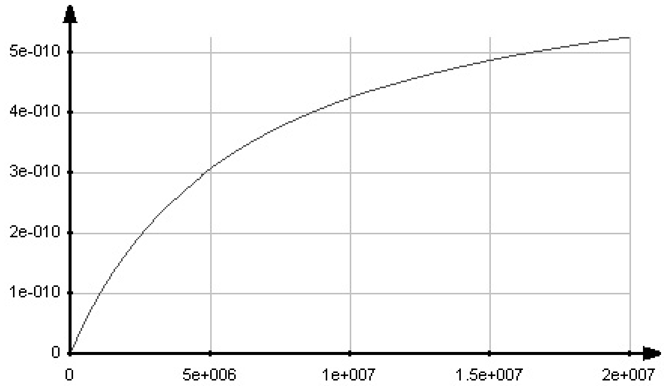

Fig. 3. FT Gravitational Time Dilation Factor *($\times 10^{-1}$-1)* vs. Altitude *(m*

$$t_o = 99.99999994714\% \times t_f \tag{12}$$

Where:

- $m = 5.9736 \times 10^{24}$ *kg* (mass of the Earth)
- $n = 1.98892 \times 10^{30}$ *kg* (mass of the Sun)
- i = -6371000 *m* (position of center of the Earth)
- $j = 1.49597870691 \times 10^{11}$ *m* (position of the Sun)
- $h = 1.3450632 \times 10^{27}$ *kg/m* (scaling factor of the Milky Way)

The precision of FT is relative to the number of masses included in its formulation, and amazingly is very sensible to the influence of large ones such as the local galaxy when high precision is required. This is because the norm or amplitude of each determinant is directly proportional to the bodyÑ mass and inversely to the distance.

The scaling factor represents the contribution of the local galaxy and is based on observations in order to match the effects. Deeper analyses of this factor constitute more complex calculations of mass distribution regarding the host galaxy.

2.1.3 Comparison

Given the fact FT was using an unaccountable constant to hold similar trends the observations are following; there is no clear distinction between the two theories up to this point. But if we observe the behaviour of both theories at even higher altitudes, the predictions will diverge from each other:

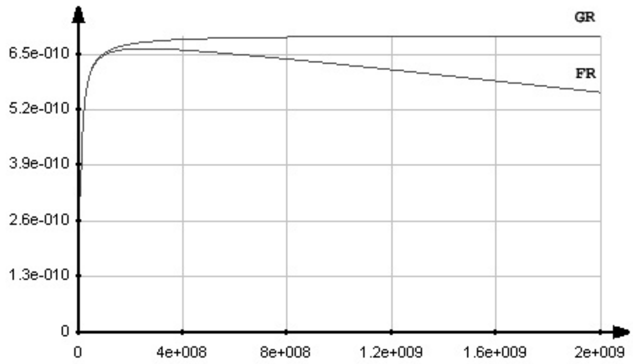

Fig. 4. GR & FT Gravitational Time Dilation Factors *($\times 10^{-1}$-1)* vs. Altitude *(m)*

As seen on the first row, for the popular Hafele and Keating Experiment [1] altitude involved and predictions surpassing geostationary satellites [2] this means:

Table 1. GR & FT Gravitational Time Dilation Factors *($\times 10^{-1}$-1)* vs. Altitude *(m)*

Altitude *(m)*	GR *($\times 10^{-1}$-1)*	FT *($\times 10^{-1}$-1)*
8,900	9.700×10^{-13}	9.719×10^{-13}
20,200,000	5.286×10^{-10}	5.286×10^{-10}
100,000,000	6.537×10^{-10}	6.488×10^{-10}
1,000,000,000	6.910×10^{-10}	6.262×10^{-10}

This also expresses a differing decreased expectation on the FT gravitational time dilation for a satellite or space probe at high altitudes or simply out of orbit, considering it is in direct line between the Earth and the Sun. If the probe is on the dark side of the planet, the opposite effect of speedups will be true.

2.2 Natural Faster-Than-Light Speed

Since GR disallows any probe or ship traveling faster than 3×10^8 m/s we reach an impasse because one of the closest star named Alpha Centauri is about 4.3650765 light years or 4.01345081×10^{16} meters away from us. This means light rays will take 4.36507646 years to overtake that distance according to GR. The following section explores consequences of FT on both interstellar and intergalactic message transmission.

2.2.1 Alpha Centauri

In order to estimate the time it would take in conformance to FT, we will follow the henceforth equation that takes into account the adjoining most massive entity, or the influence of the Milky Way with a scaling factor. Once again the scaling factor represents the average influence of all surrounding stars:

$$t = \int \frac{\sum_{i=1}^{n} \frac{m_i}{|x-d_i|}}{\sum_{i=1}^{n} \frac{m_i}{|d_i|}} \times \frac{1}{c} dx \tag{13}$$

By renaming m_1, m_2 with m; d_1, d_2 with i, j, consequently using a constant scaling factor of h representing $m_3/|x-d_3|$ and simplifying the entire equation we have:

$$t = \frac{m\log(|x-i|) + m\log(|x-j|) + hx}{\frac{m}{|i|} + \frac{m}{|j|} + h} \times \frac{1}{c} \tag{14}$$

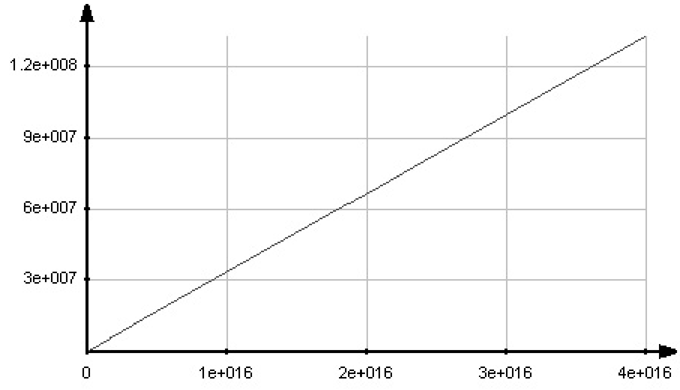

Fig. 5. Time (s) vs. Distance (m)

$$t = 4.3650764 \ years \tag{15}$$

Where:

- $m = 1.98892 \times 10^{30}$ *kg* (Sun & Alpha Centauri mass)
- $i = -149597870691$ *m* (position of Sun)
- $j = 4.1297265 \times 10^{16}$ *m* (position of Alpha Centauri)
- $h = 1.3450632 \times 10^{27}$ *kg/m* (Milky Way scaling factor)

Given that the observer is at position 0 *m*, we get an increase in speed of 100.0000009883% relative to GRÑ predictions, which is not tremendous but the experiment remains at a very low interstellar scale.

2.2.2 Andromeda

On the other hand by computing the nearest galaxy of about the same size called Andromeda and forasmuch as the hosting Virgo cluster [3] affecting both gravity fields of the Milky Way and Andromeda equally, we will have:

$$t = \frac{m\log(|x-i|) + m\log(|x-j|) + hx}{\frac{m}{|i|} + \frac{m}{|j|} + h} \times \frac{1}{c} \tag{16}$$

$$t = 2.5007882 \times 10^{6} \ years \tag{17}$$

Where:

- m = 1.1535736×10^{42} *kg* (Milky Way & Andromeda mass)
- i = -2.45986×10^{20} *m* (position of center of Milky Way)
- j = 2.403094×10^{22} *m* (position of center of Andromeda)
- h = 5×10^{23} *kg/m* (Virgo scaling factor)

Relative to GR, which predicts 2.5140531×10^{6} *years*, we have a velocity boost of 100.53043%. We are using a scaling factor from the Virgo cluster that is estimated in section 2.5.2, based on the observed galactic rotation curves.

We can foretell from these calculations galaxies will be subject to a speed bound much greater than 3×10^{8} m/s and that the more distant they are, the greater it will be relative to our galaxy. This is consistent with observations of distant galaxies outside the HubbleÑ sphere, where they all surpass the speed limit of 3×10^{8} m/s.

2.3 Artificial Faster-Than-Light Speed

By creating a tunnel with a lower gravitational potential we will observe beams of light traveling faster than c for an observer outside of the tunnel. In the following case we reach infinite speed for an object in a tunnel approaching a null gravitational potential:

$$v_o = \lim_{\Phi(r) \to 0} \frac{\Phi(r_o)}{\Phi(r)} \times v_f \tag{18}$$

$$v_o = \infty \tag{19}$$

2.4 Perihelion Precession

The demonstration of the perihelion precession of the planets is still at its early stages and thus cannot be provided. On the other hand an estimate of high accuracy has been performed and the results are convincing. But first letÑ start with what is actually observed [6]:

Table 2. Observed Disparity *(radian / cycle)* vs. Planet

Planet	*Disparity (radian / cycle)*
Mercury	5×10^{-7}
Venus	2.6×10^{-7}
Earth	1.9×10^{-7}

By comparison what had been obtained is the following:

Table 3. Computed Disparity *(radian / cycle)* vs. Planet

Planet	*Disparity (radian / cycle)*
Mercury	5×10^{-7}
Venus	1.8×10^{-7}
Earth	1.3×10^{-7}

The orbit of each planet follows standard Newtonian mechanics but only the time component is dilated by a factor of:

$$t_o = \frac{h}{\frac{m}{d} + h} \times t_f \tag{20}$$

Where:

- $h = 6.725316\times10^{26}$ *kg/m*
- m is the mass of the planet
- d is the distance of the planet from the Sun

The Milky Way scaling factor *h* is still debatable but is very close to what was observed by calculating the GPS gravitational time dilation in section 2.1, where actually is: $h = 1.3450632 \times 10^{27} kg/m$. *h* would ideally need to be constant in the entire solar system.

2.5 Dark Matter and the Galactic Rotation Curve

The idea of dark matter [4] is supposed to replace the missing matter necessary to withhold all tangential galaxies within their cluster traveling much higher than the necessary escape velocity. Dark matter explains also the same scenario at lower scales where tangential stars should technically easily escape the attraction towards to center of their galaxy. Unfortunately after many attempts of unfolding the nature of dark matter, no conclusive discovery can be revealed.

In contrast, by using FT as a mathematical representation we will find much different conclusions. Indeed, the stars and galaxies rotating around their galaxy and cluster respectively will be subject to time contraction. This means the bodies will be seen to travel much faster than the anticipated Newtonian speed. There is therefore no need for any dark matter to increase the gravity strength necessary to keep the tangential objects in an uninterrupted cycle.

2.5.1 Classical Mechanics

LetÑ take a closer by comparing the two scenarios using approximate measurements but with correct tangents. First letÑ explore the necessary velocity our Sun needs having in order to maintain its orbit around the center of the Milky Way. This is a very simplified model that disregards gravity of surrounding stars and wave effects of spiral arms:

$$v = \sqrt{\frac{Gm}{x}} \tag{21}$$

Where:

- $m = 1.1535736 \times 10^{42}\ kg$

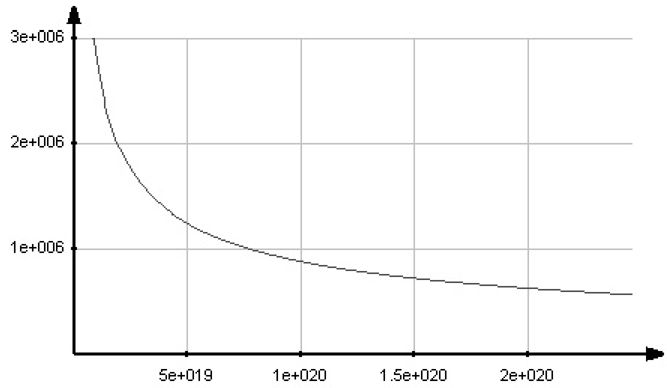

Fig. 6. Orbital Velocity (rad/s) vs. Radius (m)

The previous graph gives us the velocity proportional to its radius we should expect to see when stars are rotating a galaxy. This is known to be not true and here arrived the theory of the dark matter to augment the general mass of the galaxy.

2.5.2 Finite Theory

In the other hand, if we add time contraction effects to the stars orbiting the galaxy we will get very different results. LetÑ imagine our neighbor Andromeda has exactly the same properties as the Milky Way, in order to simplify our measurements, and we are observing it from our solar system. In these conditions an approximation of the observed speed of the rotating stars of Andromeda as seen from our position can be given by the following according to FT:

$$v = \sqrt{\frac{Gm}{x} \times \left(\frac{m}{r} + h\right) \Big/ \left(\frac{m}{x} + h\right)} \tag{22}$$

Where:

- $m = 1.1535736 \times 10^{42}\ kg$
- $r = 2.45986 \times 10^{20}\ m$
- $h = 2.5 \times 10^{22}\ kg/m$

We have arbitrarily adjusted the scaling factor h of the Virgo cluster properly to show the effects on the subjected Milky Way galaxy:

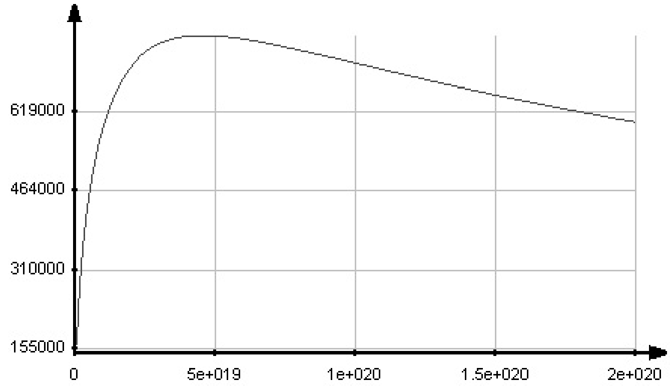

Fig. 7. Orbital Velocity (rad/s) vs. Radius (m)

We clearly see the observed velocity of the stars in Andromeda with different radius than our own Sun in the Milky Way ($r_o \neq r$). The graph curve is consistent with what is currently observed with distant galaxies.

The aforementioned rotation curve matches most of the galaxies, however low surface brightness galaxies have shown a much different trend [5]. Indeed the galaxies in question indicate an extremely high mass-to-light ratio, which will consequently affect the observed rotation curve. In the context of FT this can be accomplished by simply lowering its scaling factor:

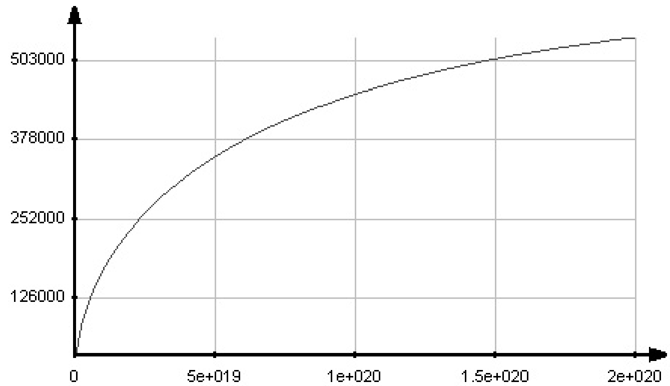

Fig. 8. Orbital Velocity (rad/s) vs. Radius (m)

Where:

- $h = 2.5 \times 10^{21}\ kg/m$

2.6 Dark Energy and the Center of the Universe

Dark energy is yet another form of energy that was induced but remains undetected in laboratories. It is supposed to be responsible for the expansion of the Universe by propelling galaxies away from each other. The problem is that in order to do so, the amount of energy theoretically required would be unimaginable. The HubbleÑ law represents the rate of the expansion of the Universe with the speed of the distant galaxies as seen from the Milky Way with:

$$v_o = H_0 x \tag{23}$$

Where:

- $H_0 = 2.26\times10^{-18}\ s^{-1}$ (HubbleÑ constant)

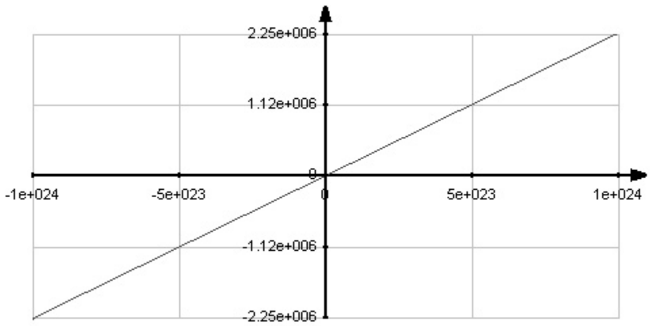

Fig. 9. Speed (m/s) vs. Distance (m)

On the other hand FT applied on the scale of the Universe proves that there is no need for such energy. Indeed if we consider the Universe to be the result of a Big Bang then all galaxies must have a certain momentum. If we try to represent the speed of the observed galaxies using FT where *h* is null because the environment must not be encompassed by anything else then we will have:

$$v_o = \frac{\frac{m}{|i|}}{\frac{m}{|x-i|}} \times v_f \tag{24}$$

After simplifying, subtracting the speed of the observer from his observations and disposing the absolute values to keep track of the direction we will have:

$$v_o = \frac{i-x}{i} \times v_f - v_f \tag{25}$$

Where:

- $i = -2.66 \times 10^{23}$ *m* (position of the kernel)
- $v_f = 6 \times 10^5$ *m/s* (speed of the observer)

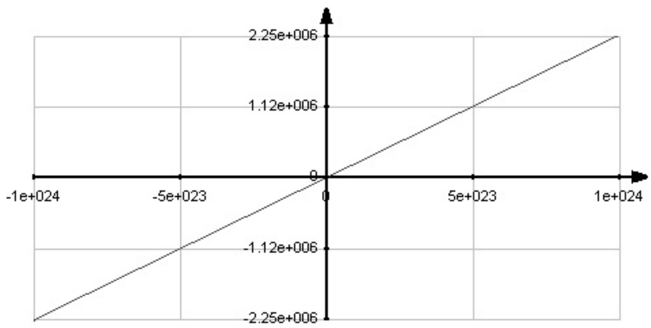

Fig. 10. Speed (m/s) vs. Distance (m)

This means *i*, or the position of the center of the Universe is actually solvable by equalling Equ. *(23)* and *(25)*:

$$H_0 x = \frac{i - x}{i} \times v_f - v_f \tag{26}$$

$$i = -\frac{v_f}{H_0} \tag{27}$$

The speed of the observer v_f is actually that of the Milky Way but the visible Universe itself most likely has its own momentum so the latter has to be taken into account.

Acknowledgments

This article was still a theoretical facet in the year 2005 and was fostered into a serious labor after confirmation of its potential validity by Dr. Griest and important requirements. Many thanks to him.

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