Time

The Equivalence of Gravitational and Inertial Mass

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Abstract

Gravity, the force that attracts all, and inertia - the force you feel pulling on you as you accelerate. Are two separate and distinct phenomena, yet they share an equivalence which has yet to be explained. Starting from first principles and general assumptions, we present a heuristic argument that provides an explanation for this equivalence, as well as an in-depth understanding of how time is the responsible underlining mechanism and why. To accomplish this, we took a step back and reanalyzed the nature of time, which subsequently led to an undeniable conclusion about the universe and time's role within it.

Background and Introduction

For almost four hundred years, from Galileo Galilei to Isaac Newton to Albert Einstein, mankind has endeavored to unlock the enigma of gravity. In 1915, Einstein published his Theory of General Relativity, suggesting that gravity is a geometry in the fabric of space-time. In the paper, "Time – The Equivalence of Gravitational and Inertial Mass", a new methodology is examined, explaining the process of what exactly causes gravity and inertia, and introduces the supposition that gravity is not caused by warping in the fabric of space-time.

So, what exactly is gravity? In the universe, objects are moving through time at different rates depending on the mass concentration or spatial velocity of an object. The greater an object's mass concentration or spatial velocity, then the greater that object's velocity through time.

In the earth – moon system, the moon is moving slower through time, relative to the earth, due to its lower concentration of mass. As such, each of the two objects is experiencing its own individual temporal velocity, thus imbuing each object with its own unique magnitude of temporal charge, which again is proportional to that object's mass concentration or spatial velocity. The interaction between these temporal charges is creating a temporal differential between the two objects, (the two temporal charges), thus creating an attraction between the two bodies, and manifesting as the phenomenon we know as gravity.

Which brings us to inertia (or the inertial force). Within the universe, there exists a temporal field that is responsible for imbuing all objects with a temporal charge, – which as previously mentioned, is proportional to an object's temporal velocity. For all objects possessing a uniform velocity, this temporal field is symmetric. However, as an object accelerates, the symmetry of this temporal field breaks, thereby causing the field to push back against that object's acceleration, with a force that is proportional to the change in the magnitude of that object's temporal velocity, and thus its temporal charge. This resistance ($f = ma$), is also what governs the temporal velocity for all objects in the universe, and ultimately every object's gravitational strength.

For example, the moon's particular mass concentration is causing it to accelerate through time at a specific rate. However, a now symmetrically encompassing temporal field reaches a sufficient magnitude and pushes back against any further increase in the moon's temporal acceleration, – thus governing the moon's temporal velocity to a specific value, and therefore to a specific temporal charge. This equilibrium is responsible for preventing all objects in the universe from free-falling into an ever-increasing temporal velocity; and is subsequently the reason why every object in the universe has its specific gravitational value.

Therefore, time is the impetus of gravity and inertia, and its equivalence. Both manifestations are caused by all objects in the universe moving through time at different rates, based on an object's mass concentration or spatial velocity, thus imbuing every object with its own correlating degree of temporal charge. Hence, gravity is the attraction between temporal charges of different magnitudes, and inertia is the resistance to any change in that magnitude.

To measure the temporal charge, and also the attraction it causes between all objects, we need to identify the absolute temporal velocity of every object in the universe. The greater an object's temporal velocity, then the greater the magnitude of that object's temporal charge. As such, within a three-dimensional object or a system of three-dimensional objects, the wider the gradient differential between the collective temporal charges. Then the greater the temporal differential and thus the attraction between those temporal charges; divided by the spatial distance squared separating them.

To locate this absolute temporal velocity, we need a common lighthouse in time that is the same in all reference frames. For this, we use the Big Bang, as every object in time has an absolute temporal velocity relative to it, depending on the mass concentration or spatial velocity of that object. Therefore, by measuring an object's mass concentration or spatial velocity, we can determine that object's absolute temporal velocity relative to the Big Bang, and thus its absolute temporal charge.

So to calculate the absolute temporal velocity of an object, and thus its absolute temporal charge, we use the following function.

The greater the spatial velocity of an object, or the subsequent spatial velocity needed to escape the gravitational field of an object in question, then the greater that object's temporal velocity. Therefore, by measuring either form of spatial velocity as a function of the speed of light, we can determine the amount of temporal velocity for that object, also as a function of the speed of light. This, in turn, corresponds to the object's absolute temporal velocity relative to the Big Bang, hence its absolute temporal charge, and we denote this value R0 (r – naught). Figure 1.

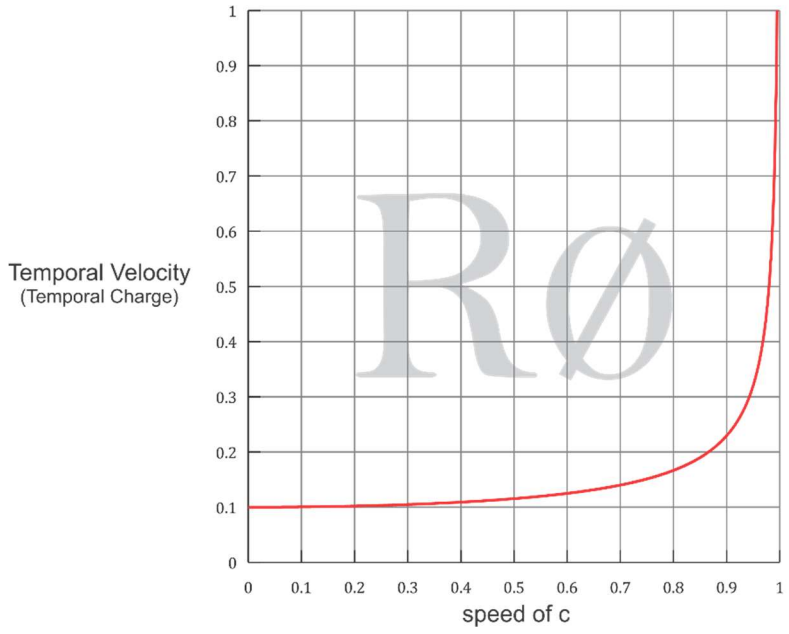


Figure 1. R0 (r – naught)

$$R\emptyset = 1 - \sqrt{1 - {}^{v^2}\!/_{c^2}}$$

Where

v = velocity from 0.0 – 1.0 (speed of light)

c = 1 (speed of light)

R0 = amount of temporal charge measured as 0.0 – 1.0 (1.0 = temporal charge of a black hole)

The closer an object's R0 value is to 1.0, then the greater its temporal charge and thus its temporal velocity. Additionally, as mass and time are intrinsically woven together, we define mass in a new equation which incorporates time and its interaction with mass in the following term. This equation signifies how mass increases proportionally to R0, which is the amount of temporal charge present within mass.

$$m = \frac{\left(\sqrt{2R\emptyset - R\emptyset^2} \cdot c\right)^2 r}{2G}$$

Where

R0 = amount of temporal charge measured as 0.0 – 1.0 (1.0 = temporal charge of a black hole)

c = 299792458 (speed of light in meters)

r = radius of object in meters

G = gravitational constant

m = amount of mass in kg

Sample Equations

1. To find the R0 of earth, we convert its escape velocity to a percentage of c.
11186 / 299792458 = .0000373125 % of c, we then input this value into the equation for R0.

$$.0000000007 = 1 - \sqrt{1 - \frac{.0000373125^2}{1^2}}$$

Given earth's R0 and radius, we can calculate its mass in kg

$$6.006*10\text{^}24 = \frac{\left(\sqrt{2}_{.0000000007 - .0000000007^2} \cdot c\right)^2 6.371*10\text{^}6}{2G}$$

2. To find the R0 of a neutron star, we again convert its escape velocity to a percentage of c.
125000000 / 299792458 = .416955119 % of c, we then input this value into the equation for R0.

$$0.0910729244 = 1 - \sqrt{1 - \frac{.416955119^2}{1^2}}$$

Given the neutron star's R0 and a radius of 10 km, we can calculate its mass in kg

$$1.170*10\text{^}30 = \frac{\left(\sqrt{2}_{.0910729244 - .0910729244^2} \cdot c\right)^2 10000}{2G}$$

3. Using the formula for gravitation, we can calculate the gravitational force (in newton's) between the two bodies when they are a distance of 1 million meters apart.

G = gravitational constant

$$4.688*10\text{^}32 = G\frac{(1.170*10\text{^}30)\ (6.006*10\text{^}24)}{1000000^2}$$

To understand temporal velocity and why an object's mass concentration or spatial velocity determines its value. We have to envision time as a two-sided coin, with time dilation and temporal velocity each being one side of that coin. From an external point of view, if time is running slowly for an object that is seemingly experiencing time dilation, – then time is running faster in the external universe for that object from its internal point of view, – thus that object is moving faster through time. These two seemingly different points of view are depicted and reconciled in the following graph. – Figure 2.

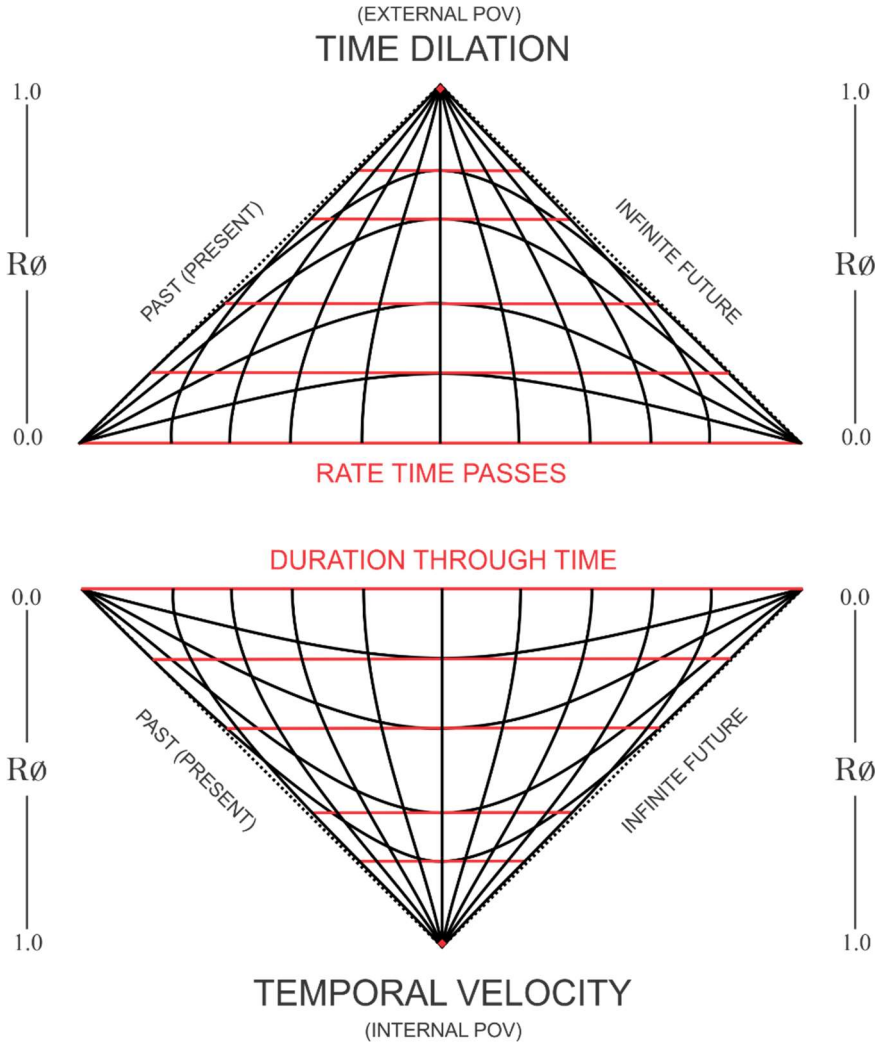


Figure 2. Time Dilation – Temporal Velocity

From an external POV, if an object is viewed as experiencing time dilation, then the rate that time passes for that object decreases (top red lines) as the mass concentration or spatial velocity of that object increases – as its R0 value increases to 1.0.

Oppositely, from an internal POV, as the mass concentration or spatial velocity of an object increases – as its R0 value increases to 1.0. That object's duration through time decreases (bottom red lines), thus that object's velocity through time, its temporal velocity increases.

Conclusions

Thus we have conclusively shown how and why gravitational and inertial mass are equivalent. What gravity and inertia are, and how time (temporal charge) is the mechanism responsible for each phenomenon.

The following are conclusions of this theory.

1. Within the universe, there exists a temporal field that stretches from the beginning of time for this universe at the Big Bang, into the infinite future. As objects move through this field they are imbued with a temporal charge (R0), that is proportional in magnitude to an object's temporal velocity through this temporal field.

2. Gravitational lensing is caused by light's attraction to temporal charges (mass) that are traveling through time. Although light does not experience time internally. Externally, light takes the path of least duration or resistance through time, which itself is a medium. Hence, the greater the magnitude of a temporal charge, then the greater its velocity through time – thus the greater light's attraction to that temporal charge.

3. Tidal force and frame-dragging are objects following the field lines of another object's temporal charge.

4. Objects that have the same temporal velocity also experience the same magnitude of temporal charge.

5. All objects have a given spatial position but also possess a temporal velocity value depending on that object's mass concentration or spatial velocity. For example, if the sun was converted into a black hole. Spatially it would be 149 billion meters away at (x, y, z) coordinates. However, the black hole would be traveling at an extreme temporal velocity through time due to its mass concentration, and possess an extreme temporal charge as a result. As such, any object in "space-time" should be identified by the use of a complex number (value), as space deals with spatial coordinates. While time, a separate dimension from three-dimensional space, deals with temporal velocities.

6. Gravitational acceleration is the rate at which objects are accelerated to reach the spatial coordinates and the equivalent temporal velocity, as that of the temporal charge it is attracted to. On earth, that rate is 9.807 m/s^2. Oppositely, the temporal velocity of any object exiting a gravitational field decreases relative to the temporal velocity of the temporal charge it is moving away from, and thereby loses energy. i.e. gravitational redshift.

7. Gravitational waves are created by the acceleration of temporal charges (mass), akin to how radio waves are produced by accelerating electric charges.

8. The centrifugal force is not fictitious. It is a force caused by the continuous symmetry breaking of the temporal field, due to an object's constant acceleration. Thus causing the temporal field push back against that object in a continuous bombardment and an accumulation of temporal charge as the object simultaneously radiates the energy away as gravitational waves.

9. Galileo Galilei discovered that objects with different mass concentrations do not fall at different rates in a gravitational field. However, objects with different mass concentrations do "fall" (move) at different rates through time.

10. The warping or geometry of space-time is not the cause of gravity. Einstein himself also did not believe that any physical geometry of space-time actually existed. [1]

11. The earth's massive core is moving through time faster than its surface. [2] This temporal differential between these two regions is the source of the earth's gravitational field.

$$m = \frac{\left(\sqrt{2R\emptyset - R\emptyset^2} \cdot c\right)^2 r}{2G}$$

12. To reconcile gravity with quantum mechanics, a boson for gravity needs to exist. As such, the above equation is significant, given that $E = mc^2$, it indicates that temporal charge is energy woven into mass. Thus, there exists a force mediator between all temporal charges (mass) - a temporal boson, a.k.a. the graviton.

Acknowledgments

The author gratefully wishes to acknowledge the awesomeness of the entire scientific community, both present, and past. As no scientific advancement can be achieved without the enormous sacrifices of giants that came before, and the accomplishments each has made in the pages of time – thank you.

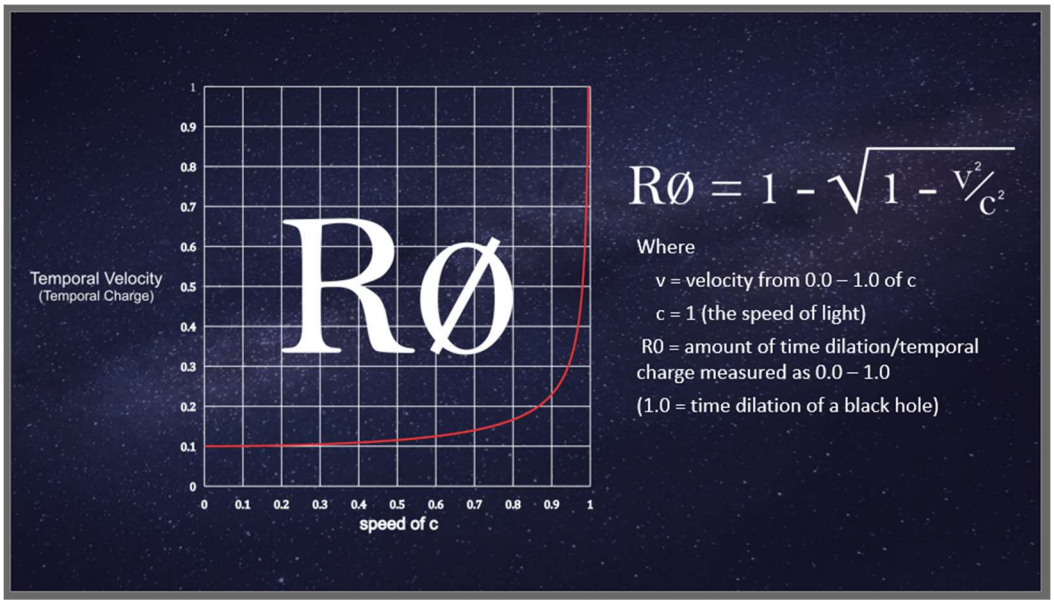
References

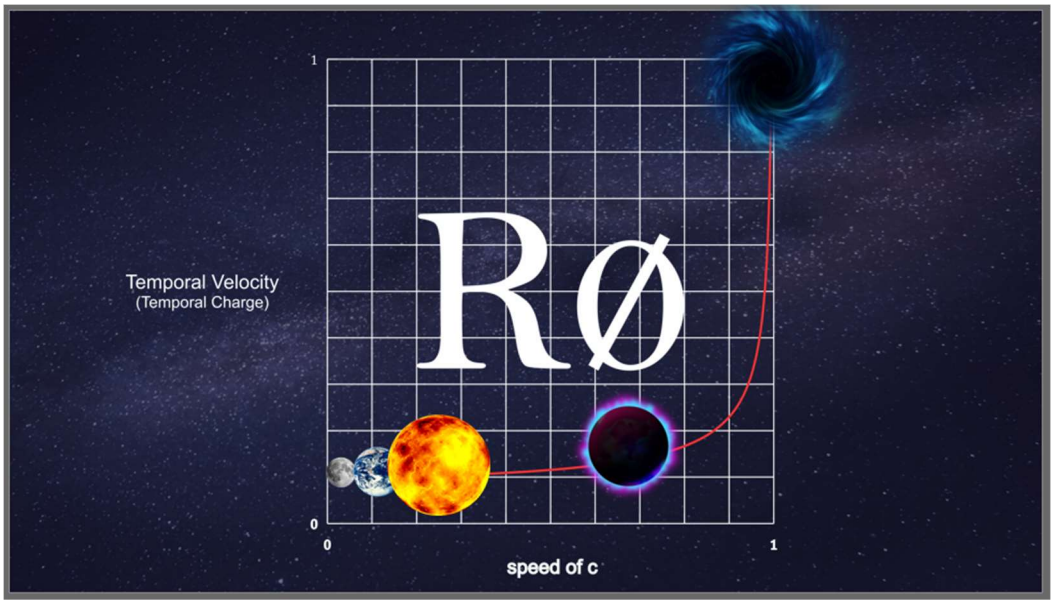
1. Lehmkuhl, Dennis: philosopher of physics and member of the Einstein Papers Project. Why Einstein did not believe that general relativity geometrizes gravity, ScienceDirect Volume 46, Part B May 2014, Pages 316 – 326 https://www.sciencedirect.com/science/article/pii/S1355219813000695
2. U I Uggerhøj, R E Mikkelsen & J Faye: The young centre of the Earth, April 2016 https://arxiv.org/abs/1604.05507

The following is an informal addition to the paper for conceptual clarity.

Conceptual Illustrations

At its core, the R0 equation simply states – that the more massive an object is or the greater an object's spatial velocity, then the faster that object's temporal velocity. Thus the greater that object's temporal charge.





Black holes are the fastest objects in the universe traveling through time. That is to say, black holes are the fastest objects traversing the temporal field. Thus black holes possess the greatest temporal charge R0 = 1.0.