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Gravity as Energy and its Relationship with other Energies. Consequences & Applications

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ABSTRACT

We start with a summary of the Theory of Special Zero Gravity which is strictly deduced from Einstein's General Relativity Theory. This Theory is also based in the premise "Gravity is an expression of the state of balance reached by matter in space-time" (from Artificial BioIntelligence Theory by this same author, Amazon November 2023). Its mathematicals basis are deduced from and exposed in detail. This Theory studies the relationship among Gravity and kinetic energy, proving that kinetic energy in its different forms is able to counteract the concavity created by the Gravity, creating at last instance a "Zero Gravity" (ZG) effect which is a function of speed and altitude. We also discuss the conditions that must be fulfilled for appying the theory in the case of spinning objects. The "partial Zero Gravity effect" is also calculated. We also deepen in the relation among gravitational potential energy and the energy conservation principle, as well as the relation with the metric tensor of Einstein.

We continue with a reflection over centered in the relationship among Lense-Thirring (LT) effect and Gravity, showing that the influence of Lense-Thirring even in small objects allows to create concavities and convexities in space-time around them. As consequence, the gravity effect over them can be counteracted, experimenting effects equivalents to partial gravity, zero gravity and even anti-gravity. We also focus in the application of both effects (ZG&LT) to the building of new space-crafts. We finally find a relationship among the different ways of counteracting/reinforcing Gravity which also affects to the way of understanding the relationship among Light and Gravity. As consequence, we deduce that Zero Gravity effect in any degree can be reached by different ways, not only by speed such it was showed in. So we generalize to a General Zero Gravity Theory, whose key is the relationship among gravitational potential energy with other energies that are able to counteract it for interacting with space-time, showing that although direct kinetic energy is the most obvious, it's not the only one.

Finally we discuss about the possible origin of the Gravity and its evolution including its influence over Quantum perception.

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Special Zero Gravity Theory

Foundations of The Theory

This study analyzes the possibility of avoiding the gravitational effect corresponding to Newton's Law of Universal Gravitation [1-5].

To do this, it starts from a strict interpretation of the Theory of Relativity, supported by the Theory of Artificial Biointelligence of this same author, through which it is deduced that all celestial bodies are in a state of balance in the Universe, which is only altered when some "foreign body" to the system penetrates the "dent" of space-time in which said celestial body is immersed in its state of equilibrium in accordance with Einstein's Theory [2,3].

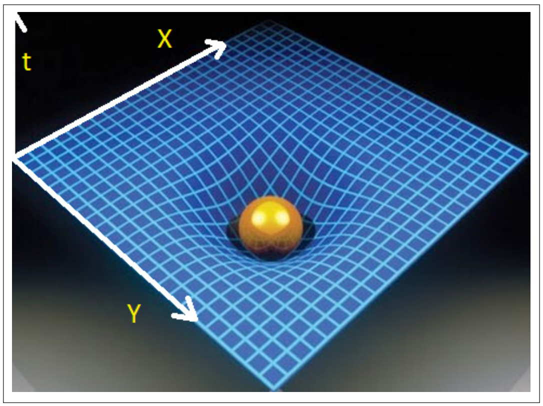
As a consequence, I consider that it should never again be stated that there is a gravitational force that attracts bodies, despite the fact that the simplification of the Theory of Relativity in Newton's Theory of Gravitation is more than sufficient to explain the interactions between nearby masses and to carry out the pertinent calculations when the intervention of the Time coordinate is not considered.

The real explanation of the phenomenon is that, when a body "falls" into the "dent" of space-time caused by another body, it is forced to "slide" into said dent, as happens with a marble when it falls into a hole. The effect may resemble that of the application of a force ("gravitational force"), so it can be explained with Newton's Theory, but the interpretation of the phenomenon is not correct.

It's about giving Time the authentic role it has in the Universe, which is none other than that of being one more axis of the coordinate system, but which at the same time maintains dependencies with the other three axes X, Y, Z of space, or in other words, it is not independent of them and therefore it's not immutable.

The best way to understand a system of four coordinates X,Y,Z,t is to reduce it to a system of three coordinates, that is, to assume that the Universe was an X,Y plane where third coordinate (usually named as Z) was in this case time t.

Then we can imagine the distortion caused in time by a mass M that was located in an X,Y plane:



In this case, to simplify, the mass M is identified with the Earth, but obviously the reasoning would be the same for any celestial body.

Development of The Theory

According to the Theory of Relativity, time passes more slowly on the surface of the Earth and gradually faster as we move further into space.

The effect of "gravitation" on time, that is, the effect derived from the presence of a mass in its equilibrium state on space-time over any mass found in its environment, can be expressed through the Theory of General Relativity and the Schwarzschild metric [2,6]. The time component of the metric tensor is

$$g00 = 1-\frac{2GM}{rc^2}$$

Therefore the times difference can be expressed as

$$(Ts-Te)^2 = \Delta Ts^2 = \frac{2GM}{rc^2} - \frac{2GM}{(r+h)c^2} \qquad (1)$$

Being h the distance between the sea level surface and the point S where we are at a height difference h above sea level, c is the speed of light, r is the radius of the Earth (6,371 km= 6,371 x 106 m.) G is universal constant=6.67 x 10^{-11} Nm^2/kg^2 and M the mass of the Earth (5.974 × 1024 Kg.

Now, if we assume that the object located at a point S is traveling at a speed v, the Theory of Special Relativity tells us on the other hand that there is a variation of time as a function of its speed [2]. The formula in which the time difference is expressed is determined by the Lorentz Factor [7]:

$$\gamma \equiv \frac{c}{\sqrt{c^2-v^2}} = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

Being v the speed of an object at point S and c is the speed of Light.

The relation of times between an observer stationary on the surface of the Earth (Te) and another moving at a speed v at point S (Ts) will be the following:

$$Te=Ts.\Upsilon$$

That is, if we tend to the limit, so that v was equal to the speed of Light (v=c): then Te=∞

And expressed as a function of Te:

$$Ts=Te.1/\Upsilon$$

Which can be expressed by homogeneity of times as

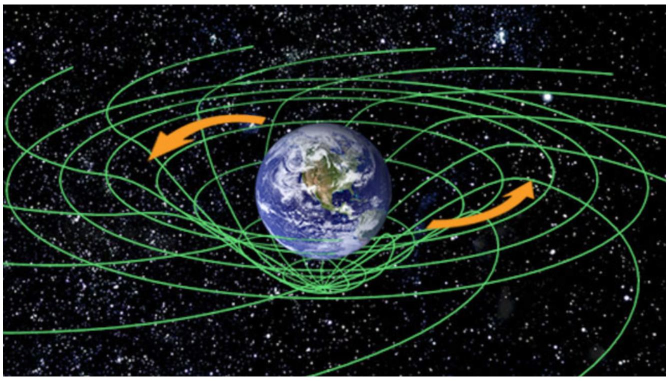
$$Ts = \sqrt{1-\frac{v^2}{c^2}}$$

Then, for an object at point S traveling at the speed of Light, time would have stopped for an observer on Earth, in other words: at higher speeds, time passes more slowly, to the point that if the speed approached at the speed of light, for an insignificant time for the traveler at point S, it would turn out that an almost infinite time would have passed on Earth (if it still existed by then).

Therefore the times difference between an object traveling at speed v and at static state can be expressed as

$$\Delta Ts^2 = \frac{v^2}{c^2} \qquad (II)$$

There is a third relativistic phenomenon that should be taken into account, the "Lense-Thirring effect", which is generated by the angular momentum of the rotating mass M (in this case the Earth), which produces a "drag" effect over space time. You could say that it "drags" any "foreign object" to move in the direction of rotation. In the following image we illustrate it by exaggerating the phenomenon for a better interpretation:



This effect, from a mathematical point of view, can be assimilated to that of a vortex in the Coriolis effect, which is why the formulas that define it are so similar. These are differential equations of the second degree.

The Lense Thirring effect for any kind of object is deeply studied based on Kerr metric, but we are going to ignore it in this discussion, since, in any case, its influence isn't significant [4].

This effect could be more or less important in other celestial bodies depending on their rotation speed (and obviously their masses), compared to that of the Earth.

There is a fourth relativistic phenomenon, called geodesic or de Sitter, related to a very small angle at which the Earth deforms its space-time. Its relevance is practically imperceptible.

In summary, for a traveler at a point S at a height h above the surface of the Earth moving at a speed v, there are two opposite time variations (this fact also happens, for example, with GPS satellites, so in that case proceeds to make a time correction):

- The height **h** causes time at point **S** to pass faster than on Earth, according to formula (**I**)
- The speed **v** of the traveler at point **S** causes time at that point to pass slower than on Earth, according to formula (**II**)

As we saw previously, it is the "dent" that is caused in the "mesh" of space-time by the presence of a mass M, or in other words, the deformation in t axis caused by said mass (when any object tries to alter its state of stability) the cause of the effect that colloquially, since Newton's time, we call "gravity". But... what if we managed to alter that dent, in the sense of "flattening" it and making it non-existent?... In that case, if the dent for practical purposes "did not exist", no object would "fall" into it. What would happen is that the state of stability of the mass M would not be altered, since it would be "as if it had not even noticed" the presence of another object.

To achieve this effect, we must equalize the times expressed in formulas (I) and (II).

Making (I)=(II):

$$\frac{2GM}{rc^2} - \frac{2GM}{(r+h)c^2} = \frac{v^2}{c^2} \quad \rightarrow$$

$$GM\left(\frac{1}{r} - \frac{1}{r+h}\right) = \frac{v^2}{2} \quad (**)$$

That is, $v = \sqrt{2GM}\left(\frac{1}{r} - \frac{1}{r+h}\right) \quad (*)$

Some examples:

For h=100 m. → v=44.32 m/s (159,55 Km/h)

For h=1000 m → v=140.15 m/s (504.55 Km/h)

For h=10000 m → v=442.89 m/s (1594.40 Km/h)

For h=30000 m → v=765.91 m/s (2757.27 Km/h)

For h=50000 m → v=987.24 m/s (3554.07 Km/h)

Important: To make as few calculation errors as possible, values of constants such as **G,M, r** must be adopted with the highest possible resolution.

On the other hand, it must be taken into account that the values will be slightly modified depending on the longitude/latitude in which we find ourselves, since the simplification assumes that the Earth is perfectly spherical and its composition perfectly homogeneous, something that is obviously not true.

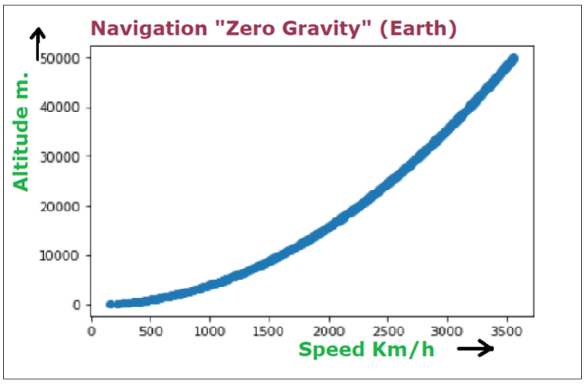
For impatients that can't wait to know why we take the surface of Earth as reference, I suggest jump to the chapter about the singularity in the Theory where I think it's clearly explained.

The theoretical final result is that a ship at a speed **v** and a height **h** resulting from (*) will "**defy gravity**" and travel under the "practical" effect of not being subjected to it ("**zero gravity speed**").

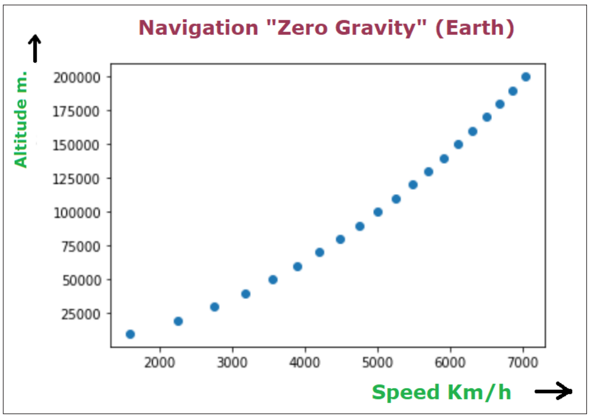
And, vice versa, from (**), that is, from the equality of the equations (**I**)=(**II**), one can also calculate the height **h** at which one must travel at a speed **v** to get the "practical" effect of "zero gravity".

For a ship that decides to travel continuously in "zero gravity", such speed will have to be continually recalculated in real time by the onboard computer in order to adapt it to different altitudes.

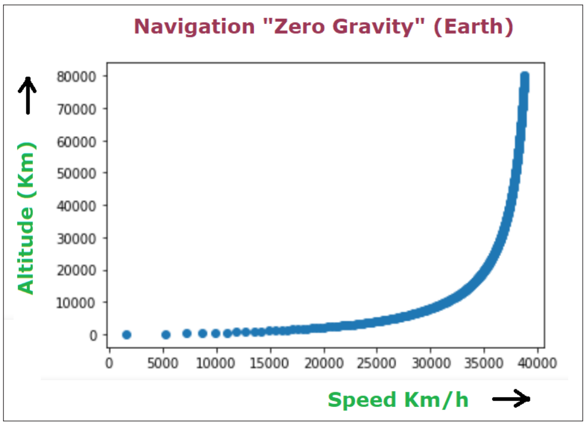
A code in Python is attached in [1]
Based in that code, some diagrams can be plotted.



Or, if we expand to altitudes of up to 200 km:



Or, expanding to very high altitudes (80,000 km):



In this third graph we observe how, for high altitudes, where the effect of gravity is smaller, the curve tends to an **asymptote close to 40,000 km/h**, which matches with the "classical Newtonian" calculation value of the escape velocity. The physical reason is the greater the gravitational potential field, the greater the speed needed to counteract it. We'll see this in detail in other chapter, when we talk about the partial zero gravity effect.

In turn, this third graph, in which at a certain height the speed of "zero gravity" matches with the classic escape speed, shows us the validity of this Theory.

This model has been applied to the Earth, but it is valid for any point in the Universe. With the exposed model, we should be able to navigate through space without that our ship being affected (once the corresponding calculations have been carried out in real time adapted to the environment where we are) by the "gravitational effect", with the consequent drastic reduction of necessary energy.

It should also be an effective method to launch satellites into orbit simply and economically or to take any space ship into space (regardless of its size and weight) without increasing its inclination angle or the energy needed.

Finally, we should point out that, given that for each altitude there is a specific speed of "zero gravity", the corresponding set of points (Vz,h), where Vz would be the "speed for zero gravity at altitude h", would correspond to singular points for Newton's Theory, that is, they could seem not being affected by it.

As a consequence, it would be essential to make them known,

Under these circumstances, what we have been looking for is getting to "flatten" the space-time so that the object/ship goes practically "unnoticed" by the Earth, "counteracting" the effects of a curved space. Then we could ask ourselves if it would be possible not only to "flatten it", but rather manage to move from the "concavity" of space-time to a convexity, that is, that the ship was "expedited" from the vicinity of the Earth.

This case would require a more detailed and exhaustive analysis, but in first instance we consider that we would be faced with a case in which, simply, the speed of the ship would be higher for each altitude than the corresponding singularity speed. Therefore the "convexity" would be the result, talking in conventional terms, of speed being able to "overcome" gravitational effects (without taking into account aerodynamic considerations).

In the event that we were able to prove the possibility of convexities in space-time by objects in movement, I consider that we could extrapolate as conclusion the possible existence of convexities in a general way in space-time and, in particular, to that of "white holes" which would "expel" mass (instead of "absorbing" it) given their extreme convexity (contrary to the extreme concavity of black holes).

White holes could therefore be found associated with "wormholes" or Einstein-Rosen bridges.

A Singularity in The Theory

This theory presents a singularity at sea level as reflected in the formula (*), when h=0.

This singularity is interpreted as due to the fact that the Theory is closely linked to the gravitational potential field, being the surface of the celestial body (the Earth in this case) our reference/origin which is also the origin of our Time axis.

We'll explain forward in detail the close relationship among gravitational potential energy and kinetic energy and deduce how the principle of conservation of Energy is the key for understanding how Zero Gravity effect works. That is, although this Theory is coherent with different valid physical approaches, perhaps the energy balance is the best way of understanding the need of taking the surface as reference point and therefore such origin becomes a singularity.

Application to Rotating Objects

Since the Theory of General Relativity was born there has been, and continues to be, a strong controversy regarding whether the rotation of an object in space follows relativistic or absolute guidelines. In other words: whether the rotation of an object should be considered absolute, that is, independent of the observer or not.

There are hypotheses in both senses. The main reason in favor of the absolutism of movement is that, according to the Theory of General Relativity, the speed is always relative to the reference system in question but the acceleration is always absolute. Since the rotation of an object around an axis of symmetry requires an acceleration that acts perpendicular to the tangential movement, that is, in the direction of the axis, called centripetal acceleration, said movement should be considered absolute. However, there are other hypotheses that consider that, despite this circumstance, uniform motion produced with a constant velocity should be considered relative, like any other linear motion.

For the case at hand, which is none other than the application of this Theory, the first rotating objects that would occur to us are probably those with a rotating axis perpendicular to sea level. Although it could be the subject of a simple experiment (simply applying rotation speeds as a function of altitude and diameter as we will indicate later), I consider that in this case, since the Z axis of the observer (which coincides with that of the "acceleration of gravity", g vector) and the axis of rotation are practically parallel, we would be closer to the "absolutist" case than to the "relativist" case.

However, I consider that the formulas that follow are perfectly applicable to any axis as long as the following critical technical considerations are respected:

• Space crafts **whose axis of rotation are strictly parallel to g, will not work**. Some "excentricity" should be added ("spinning top effect") although it's not necessary that it's ostensible. A little effect is enough, because the important fact is **altering** slightly (but **continuously) the direction of the axis of rotation to be a relativistic one**.
• Space crafts whose rotation edge has another direction of rotation could also have the previous issue being the solution the same that the exposed in the previous point.

Taking into account the previous considerations, the present theory is also perfectly applicable to objects that are rotating around an axis of symmetry, either remaining practically immobile or simultaneously moving (which would obviously complicate the calculations).

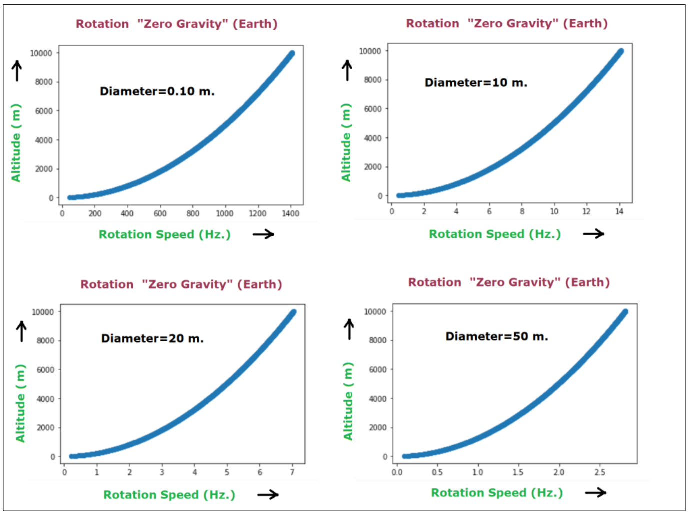
The above formulas could also be applied to new models of rotating air and space ships, which could require a high rotation speed for high altitudes, depending in turn on their diameter.

Such rotation speed could be combined with the translation speed to achieve the desired function.

Although the "Lense-Thirring" effect should also be taken into account for high rotation speeds, we could obtain the following graphs for different diameters of the ship rotating around a symmetry axis by applying the same simplified formulas dividing the speed by the length of the circle (*) [4]:

(*) Assuming that all the mass is concentrated in the periphery, in the plane perpendicular to the axis of symmetry.

A model for different mass distributions is proposed in [1]



In previous graphs, the speed of rotation is expressed in Hertz (Hz), that is, the number of rotations (turns, revolutions) per second.

As can be seen, for a ship diameter of e.g. 50 meters, the ranges of the rotation speed to reach a state of "immobility" (or, although the name is not correct, "ingravity") go from just over zero to 2.5 revolutions per second (0 to 10,000 meters altitude). However, for a "prototype ship" of only 10 cm. of diameter, ranges are among more than 100 and 1400 revolutions per second.

It should be emphasized that, as a direct consequence of the Theory, the necessary turning speed does not depend at all on the "weight" (it would be more correct to say "mass") of the ship.

The axis of rotation could be any as long as it's an axis of symmetry of the object.

If according to this Theory it is possible to "flatten" the space-time, it should also be possible to create a "convexity" in it.

To do this, by increasing the "equilibrium" or "weightlessness" rotation speed, the ship should be able to ascend. It would be the opposite effect of "gravitation", so we could colloquially call it "anti-gravitation" (*).

In short, at speeds lower than the equilibrium rotation speed the gravitational effect (at different degrees, so we call it zero partial gravity) would prevail, at higher speeds the "anti-gravitational" effect would prevail.

It must be taken into account that the "equilibrium speed" is a function of the altitude, therefore it should need to be continually recalculated.

(*) Note: My experiments show that indeed the antigravity effect could be reached with a speed of rotation higher than the balance speed for zero gravity.

As a curious fact, if we relied only on rotation and not translation, to maintain "weightless" a ship of about 50 m. of diameter at high altitudes above the Earth, we would require a rotation speed of about 68 Hz.

Logically, if the ship also moved simultaneously, the necessary rotation speed would decrease.

Therefore, new ships could be designed based on this Theory and not only on aerodynamics, not only for traveling to space but for transporting passengers and merchandise at the planet level.

Significant fuel savings could also be achieved and even renewable energy could be used, because of their design geometry would not be forced to follow conventional aerodynamic rules.

Zero Gravity Partial Effect

In previous chapters we analyzed at what speed (linear and/or angular), an object at a certain altitude h would result in "flattening" space-time and, therefore, traveling under the effect of "zero gravity".

We also wondered what would happen if the object traveled at a speed lower than the theoretical speed of "zero gravity" and, even, if at a speed higher than that of "zero gravity" the opposite effect could be achieved, that is, that the object could be "repelled" instead of "attracted" by Gravity.

We are going to analyze the simplest case of both of them, that is, what happens when the object travels at a speed lower than that of "zero gravity".

Our target is to find the relationship between speed and the gradual decrease in gravity associated with it (that is, the Partial Zero Gravity effect) until reaching the "full Zero Gravity" effect.

To do this, we are going to start from the time balance formula calculated in a previous chapter, based on which we deduced the speed of "Zero Gravity":

$$\frac{GM}{rc^2} - \frac{GM}{(r+h)c^2} = \frac{v^2}{2c^2} \rightarrow GM\left(\frac{1}{r} - \frac{1}{r+h}\right) = \frac{v^2}{2} \quad (3)$$

If we now wanted to calculate the speed at which half of the time difference due to Gravity would be "compensated", instead of completely compensating it, we would only have to divide the expression to the left of the equality by two, that is:

$$\frac{1}{2} * \left[GM\left(\frac{1}{r} - \frac{1}{r+h}\right)\right] = \frac{v^2}{2}$$

from which we would solve the value of v.

And, in a general way, calling Xt the time differential factor (in the previous example 2), we can calculate the theoretical speeds at which we would compensate 1/Xt the time difference due to Gravity:

$$\frac{1}{Xt} * \left[GM\left(\frac{1}{r} - \frac{1}{r+h}\right)\right] = \frac{v^2}{2} \quad (4)$$

Therefore:

$$v = \sqrt{2GM\left(\frac{1}{r} - \frac{1}{r+h}\right)} \,/\, \sqrt{Xt}$$

If we take the "zero gravity speed" (Vz) as a reference:

$$V=Vz/\sqrt{Xt}$$

Examples:

For Xt=1 → V=Vz

For Xt=2 → V=Vz/√2

For Xt=3 → V=Vz/√3

For Xt=4 → V=Vz/√4=Vz/2

.
.
.

For Xt=10 → V=Vz/√10

Another way of interpreting equation (3) is that ***it expresses the degree of conversion of gravitational potential energy into kinetic energy*** per unit of mass. The smaller Xt is, the greater its conversion, until it is complete for Xt=1.

When this conversion of gravitational potential energy into kinetic energy is completed, the "Zero Gravitation" effect is achieved for a given altitude. In other words: ***it is a consequence of the principle of conservation of energy***.

This relationship between gravitational potential energy and kinetic energy explains that, the higher the altitude, the more speed (higher kinetic energy) is necessary to achieve the effect.

Furthermore, this relationship is implicitly reflected in Einstein's mathematical development that led him to affirm that the metric tensor (limited in this case to the component of times g00), which defines the simplified space-time for the Newtonian field in Schwarzschild metric, is the gravitational potential field (U).

$$g00 = -1 - 2U/c^2$$

Let's now see what it means to "compensate by speed" in 1/Xt the time difference due to Gravity:

Based on the equation (3) and the equation of difference of gravities Δg among a point at the surface and at and altitude h:

$$\Delta g = GM\left(\frac{1}{r^2} - \frac{1}{(r+h)^2}\right) \qquad (5)$$

Working a little bit both equations (3) and (5) we can reach to the following expression: $\Delta g = \Delta Ts^2\left(\frac{1}{r} + \frac{1}{(r+h)}\right)\frac{c^2}{2}$ (6)

That can be also expressed in function of speed v as

$$\Delta g = \frac{v^2}{2}\left(\frac{1}{r} + \frac{1}{(r+h)}\right) \qquad (6b)$$

(6) and (6b) express (for any specific value of h) a linear relationship among Δg and $\Delta Ts2$ and among Δg and v^2.

This physical fact is clearly explained in a geometric symbolic simplification in [1].

Relevant Considerations
This theory is valid for objects in translation or rotation, as we discussed in previous chapters, with the following exceptions (just as previously mentioned):

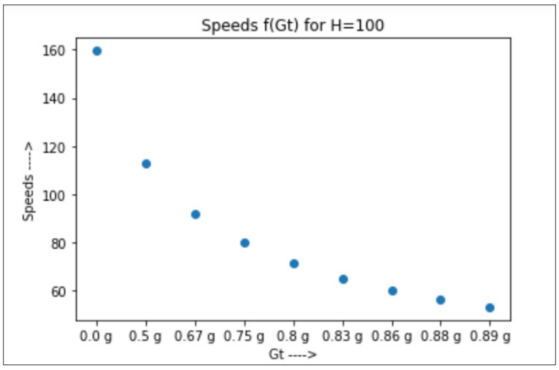
- It is not valid for objects either in free fall or that follow in any case the direction of the Gravity vector g, because they share the same reference system and relativity of times therefore makes no sense.
- It is not valid, by analogous reasoning, for objects/ships whose axis of rotation fits with the direction of the Gravity vector g, since the centripetal acceleration could be considered **absolute instead of relative** in this case.

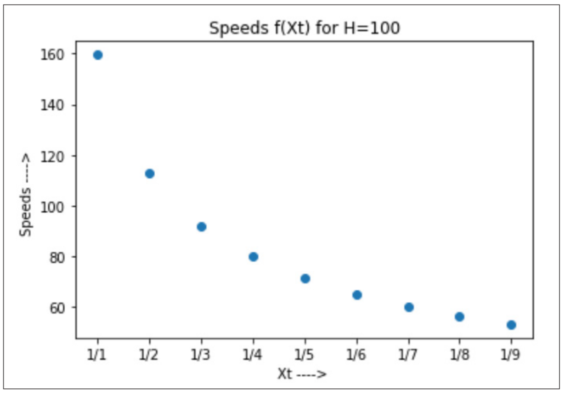
  In these cases, such ships would have to perform, simultaneously with the rotation around their axis, an oscillatory type movement around it (colloquially speaking, "spinning top type") to ensure that the movement could be considered relativistic and the considerations related to this Theory can therefore be applied.
- For other axis of rotation, it is suggested that they have a slight eccentricity to prevent the acceleration vectors from continually maintaining a fixed angle.

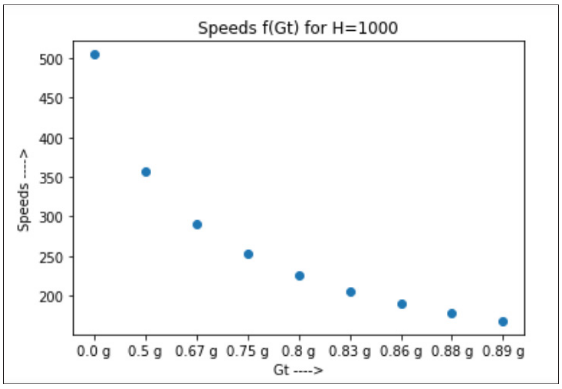
However, in these cases it is relatively easy for the axis to have a small enough eccentricity to ensure that the rotation movement is relativistic.

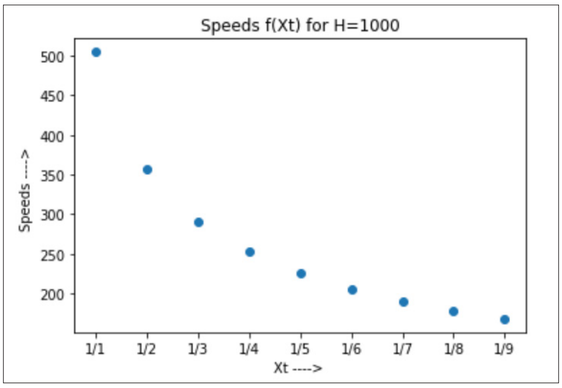
Below we present graphs of speeds as a function of Xt and real gravity Gr for different altitudes achieved with a simple Python program.

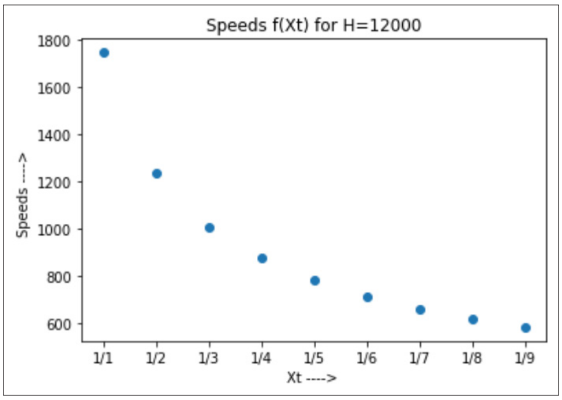
We remember that the values for very low altitudes, close to the singularity (zero altitude) may present a relatively high margin of error.

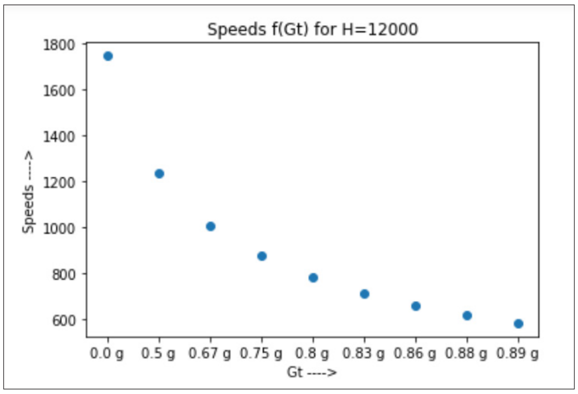












Considerations for speeds higher than "Zero Gravity" speed:
From the formula (*) and Figure 1, it can be deduced that for values of xt < 1, that is, for speeds higher to "zero gravity speed" the object/ship could be theoretically "repelled" by the gravitational field.

It is obvious that this hypothesis has complete and coherent mathematical support. But it would be necessary to confirm whether it also has it in the physical sense, since we would be talking about accepting the possibility of achieving convexity in space-time based on the speed of an object.

In my modest opinion, convexities in space-time are as feasible as concavities (many times achieved through rotation), and in the particular case at hand, "negative effective gravity" could be totally feasible.

I omit the calculations due to their similarity to the previous ones and because I consider that this hypothesis should be especially checked and proven through experimentation.

Proofs of Validation
Like any theory, this theory must be subjected to experimentation and testing, with the advantage that its verification is not too complex, and in fact I have allowed myself to carry out several tests, all successfully, with very simple equipment, which I will refer at the end of this chapter.

On the other hand, a few months ago some studies about of a strange magnetic levitation of causes not yet completely clarified appeared:

https://scitechdaily.com/defying-gravity-scientists-solve-mystery-of- magnetic-hovering-beyond-classical-physics/

In my opinion, the possibility that one of the magnets (the "floating magnet") had reached the "zero gravity rotational speed" should be studied, which would help to explain partially the phenomenon.

Especially taking into account that it is documented that the smaller the diameter of the "floating magnet", the more speed of rotation is needed (which would be in line with everything previously stated).

Although experiment was done almost at sea level (Denmark) and therefore error margin could be high, the sizes of the floater magnets and the fact that levitation rotation speed is function of their diameters suggest that it's likely that Zero Gravity could also be implied in the phenomena.

Therefore it would be interesting to repeat the same experiment at a higher altitude (more of 100 m.) to know if the results are exactly the same or not.

We would also suggest trying with larger magnets, not limiting the experiment to small objects.

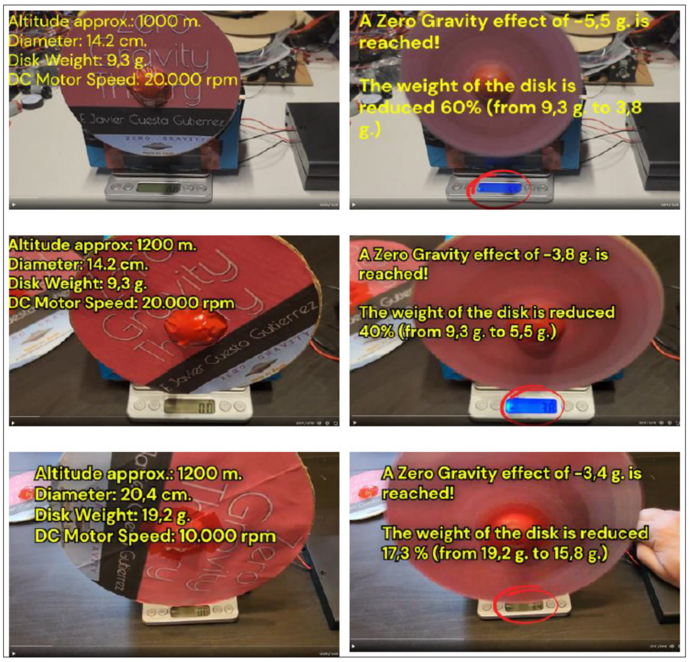
In any case, it would also be important to take into account not only the size of the floating magnets, but also their shape, since this will influence the equilibrium rotation speed.

If the results at different altitudes were identical, the intervention of the "zero gravity" effect would have to be ruled out, but otherwise we would probably have the first proof of validity of the Theory, even prior to the experiments carried out on my part subsequently.

But the real proofs of this Theory have came from my own experimentation.

I have carried out some experiments.

Even though I do not have the most appropriate laboratory equipment and environment, I consider that the results are more than eloquent and prove the validity of the Theory.



The results (videos) can't be obviously shown in this paper, but they're published on my X profile, The reader can access to them at

https://x.com/jaimevoltius/status/1832821529274462396

All the updated information and the evidences as result of them can be found there.

Towards a General Zero Gravity Theory
Lense Thirring Effect Applied to Rotating Objects

We're going to do a summary of the paper focused to the relationship among Lense Thirring (LT) effect and Gravity applied to small rotating objects. If more detailed info is needed, I refer to such paper [4].

Objects with angular momentum (rotation) are known to exhibit an effect called Lense-Thirring (LT) precession whereby locally inertial frames are dragged along the rotating spacetime.

Such effect has been usually associated to celestial bodies, and especially studied in the case of black holes and neutron stars, but it's showed at that Lense Thirring precession can be also very relevant for small objects under some specific conditions exposed in the associated paper [4]. The influence of Lense-Thirring in such objects allows to create concavities and convexities in space-time around them.

As consequence, the gravity effect over them can be counteracted (or reinforced), experimenting effects equivalents to partial gravity, zero gravity and even anti-gravity. Different objects in morphology and density (homogeneus) are studied as examples using some simplifications but the method could be widely extended to anyone. Kerr spacetime metric is applied. Some limitations of Kerr metric are also exposed. A set of graphics showing the relevance of LT effect in function of morphology, colatitude, size, number of rpm and even kind of material are created. Finally an analysis of the results obtained is done. As consequence of them, it's proven that LT effect should be also taken on account to be applied not only to small objects but to new space crafts designs.

This study applies the same concepts involved in the Special Zero Gravity Theory but counteracting in this case the gravity with the consequences of applying Lense-Thirring instead simply spin [1].

I refer to the bibliography mentioned in for a more detailed development of the formulas used here, since I consider unnecessary to repeat fully documented previous reasonings [4].

Earlier analyses of the Lense Thirring (LT) effect assume slowly rotating and weakly gravitational effect.

As result, the simplified formula for LT precession in the "weak gravity" field for celestial bodies is reached:

$$\Omega_{\rm LT} = \frac{2}{5}\frac{GM\omega}{c^2 R}\cos\theta.$$

where G is the Universal Constant, M the mass, ω the rotation speed, R the radius, c the light speed and ϴ the latitude (in our case reduced to the equator, therefore ϴ =0).

But this simplified expression in the "weak-gravity field" is not valid for our case, because although our objects of study create a very tiny newtonian gravity effect around them, they have a high rotation speed when compared with their mass, therefore weak-field should not be applied by default. We must apply strong-field instead. We're also going to find out such need later from a mathematical side.

For using LT in a generic way for any kind of object with any rotation speed, we're going to use Kerr metric (although our rotating object is not in vacuum, but this fact has hardly any influence over the precession rate).

LT precession rate in Kerr spacetime & Boyer-Lindquist coordinates can be expressed as:

(7)

$$\vec{\Omega}^K_{LT} = 2aM\cos\theta\frac{r\sqrt{\Delta}}{\rho^3(\rho^2-2Mr)}\hat{r} - aM\sin\theta\frac{\rho^2-2r^2}{\rho^3(\rho^2-2Mr)}\hat{\theta}.$$

Where a is the Kerr Parameter

$$a = \frac{J}{Mc}$$

"Where a is the Kerr Parameter, J is the angular momentum, M the mass and c the speed of light, but usually is simplified (when applied to black holes, neutron stars …) using c=1.

But in our case, focused to the study over small rotating objects, we must consider the real value of c.

The module/magnitude of the vector (7) is our first goal. It is: (8)

$$\Omega_{LT}(r,\theta) = \frac{aM}{\rho^3(\rho^2 - 2Mr)}\left[4\Delta r^2\cos^2\theta + (\rho^2 - 2r^2)^2\sin^2\theta\right]^{\frac{1}{2}}$$

Where a=J/M (known as Kerr parameter, the angular momentum per unit mass), and Θ the collatitude, being

$$\rho^2 = r^2 + a^2\cos^2\theta, \quad \Delta = r^2 - 2Mr + a^2. \qquad (9)$$

This is the LT precession rate in a generic way, where no weak gravity presumption has been done.

In the case that r >> a (r >> M) → the Kerr metric is almost reduced to Schwarzschild metric $\rho^2 = r^2$, a=0). In fact the equation (7) would be reduced to the weak-field:

$$\vec{\Omega}_{LT}(r,\theta) = \frac{J}{r^3}\left[2\cos\theta\hat{r} + \sin\theta\hat{\theta}\right]$$

We're going to use the weak field **only** when the general way can't be used due to the presence of the singularity represented by a negative value of Δ (discriminant).

I insist again in the fact that we're going to use the a **Kerr parameter** in its generic form, not in its simplified form (c=1).

In our particular case, the Kerr parameter is relatively high, because **J=I.ω** where **I** is the moment of inertia and **ω** the angular speed and we're managing large angular speeds and small masses. Therefore we're going to use weak-field ***only when strictly necessary***.

We're going to focus calculations in Equator (for spherical objects) although the precession effect changes slightly from Equator to Poles, as it's studied in detail in [4].

Scope of Application to Small Rotating Objects

To apply LT effect to any rotating object, we base our work on the same premise applied to Zero Gravity effect [1]: the concavity produced by a celestial body over any object can be counteracted by the convexity in spacetime produced by the object speed, lineal or angular. Then we're going to consider that Gravity can be also counteracted by the spacetime convexity created by LT effect (when the object spins counter-clockwise) or generated/reinforced by the spacetime concavity created by LT effect (when the objects spins clockwise).

I would like to remark that the sign of Δ (discriminant) parameter (9) deeply determines the range of application of the formula (7) for not- weak fields. That is, when $M^*r > (r^2+a^2)$ then $\Delta < 0$. This scenario is more suitable for low values of a and for denser materials. In such cases we're going to apply weak-field solution.

In fact an strict application of such range ($\Delta > 0$) would limit the application of Kerr formulas to an specific and bounded interval of rotation speeds.

From the obtained results (exposed in [4]) a close relation (especially for light materials) can be found among the range of rotation speed needed for applying Zero Gravity effect (ZG) and the range of rotation speed needed for applying LT effect [1].

Applying simultaneously both effects (ZG and LT), space crafts based on both technologies could achieve partial zero gravity, total zero gravity and anti gravity effects of different magnitudes.

Results Analysis

Relevant conclussions can be extracted from the results reached in [4]:

- LT precession rate effect can be very relevant for small objects with high speed of rotation and therefore it should be taken on account to be applied for future space crafts. E.g. For a disk of steel (solid) of 20 m. diameter and 2 m. of height, with a rotation speed of 2000 rpm (33.33 Hz.), that is, 210 rad/s=12032 degrees/sec., the precession rate is 52 degrees/sec., 0,4% of the rotation speed.
  We can observe that order of magnitude is very relevant and, as consequence, the according impact over the space-time around the object. Therefore a partial zero gravity effect is reached for counter-clockwise rotations and a partial increase of gravity is reached for clockwise rotations.
- The precession rate for the same rotation speed, diameter and kind of material is larger for solid materials than hollow ones.
- The precession rate for the same rotation speed and diameter increases with the density of the material.
- The precesion rate decreases from Poles to Equator.
- The precession rate increases from the center (0) to radius.
- The greater the moment of inertia, the greater the precession.
- For the same radius, the precession rate reached by an sphere is notably greater that the reached by a disk.
- The results show the values of the module of the LT precession vector, but not the vector components and therefore its direction. In any case, the vector will be oriented towards convexity of space-time for counter-clockwise spins, therefore counteracting the gravitational effect (decreasing the piece weight) and towards the concavity of space-time for clockwise spins (increasing the piece weight).

Influence of Precession Rate Over Gravity

I miss some studies about new advanced metrics along last decades. Such lack of research in this field lead us to very limited options when studying environments of a minimum of complexity. Most of current metrics have a lot of limitations and in fact they're applied only in vacuum. But we have currently very powerful tools (computing, AI) to solve any complex system of differential equations regardless their degree.

It's a pity that nobody has cared yet about getting metrics involving two or more bodies at least. They could be very useful in every way, including a right space-time interpretation of the great information coming from JWST and Hubble. My view is relying always everything in classic Gravity when we have a theory so powerful (Relativity) is a huge error.

This case is a good example of the previously exposed: we're not applying Kerr metrics to a black hole or a neutron star. We're applying it to a simple spinning body but that can't be considered in vacuum, because it's subject in this case to Earth Gravity.

Therefore the following study about the influence of the precession rate over Gravity is limited and we must assume some error margin. We're going to apply the following limitations:

- Kerr metric is going to be used:

$$ds^2 = \left(1 - \frac{2GMr}{\rho^2}\right) dt^2 + \frac{4GMr\, a\, sen^2\theta}{\rho^2} dt\, d\varphi - \frac{\rho^2}{\Delta} dr^2 - \rho^2\, d\theta^2 - \left[r^2 + a^2 + \frac{2MGra^2 sen^2\theta}{r^2 + a^2 cos^2\theta}\right] sen^2\theta d\varphi^2$$

  Taking into account the symbols values as explained previously in (9)
- The object will have spheric geometry. We'll apply colatitude $\Theta = 0$ because of the second term relationing $dt\, d\varphi$ disappears (=0).
- We'll suppose a relationship among dt^2 and Gravity close to linearity just as it's explained in [1].

With such suppositions, the time component of the tensor is reduced to

$$\left(1 - \frac{2GMr}{\rho^2 c^2}\right)$$

$$\rho^2 = r^2 + a^2$$

In our case Therefore the time component for a=0 (spinning=0, J=0) reduces the previous expression to Schwarzschild metric:

$\left(1 - \frac{2GMr}{r^2 c^2}\right)$, that is, $\left(1 - \frac{2GM}{c^2 r}\right)$

This leads us to that the square of the time difference ***simplified to this case*** among an object spinning around one of its symmetry axis attributable to frame precession and the same object in rest state would be:

$\Delta Ts^2 = \frac{2GMr}{c^2 r^2} - \frac{2GMr}{(r^2 + a^2)c^2}$ that can be expressed for a more intuitive interpretation as

$$\Delta Ts^2 = \frac{2GMr}{c^2}\left(\frac{1}{r^2} - \frac{1}{(r^2 + a^2)}\right) \quad (10)$$

As can be observed, the Kerr parameter a influences directly over the difference of times.

On the other hand, the object is subject to a gravitational field (Earth in our case).

Therefore there're a difference of times ΔTe (by Gravity) in function of altitude, that can be expressed (being in this case Me the mass of the Earth, re the Earth radius and h the altitude) like [1]:

$$\Delta T_e^2 = \frac{2GM_e}{r_e c^2} - \frac{2GM_e}{(r_e + h)c^2} \quad (11)$$

The difference of times by precession/LT effect (ΔTs) will add to the difference of times by Gravity (ΔTe) if the object is rotating clockwise (increasing the "weight" of the object) and it will substract from ΔTe if the object is rotating counter clockwise (decreasing the "weight" of the object). In such case, equalizing ΔTs= ΔTe and simplifying the resulting equation we could know the value of **a** needed for reaching an state of Zero Gravity at altitude h:

$$Mr\,(1/r^2 - 1/(r^2 + a^2)) = Me\,(1/r_e - 1/\,(r_e + h)) \quad (12)$$

From this equation we can calculate easily the value of **a** for getting a "Zero Gravity" effect (**az**):

Doing $K_1 = h/(Re*(Re+h))$ and $K2 = M/(Me*r) \rightarrow a_z^2 = K_1\, r^2 / (K_2 - K_1)$ (13)

From (13) we can calculate the value of the rotation speed (J=Iω=aMc → ω=aMc/I) for any object of mass M and moment of inertia I for reaching a full Zero Gravity effect and the value of such rotation speed for increasing/decreasing (in function of the direction of rotation) the partial gravity effect over an object.

We also could extrapolate Zero Gravity partial effects from (11) for specific **a** values.

I insist once more that this is a simplified way. Therefore the results obtained are only an approximation. We should create (and obviously use) more advanced metrics for getting an exact solution.

I insist once more that this is a simplified way. Therefore the results obtained are only an approximation. We should create (and obviously use) more advanced metrics for getting an exact solution.

Application to New Space Crafts

The associated technology will allow to build spacecrafts which take advantage of ZG and LT effect.

Combining ZG (Zero Gravity) effect and LT effect, spacecrafts could increase/decrease the gravity effect (they could even create an antigravity effect or "negative gravity") [1,4]. LT effect will become more relevant than ZG effect usually at higher altitudes (> 10 Km.) and less relevant than ZG effect to lower altitudes (< 10 Km.), because the influence of the altitude in the case over the LT effect is lower than the influence over ZG effect.

Therefore, we could build spacecrafts which combine ZG+LT effect to get the best of both worlds in order to travel taking advantage of warping the space-time around the spacecraft. In order to difference the ZG effect produced by speed and the ZG effect produced by LT effect, we're going to call the global ZG effect "Theory of General Zero Gravity" and the specific effect due to speed "Theory of Special Zero Gravity". We will go into more detail about it later.

From the previous result analysis , we can infer that the more efficient designs for getting the best of both effects for space crafts should be based on solid (or semisolid) spheres and disks. They also predictably would be the simplest to design.

It's not a goal of this paper to detail the possible designs of the new spacecrafts, but there's an important fact to take on account: From both points of view (theoretical and practical), ZG and their associated experiments have showed that concavities in space-time produced by Gravity can be not only counteracted until they're flatten but to the point of creating convexities. Therefore spacecrafts could consist of an spinning body (external rotating semi solid sphere or disk) and an internal hollow operative body. The spinning body would create an anti- gravitatory effect around it which would be enough to counteract its owning gravity + operative body gravity.

Corollary: There is a renewed interest in the old warp drive dream Project.

But there was a huge problem since its formulation long time ago in order to put it to work: There would be needed to find some kind of "antigravitatory material" to create (in our own words, not in theirs) a convexity effect over space-time.

But we have good news for these projects: There's not need at all to find such material that very likely does not exist. A LT effect can be reached by rotation (counter-clockwise) instead.

In summary, ZG+LT effects could allow theoretically to build a warp drive spacecraft. But there will be other ways to do it as I'll explain at the end of this paper.

In any case my view is we should learn to walk before to run: spacecrafts based on ZG+LT effect at first, then Warp Drive spacecrafts based on high rotation speeds clockwise and counter-clockwise.

Conclusions

A General Zero Gravity Theory

The Special Zero Gravity Theory shows that gravitational potential energy can be counteracted by kinetic energy (coming from translation and/or rotation) [1]. This should be the first focus of our attention in order for finding a generalization.

Zero Gravity effect (partial or full) reached by speed is according to the principle of conservation of energy: It's a conversion of gravitational potential energy in kinetic energy, or, under the opposite view, a conversion of kinetic energy in anti-gravitational energy, that is, the energy needed to flat the space-time around an object (located in an specific space-time point) subjected to the gravity created by other object.

Although someone could think intuitively that the more close to the Earth surface (sea level), the more speed we should need to counteract the Gravity, we deduced the following formula in [1]:

$$GM\left(\frac{1}{r}-\frac{1}{r+h}\right)=\frac{v^2}{2}$$

which shows that the speed needed to reach a Zero Gravity effect is lower the closer we're to sea level. Why?... Because the potential gravitatory energy to counteract is greater as the altitude increases.

We also could say from the above formula that it expresses the work (kinetic energy) that is needed for keeping in balance an unit of mass to an altitude h. But the speed vector is not necessary that has an associated specific direction (as long as it meets the conditions indicated in [1]).

Our study about the influence of Lense-Thirring effect over rotating objects showed that although the conventional gravity produced by small objects has hardly some influence over large objects, the Lense- Thirring effect created as consequence of their spin can really counteract the gravitatory potential field around them [4]. The impact of such effect in function of speeds, shapes, densities … was widely studied in the paper so it has no sense that we repeat them here [4]. The important fact is that we started from the same premise than the Special Zero Gravity paper, that is, that the gravity over the small object can be counteracted (or reforced depending of the direction of rotation) by the Lense-Thirring effect instead of doing it by speed.

In other words, we show theoretically and experimentally that gravitational potential energy can be also counteracted by shearing energy, understanding it as shear energy produced by a Lense-Thirring effect over space-time.

That is, we're counteracting gravitational potential energy with shearing energy in this case.

Therefore we can deduce a conclusion although it is pretty different from the current conventional physical perception of the Gravity: Gravity (or for being more exact, gravitational potential energy) can be considered for all purposes an energy. It is the energy needed by the matter to reach a state of balance in space-time and stored like a potential energy. Such energy can be counteracted (or reinforced!...) by any kind of energy that is able to interact with the space-time. Such currently known kind of energy is kinetic in one way or another. In fact we could consider that every energy (no potential) can be expressed in one way or another way as kinetic energy.

Therefore my view is this should open the door to interact in a close future with Gravity through other kind of energies, not only pure kinetic or shearing.

There have been two reasons for calling this deduction "**General Zero Gravity Theory**":

In honor to the great Albert Einstein, because this Theory was really written between lines of his General Relativity Theory. In fact he could be considered the grandfather of my Theory.

Because **Zero Gravity can be achieved not only by speed, but by other kind of energies**. I've exposed some of them here but I'm sure we could find others that are able to do the same work in a close future.

Light and Gravity

Based on what was stated before, we can find here the explanation for the real relationship between Light and Gravity: Light counteracts the Gravity effect (gravitational potential energy) due to its own energy in shape of electromagnetic radiation (which also can be considered ultimately kinetic energy). The light loses energy as it travels through intense gravitational fields, but it does not loose speed. As light loses energy along its way due to the gravitational fields, its tendency towards the red spectrum increases (redshift).

Therefore we could deduce the global value of the gravitational fields crossed by light along its path measuring its total energy loss. That is, we could calculate an equivalent gravitational field that was able to produce the same global effect.

What's more: the light bending+redshift can also give us an approximation not only of the equivalent gravitational field but the equivalent surface in space-time followed by Light through its geodesics lines.

Following the thread of the explanation, we could be able theoretically to use also electromagnetic energy for counteracting gravity.

Discussion

General Zero Gravity Theory is an extension of Special Zero Gravity Theory showing that Gravity can be counteracted (and in some cases, reinforced) by different kind of energies, including electromagnetic energy [1].

It should open a golden door to a new technology (or technologies) that will allow us to build very advanced space-crafts in a close future.

Space-crafts that should be able to navigate through space-time in in ways hitherto unimaginable, where ships based on Special

Zero Gravity Theory would be a first step (ships like "UFOs made on Earth"), and likely Warp-Drive based ships (taking the best of the combination of kinetic/shearing/electromagnetic energies) could be a second step.

And it's very likely that as we advance in this technology, new types of ships will come. They will improve any of those imagined in our science fiction movies (including our admired Star Trek Enterprise) by sure.

If we want to explore the Universe (and even searching by a habitable planet) without to be limited by so little distances, we should create "relativistic" spacecrafts very different to our current conventional "newtonian" rockets.

If we admit the postulate of the Artificial BioIntelligence Theory that "Gravity (that is, an energy) is the expression of the balance state reached by matter in space-time", then the next question is "how such balance state expressed as energy was achieved?" [3]. Well, my view is (by the principle of conservation of energy), that another energy was necessary for reaching such balance state expressed as gravitational energy. The next question then would be "and what kind of energy ("hand") would be able to warp the fabric of space-time and creating gravitational potential energy ("bow")?..."

My view, taking on account the relationship among Light and Gravity just as expressed before, is that such energy should be mainly electromagnetic energy.

Gravity had started to be created in a very first step from some kind of interrelation among the primitive energy and the own energy coming from the first atoms. In a second step the Light would have also intervened working as some kind of "catalyst" over the matter.

Quantum Electrodynamics (QED) could help us to research how such kind of processes could have produced.

This view about Gravity origin would be coherent with data coming from JWST about early galaxies implying that dark matter could not exist.

Curiously it also could explain the strange link between changes in cosmic radiation and seismic activity or the relation between solar activity and volcanic activity: relevant changes in electromagnetic radiation would affect in some degree to the Gravity producing some little (but enough) changes in the movements of the tectonic plates.

I'm going to add here other assertion of Artificial BioIntelligence Theory: such balance state reached by matter that we call Gravity has been built along Time over darwinian self learning processes, or, in other words, Gravity has evolved along Time till reach its current state [3]. That is, matter has needed not only Energy but Time to warp space-time. Such energy had been released over Time. The more concentration of matter, the greater the warping of the fabric of space-time.

Therefore we should pay attention to JWST data to confirm how such evolution has be done.

References

1. Javier Cuesta Gutierrez F (2024) Special Zero Gravity Theory. Preprints https://www.preprints.org/manuscript/202501.1106/v1.
2. Einstein A (1920) Relativity. London: Routledge https://philpapers.org/rec/EINR-4.
3. Cuesta FJ (2023) Theory of Artificial BioIntelligence. Amazon https://www.amazon.com/THEORY-ARTIFICIAL-BIOINTELLIGENCE-Javier-Gutierrez/dp/B0CNDCT28K.
4. Javier Cuesta Gutierrez F (2024) Lense-Thirring effect applied to small rotating objects. Preprints https://www.preprints.org/manuscript/202412.2408/v1.
5. Newton Isaac (1846) Newton's Principia: the Mathematical Principles of Natural Philosophy. New-York: Daniel Adee https://web.math.princeton.edu/~eprywes/F22FRS/newtonprincipia.pdf.
6. Schwarzschild K (1999) On the gravitational field of a sphere of incompressible fluid according to Einstein's theory. Proceedings of the Royal Prussian Academy of Sciences 1916: 424-434.
7. Lorentz HA (1904) Electromagnetic Phenomena in a System Moving with any Velocity Less than that of Light. Proceedings of the Royal Netherlands Academy of Arts and Sciences 6: 809-831.