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 through this field. 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 (the temporal field) at different rates, based on an object's mass concentration or spatial velocity, thus imbuing every object in the universe 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.

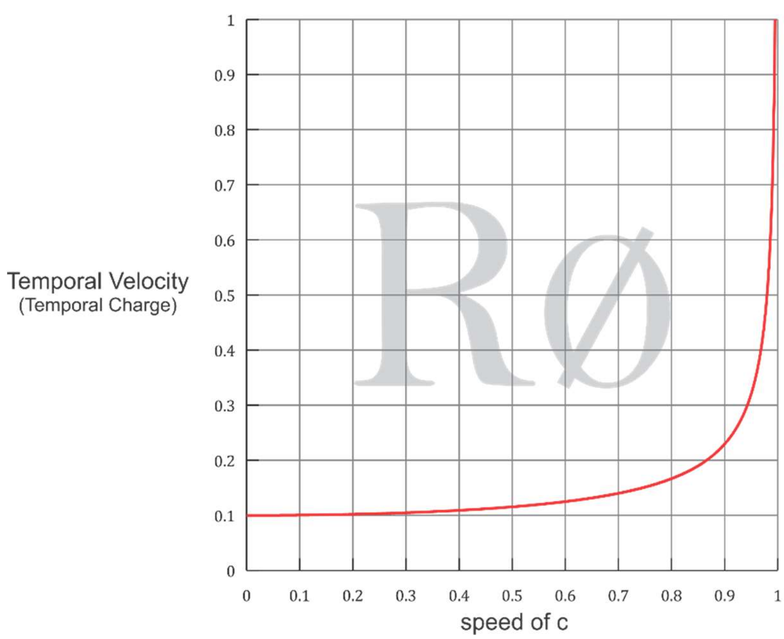

Figure 1. R0 (r – naught)

Equations

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

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

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

Temporal Velocity

To understand temporal velocity and why an object's mass concentration or spatial velocity determines its value and consequentially the value of that object's temporal charge. 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.

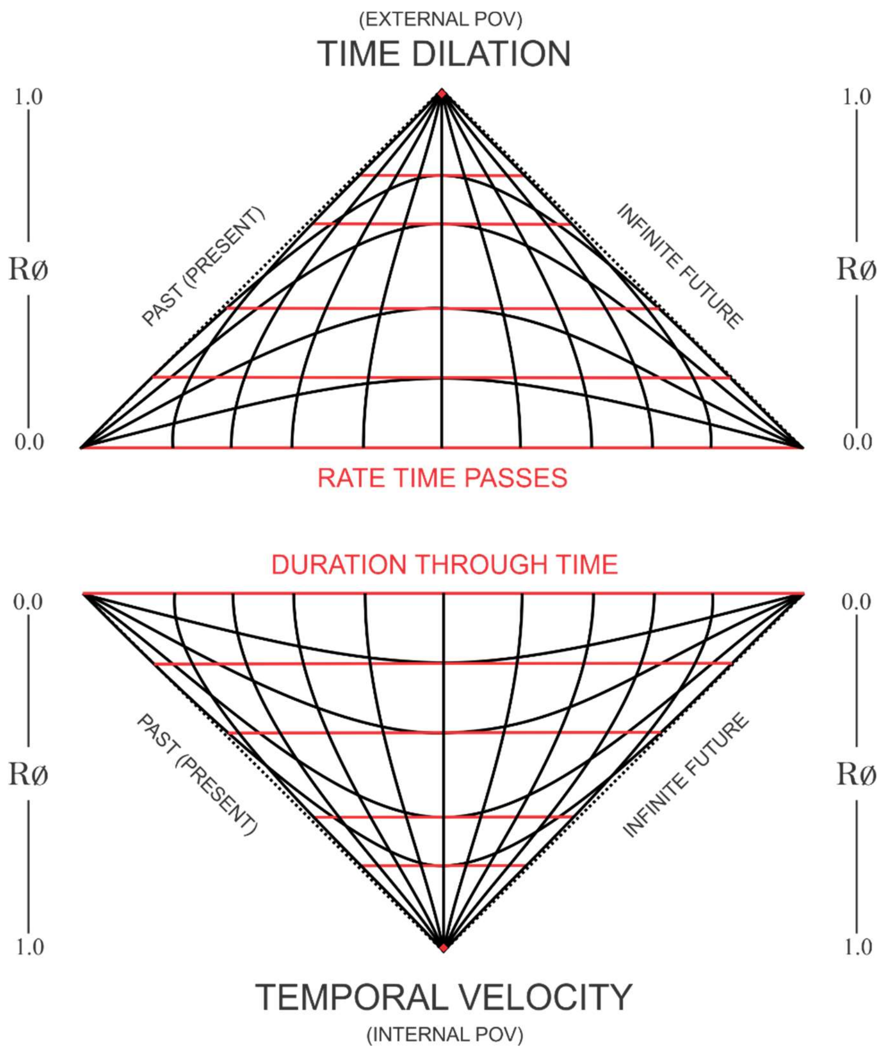

Figure 2. Time Dilation – Temporal Velocity

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.

Temporal Charge

When we think of the universe, we envision every object within it as existing and evolving on a three–dimensional stage. As it is analogously depicted in Figure 3.

However, unable to conceptualize the temporal dimension and the temporal field which permeates it. We lack an understanding of time and how objects (mass) moving through it create the entity which is directly responsible for the gravitational force – the temporal charge.

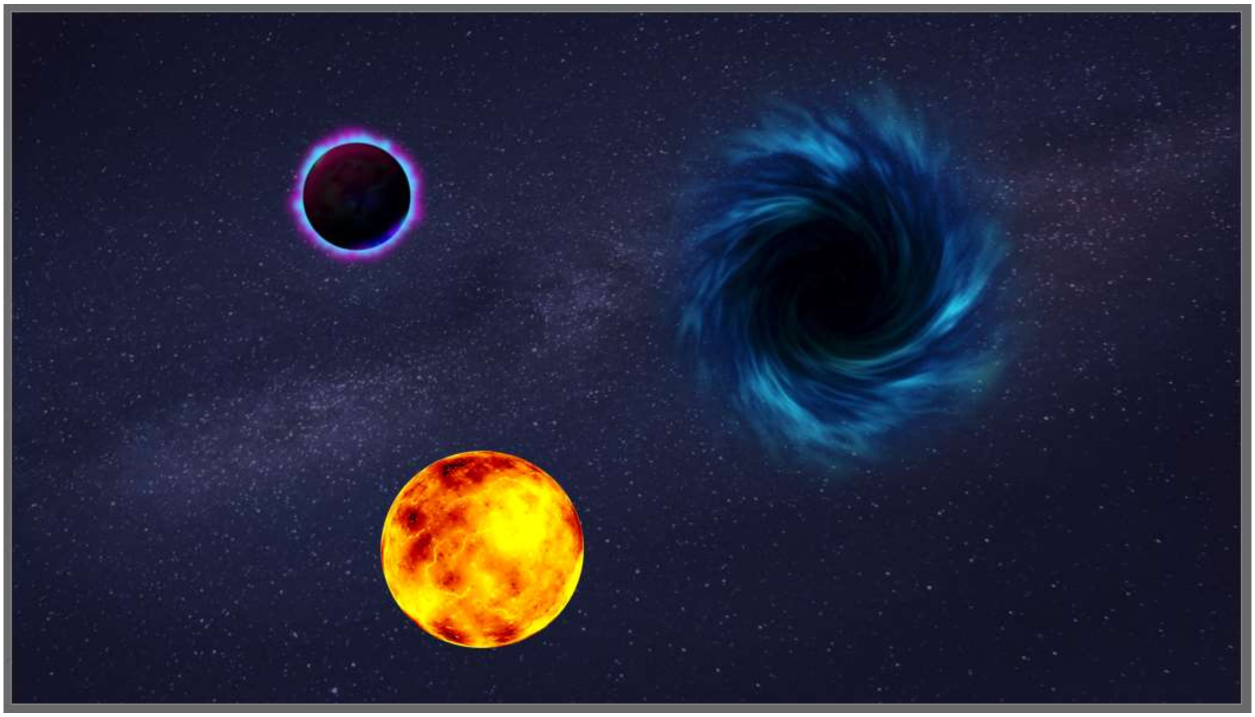

Figure 3.

As previously stated, objects are traveling through time at different velocities depending on the mass concentration or spatial velocity of that object. Which is depicted by using the temporal velocity vector. Figure 4.

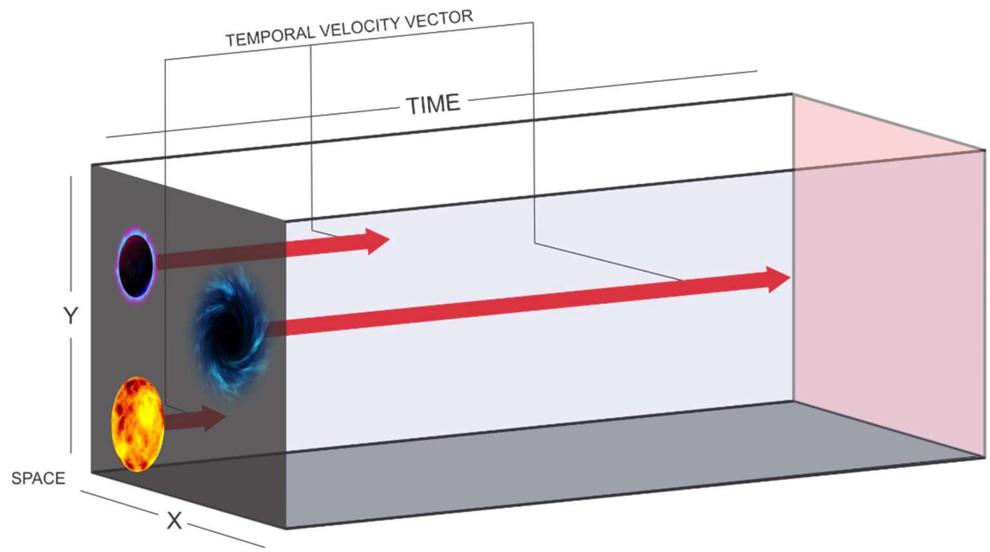

Figure 4.

As an object (mass) moves through the temporal field (time), a symmetrically encompassing temporal field pushes back until an equilibrium is reached between the object's temporal velocity and the temporal field. Hence governing that object's temporal velocity, its temporal charge and thus its gravitational field to a specific value. Figure 5.

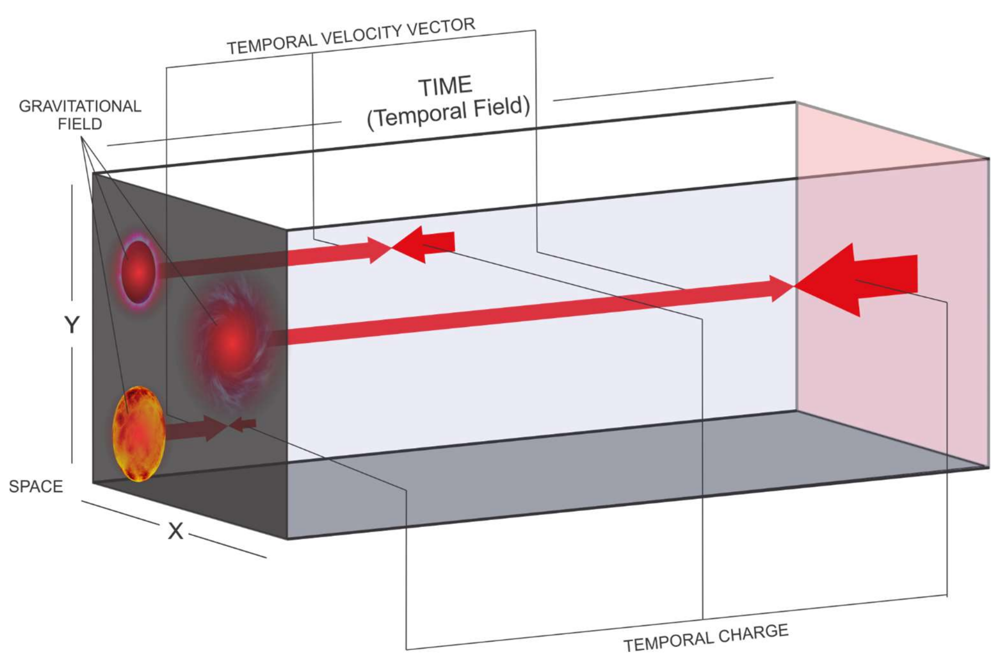

Figure 5.

By moving through time and interacting with the temporal field – all mass becomes a temporal charge, and the magnitude of the charge is proportional to an object's temporal velocity through the temporal field (time). Which itself is directly proportional to an object's mass concentration or spatial velocity.

An object's gravitational field and the field of the temporal charge are both one and the same. Hence the gravitational force between all objects is caused by the temporal differential between the fields of temporal charges (mass) that are moving through time at different velocities.

As illustrated in Figure 6., the mass concentration at the center of an object is causing that region to move faster through time than its surface. Thus the temporal differential between the two regions is causing the attraction we know as gravity.

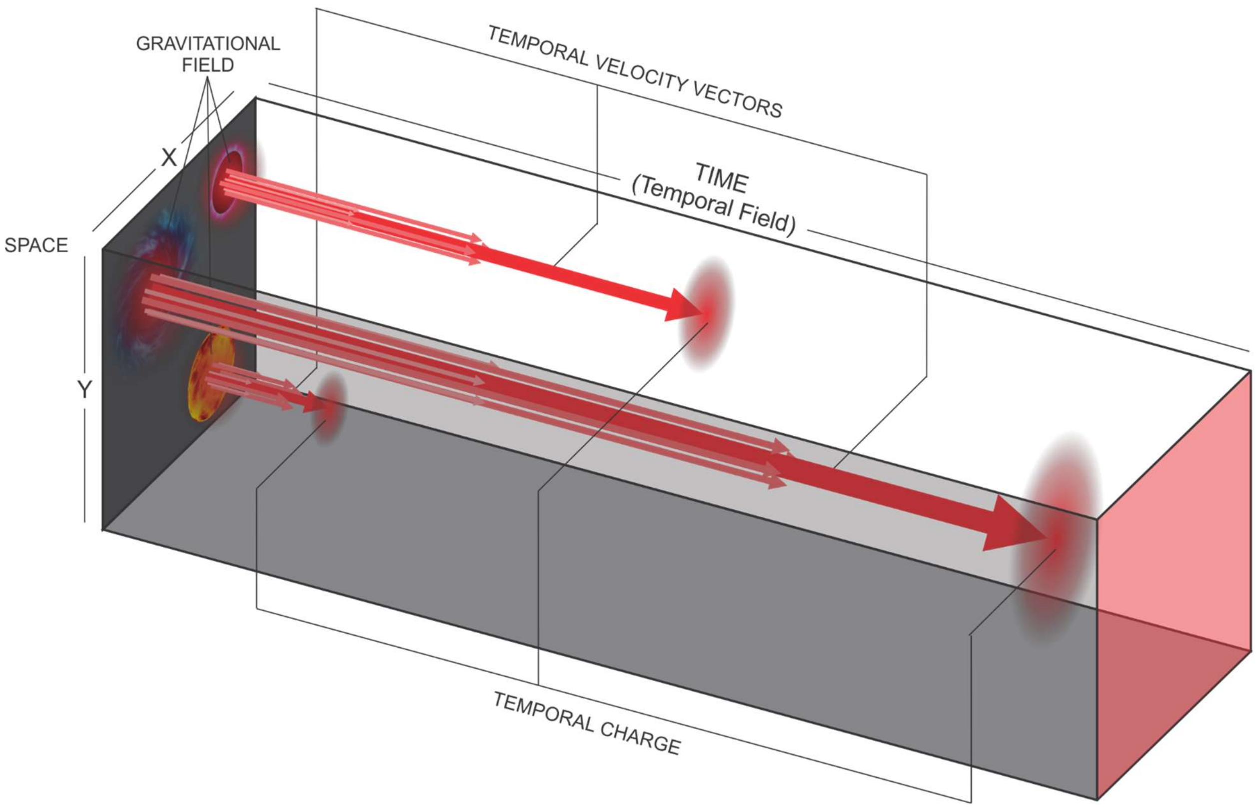

Figure 6.

The illustration (Figure 6.), also depicts how interaction with the temporal field (time) is also the source of an object's inertia. As an object is spatially accelerated its temporal velocity also increases thus breaking the symmetry of the temporal field – forcing the field to push back (f = ma) against that temporal acceleration and the change in magnitude of that object's temporal charge.

This interaction is also the source of inertial mass. As an object accelerates, it moves faster through the temporal field, hence the energy of its temporal charge increases. Thus per $E = mc^2$ the mass of the object also increases.

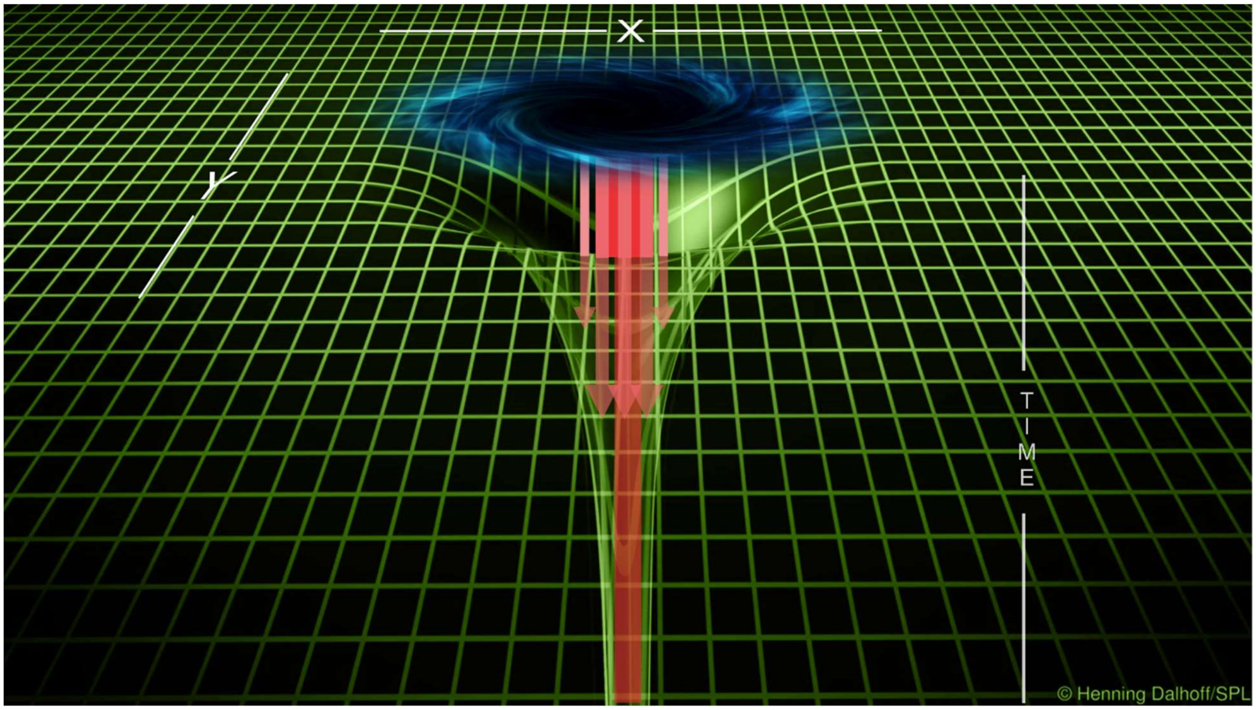

Figure 7.

The widely accepted representation of space–time is both misunderstood and incomplete. The perceived warping in the fabric of space–time is thought to be indicative of the geodesics that objects follow. Leading to the incorrect conclusion that gravity is not a force but a consequence of geometry in space–time. Also, from an external POV, the magnitude of this curvature is analogous to the amount of time dilation present at that region.

However, this warping (geometry) does not exist, it came about because the mathematical tools used to describe what is occurring came from the mathematics of geometry. Now the interpretation of general relativity, that attributes gravity to the curvature of space–time, is (almost) universally accepted, but Einstein himself did not agree with this interpretation. He considered the geometrical view and rejected it. He thought of general relativity as no more of a geometrical theory than Maxwell's electromagnetism. [1]

It was Weyl and Levi–Civita who put forward and popularized the geometrical conception. It became the orthodoxy and went into all the textbooks, but all through his life, Einstein disagreed with this move. [1]

In actuality, what general relativity is describing is not a geometry in space–time, but the temporal velocity vector and how its magnitude indicates how fast a region in the universe is moving through time and the consequences of that. Figure 7.

Thus, as it stands now, general relativity is incomplete. It lacks a description of the temporal charge, how it is created and why it is directly responsible for the mechanism of gravity – as examined here in this paper.

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 into the infinite future. As objects move through this field they are imbued with a temporal charge (R0), which is a property that inextricably connects all objects in the universe to the temporal field and therefore to time.

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 field differential.

4. Objects that have the same temporal velocity also experience the same temporal differential and 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 to push back against that object in a continuous bombardment and an accumulation of temporal charge – as the object simultaneously radiates the accumulated energy away as gravitational waves.

9. Galileo Galilei discovered that objects with different mass concentrations do not fall at different rates in through space. 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 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] The temporal differential between these two regions is earth's gravitational field.

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

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 (time) 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

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References

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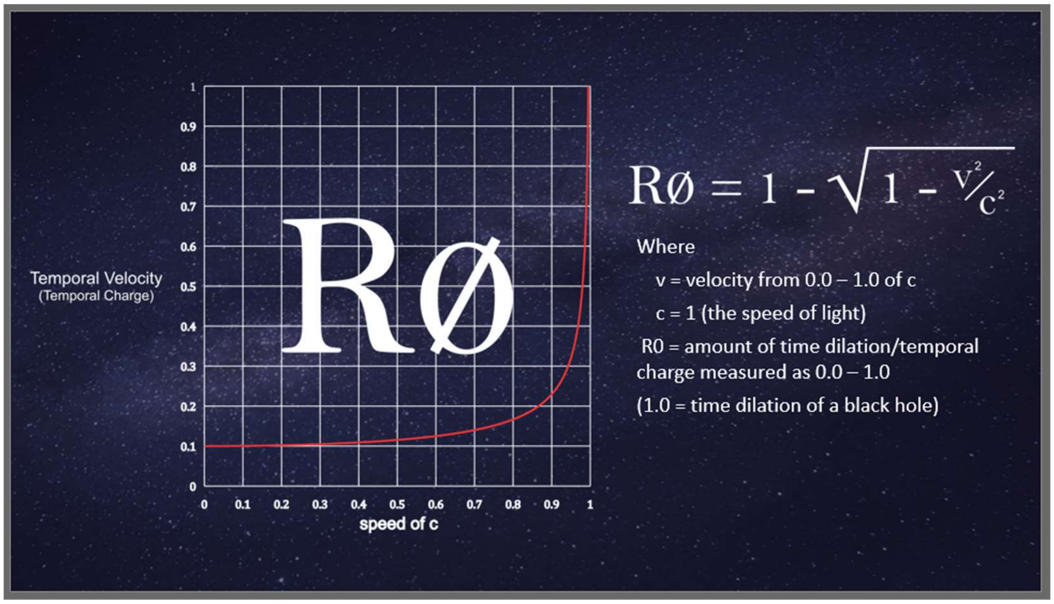
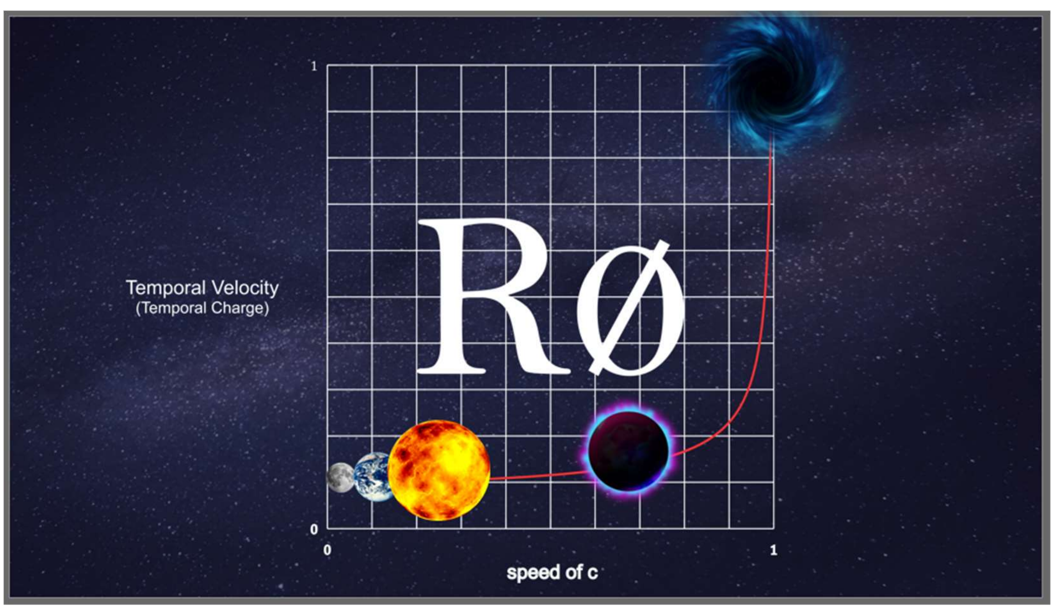
The following is an informal addition to the paper for conceptual clarity.

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