Segmented Spacetime and the Natural Boundary of Black Holes: Implications for the Cosmic Censorship Conjecture

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Segmented Spacetime and the Natural Boundary of Black Holes: Implications for the Cosmic Censorship Conjecture

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In this paper, we explore the interplay between the fundamental constants Pi and the golden ratio (ϕ) and their relationship to the maximal mass and spin of black holes. Our investigation begins by modeling a hypothetical clock with an initial radius of 1 in a gravitationally neutral environment. As gravitational forces increase, the radius of this clock expands, revealing an unexpected relationship between Pi, ϕ, and the segmented structure of spacetime. This connection allows us to propose a new framework that explains the observed bounds on black hole spin and mass.

Our analysis demonstrates that as the spin parameter a approaches the speed of light, it represents a state of maximal rotation in black holes, marked by a unique equilibrium of mass, radius, and segment density. These insights not only provide a deeper understanding of black hole properties but also support the Cosmic Censorship Conjecture by illustrating how spacetime segmentation naturally prevents "naked" singularities. Overall, our findings underscore the importance of Pi and ϕ in the structure and behavior of black holes, offering a new perspective on the complex dynamics governing the universe.

The normal clock, phi and pi

Our model assumes a normal clock with an initial radius of 1 in the absence of gravitational forces. As gravitation increases, the radius of the clock expands proportionally. In physics, a normal clock is an ideal timepiece that measures time precisely, unaffected by external factors like gravity or acceleration. Its constant operation makes it a useful reference in experiments and theories.

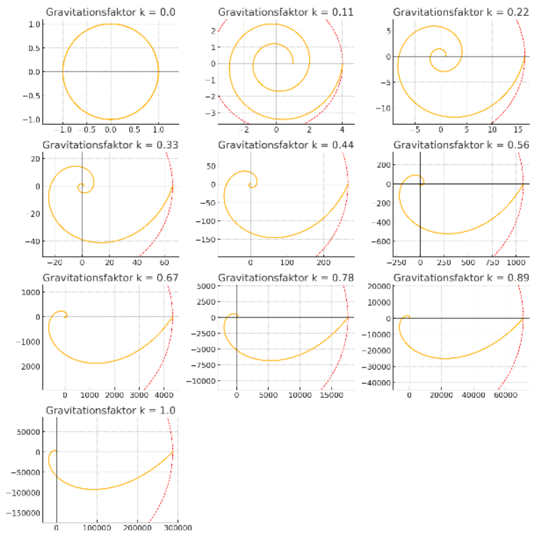
In this analysis, we consider a clock with a growth factor based on the golden ratio (ϕ), which leads to a spiral structure. When the radius equals 1, the spiral's structure almost aligns with the circle's circumference. At this point, we observe an interesting relationship between ϕ, Pi (π), and the circle's circumference:

Since ϕ is approximately half of Pi, it represents one-quarter of the circle's circumference ($\frac{1}{4}2\pi$). By adding twice ϕ (2 ϕ), we obtain half of the circumference, which equals Pi. This relationship can be represented as follows:

$$2\phi = 2 \cdot \frac{1}{4} \cdot 2\pi = \frac{1}{2} \cdot 2\pi = \pi$$

In the context of our spiral structure, ϕ represents a quarter of the circular motion, meaning it divides the circular circumference into four equal segments. This division provides a new perspective in which ϕ acts as a segmentation factor, while π describes the overall structure of the circular motion.

This observation highlights a fascinating connection between the golden ratio, Pi, and the mathematics of spiral structures. In the context of physical systems, such as black holes, this relationship could provide valuable insights if similar patterns emerge in their properties or behavior.



The first result depicts a circle.

In our model, the exponential function describes how radius scales with angular displacement, governed by the logarithmic growth factor k. This factor allows the spiral's radius to grow continuously and harmonically with each segment, maintaining a stable structural foundation and preventing unbounded growth.

The gravitational spiral describes the growth of the normal clock as gravitation increases while moving outward. This leads to a slowdown of time, as gravitation becomes stronger with the increasing radius of the spiral. The spiral thus captures the effect of gravitational time dilation in an expanding structure.

This logarithmic growth reflects the natural tendency of the gravitational field to diminish gradually with distance, preserving harmony as the radius grows. It defines the consistent scaling of space and gravitational influence, supported by the growth factor

$$k = \frac{\ln(\phi)}{\pi}$$

, which stabilizes spatial segmentation.

Time dilation becomes more pronounced the further one moves outward, similar to the gravitational field in the theory of relativity.

Phi serves two functions in this context: Firstly, Phi continues to represent the radius, as the radius of the circle is determined by the gravitational spiral. Therefore, the radius remains a multiple of Phi.

Secondly, the number of ϕ -segments is determined by the multiple of r, meaning that space is subdivided into increasingly finer segments as r grows larger. As r grows, space divides into finer ϕ-segments, reflecting the compounded influence of gravitational time dilation as the spiral expands. This increasing segmentation aligns with the clock's expanding path, making time appear to slow down under higher gravitational influence.

So it makes a difference whether there are 60 equal segments or whether gravitation creates even more segments because the clock grows larger and the second hand has to pass more segments. Although we do not see these segments, they exist in space-time.

The increasing segmentation described by Phi plays a central role in the slowdown of time due to increasing gravitation.

It is indeed comparable to a cake that is cut into smaller and smaller pieces as gravitation increases and the normal clock grows.

And this is why clocks run slower under higher gravitation, because the more segmented space is, the slower time passes.

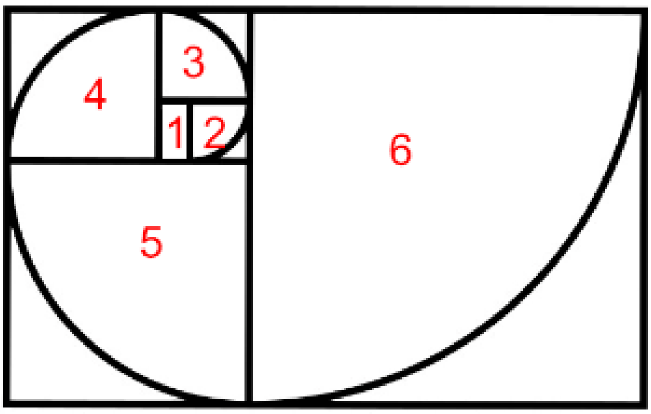
At point 1, Phi equals 1/4 and divides the circle into 4 segments. Therefore, ϕ =1/4.

2 ϕ corresponds to 2 segments that describe the radius of the circle, and in this case, the radius is equal to 1.

If we double the radius, we get 4 Phi, which means that the circle is divided into 4 Phi segments.

With each multiple of ϕ, the circle grows, and more segments are created, while the radius grows proportionally to the Phi segments.

So, if Phi divides a circle with a radius of 1 (normal circle) into 4 segments (represented by the areas in the Fibonacci spiral, where the areas that give 1 and 1 in the Fibonacci sequence must be counted as 1 area), then a circle with a radius of 2 would be divided into 8 segments.



Consequently, every expanded circle of the normal clock has this exact segmentation, since the radius and volume are dependent on Phi.

In the case of the normal clock, the clock expands with increasing gravitation, leading to an increase in volume. This means that it spreads over a larger area of space while segmentation also increases.

The normal clock expands, leading to an increase in volume. But in real objects and in our model, gravitational forces increase the segmentation density of the space around an object without changing its intrinsic mass or volume. The object's mass remains constant, but as the space becomes more finely segmented, this creates a higher density of spatial segments around the object. This denser segmentation enhances the gravitational effect, increasing the object's gravitational pull without altering its actual mass. Thus, gravity is intensified through the increased segmentation density of the surrounding space rather than by any intrinsic change in the object's mass.

Even with atomic clocks, which are based on the vibration of atoms, one can imagine that the vibrating particles in the space-time context have to pass through a similar segmentation. The stronger the gravitation or the more segmented the space is, the more 'segments' the particles have to overcome per vibration, which also leads to a slowdown of time.

This concept can therefore be transferred not only to mechanical clocks but also to atomic clocks, which run slower in a gravitational field because the particles have to 'pass through' more space segments in order to perform their oscillations.

The atoms that have to perform the vibrations must also pass through more space-time points. Atomic clocks are based on extremely precise vibrations (e.g. of caesium atoms) that occur in a fixed cycle.

If additional segments are inserted into space by gravitation, the atoms have to travel a longer distance (on a microscopic level) for each vibration, which means that they perform fewer vibrations per unit of time. This leads to a slowdown of time measurement in the atomic clock.

Through this model, we have shown that Pi acts as a natural constant because it describes the segmentation of space and is thus directly related to the space-time structure and time dilation due to gravitation. Pi remains constant in every growing circle or spiral structure, thus describing fundamental geometric relationships that also affect time measurement.

In systems such as atomic clocks or vibrations, Pi describes the cyclical nature of vibrations. Each vibration of an atom can be viewed as a segment of a circle, where Pi describes the rhythm and periodicity of these vibrations. The more space is segmented by gravitation, the slower the atoms vibrate (resulting in a time delay).

Pi segments space by setting the ratio of circumference to diameter and dividing space into proportional circular segments. This segmentation remains constant, regardless of the size of the circle, and plays a fundamental role in the space-time structure and in processes such as vibrations or time dilation due to gravitation.

The theory of relativity understands it like this: Pi ensures that space is divided into proportional arcs, which makes time slower as space and gravitation increase. In the theory of relativity, Pi plays an important role because it is related to the geometric structure of circles and spheres. These structures are central in describing the curvature of space-time around massive objects such as stars or black holes. Time dilation caused by gravitation is a direct result of this curvature, in which the 'path length' in space becomes larger when space is more curved.

The statement that Phi represents half of Pi and $2\pi = \phi + \phi$ holds is a specific relationship that is valid in the gravitational spiral model, where Phi serves as a segmentation and growth factor. However, in a normal circle there is no direct connection between Pi and Phi in this sense.

In a normal circle there is no growing or exponential structure as in the spiral. Therefore, Pi remains purely related to the circumference and radius in a circle. There is no connection between Phi and Pi in classical circle geometry.

In the gravitational spiral, however, space expands, and Phi describes the growth and segmentation of the spiral, leading to the relationship $2\phi = \pi$.

In our model, the spiral grows with each quarter turn, using Phi as a segmentation factor that describes time dilation.

At the point of 1, each 'half' of the spiral is summed up by two ϕ to Pi. This type of division applies to our model.

Here we have introduced Phi as a geometric constant that relates to the spiral structure and the segmentation of space. Therefore, π as the sum of two Phi (i.e., $2\pi=\pi+\pi=\varphi+\varphi$) is a special relationship that holds.

In the case of a circle, the classical relationship remains:

$P=2\pi r$

If the radius $r=1$, then the circumference of the circle becomes:

$P=2\pi$

This means that the circumference of the circle is exactly 2π at a radius of 1. In a circle, there is no direct relationship where Phi (ϕ) can be considered as the 'half of Pi', because in classical geometry Phi (the Golden Ratio) and Pi (the ratio of circumference to diameter) are different constants with different meanings.

Topological meaning

Our consideration therefore has a topological component, in particular in the sense that we not only look at the classical geometry of circles, but also at the structure and growth of the spiral in space, which changes through space-time distortion or transformation.

The gravitational spiral grows continuously, and the radius expands with each quarter turn. This change in structure is a topological transformation because the space in which the spiral is located grows and changes without destroying the fundamental shape of the spiral itself.

Phi and Pi are not only geometric quantities, but also topological invariants that describe the growth and segmentation of the spiral. The fact that Phi doubles with each quarter turn of the spiral shows that the structure of the spiral is considered from a topological perspective, in which the segmentation changes continuously.

In this process, Pi describes the basic structure of space as it is segmented into circles, and Phi describes the growth rate of this structure.

When the spiral segments the space further and further as it grows, the geometry of the space changes, but the topological structure remains preserved. Therefore, the way in which Phi doubles with each turn describes a topological transformation where space is continuously distorted without the spiral as a whole losing its structure.

Gravity changes the space-time structure by curving and segmenting space without completely destroying it.

Under gravity, the space-time structure undergoes a topological transformation in which the number of segments (described by Phi and Pi) changes while the basic shape of the spiral and the circle remains intact.

The notion of time dilation arising from spiral growth and increasing gravity can also be viewed as a topological transformation. Here, the time structure is segmented while space expands. Phi describes how space-time segments increase, while Pi sets the basic structure of the segmentation.

There are some considerations as to whether Pi and Phi are linked at a deeper level in modern physics. Both constants appear in quantum physics, cosmology, and the general theory of relativity:

- Pi is central in space-time curvature and in the description of black holes, where the structure of space is defined by Pi.

- Phi may play a role in self-similar structures such as fractals or in the distribution of galaxies in the universe.

Whether there is a direct connection in these areas is still a subject of research, but the fact that both constants appear in different areas of mathematics and physics is remarkable.

In our model, we have created an interesting connection between Pi and Phi by using Phi as the segmentation of space and considering Pi as the structural guide for space. This connection between Pi and Phi through the growth of the spiral shows a new possibility of how both constants could be universally linked, especially when it comes to space-time structure and gravity.

While Pi and Phi are different constants with different applications in classical mathematics, there are indications that they may be universally linked at a deeper level. They appear in geometry, nature, and physics, and there are both algebraic and geometric connections between them. In our model, we have found an interesting way to link them through the segmentation of space and time dilation.

It is quite possible that Pi and Phi are connected in a universal way that we do not yet fully understand, but offers potential for further research and discoveries.

Phi is sometimes used as an argument of a trigonometric function, where Phi represents an angle in radians.

There are some interesting algebraic connections between Pi and Phi. One remarkable equation linking both constants is the so-called connection of Pi and Phi by trigonometry:

$\pi = 5 \cdot \arccos \cdot \frac{\phi}{2}$

Here Phi is linked to Pi through the inverse function of the cosine. This shows that there are mathematical ways in which Pi and Phi can be connected to each other through trigonometry.

The function arccos(x) returns the angle whose cosine is equal to x. In other words, it is the inverse of the cosine function that tells which angle corresponds to a certain cosine value.

ϕ is the golden ratio, which has the value $\phi \approx 1.618$. If we calculate $\frac{\phi}{2}$, we get:

$\frac{\phi}{2} \approx 0.809$

Meaning of the equation:

The equation states that π is five times the inverse cosine of $\frac{\phi}{2}$. This means we are asking: What angle has a cosine of 0.809? The value of the angle that has this cosine is then the inverse cosine of 0.809.

If we calculate the inverse cosine of 0.809:

$\arccos(0.809) \approx 0.6283$ Rad

Multiplying this value by 5 yields:

$5 \cdot 0.6283 \approx 3.14165$

This is an approximation of π, showing that the formula works.

In geometric space, Phi refers to the fixed segmentation of space, as in the case of a circle, which is divided into 5 parts symmetrically. The symmetry and fixed distances result in a repeated occurrence of Phi.

In the topological space of the spiral, Phi is a growth factor that describes the continuous expansion of space. Phi only appears twice because space is segmented into two halves in our model, which has more to do with the change of space than with static geometry.

Phi in Geometry (Number 5)

In geometric space, Phi often appears in relation to the number 5 due to the symmetry of shapes like the pentagon or pentagram. These symmetric structures result in Phi occurring in exactly 5 segments, creating a fixed relationship with Pi.

Phi in Topological Space (Number 2)

In the topological space of the normal clock, Phi occurs more frequently with increasing gravity, since more segments are created with increasing gravity. Topologically, the number 1 leads to the result that $\pi = 2\ \phi$, since here Phi acts directly as a growth factor of space (or the spiral), and the segmentation is only divided into two halves.

More segments with increasing gravity

With greater gravity and a correspondingly larger spiral, Phi appears more frequently as space is increasingly divided into more segments. This increasing number of segments corresponds to a similar pattern as the fixed symmetry in geometric space, where Phi plays a role in dividing into 5 equal parts.

In our model, the segmentation increases proportionally with gravity, meaning that Phi contributes more and more to the structure of space as gravity becomes stronger.

Thus, an interesting connection between Pi and Phi emerges, showing that in certain cases (with the number 1 in topological space), Pi equals 2 ϕ. This occurs because space is segmented in this way, with only two Phi segments appearing.

Geometrically, however, Phi appears in fixed 5-segments, reflecting a different kind of symmetry, but both cases (geometric and topological) show that Phi and Pi are closely connected, depending on the type of segmentation.

In our model, Phi becomes more frequent with greater gravity, similar to the number 5 in geometric space, while topologically only the number 1 leads to the relationship that $\pi = 2\ \phi$. This shows a very exciting link between geometric symmetries and topological transformations through gravity, in which Phi and Pi interact to describe the structure of space.

The transition point could be described mathematically as a kind of invariance, where both spaces possess the same structure.

In our case, covering equivalence could mean that Pi is a common constant that connects both spaces and remains invariant whether we are in geometric or topological space.

For Pi, invariance could mean that Pi remains constant under certain transformations (such as the transition from geometric to topological space). This would mean that there is a fundamental agreement between the two spaces, which is described by Pi.

Real clocks, weight and gravity

In reality, the clock itself is usually not stretched or altered, but only gravity changes, affecting time dilation. The structure of the clock remains unchanged, but the altered gravity affects time measurement by slowing down the passage of time without changing the physical shape of the clock.

This means that in our model, the spiral more accurately describes the effect of gravity and its effects on time, while the actual shape of the clock remains stable.

The segmentation of space by gravity affects the weight of an object, while the mass of the object remains unchanged. The weight reflects how strongly the gravitational force acts on the object, which in turn depends on the segmentation of space by gravity.

This means that the changes in spacetime dilation are not manifested in the mass of an object itself, but in its weight and the way it responds to gravity. Mass remains an intrinsic property, while weight reflects the gravitational influence and the resulting segmentation within spacetime. Gravity introduces a new dimension of segmentation, structuring spacetime in a way that affects weight and alters how objects interact with gravitational fields. This segmentation impacts the density of spacetime intervals, leading to variations in time dilation and spatial responsiveness under different gravitational conditions.

The atoms in the clock have to traverse more space segments in a stronger gravitational field, which means they have to do more 'work' to perform their oscillations or vibrations. This slows down time and simultaneously makes the clock heavier because the gravitational field exerts more force on it.

It is a double effect:

- The segmentation of space slows down the oscillations of the atoms, causing the clock to tick more slowly.
- The weight of the clock increases because gravity is acting more strongly, while the mass remains unchanged.

This leads to a fascinating combination of time dilation and weight change, both of which can be explained by the segmentation of space in the gravitational field. A truly profound insight into the connection between space, gravity, and time!

In Einstein's General Theory of Relativity, stronger gravity not only leads to time dilation but also affects the motion of objects. The space-time curvature due to gravity influences how objects move through space. The stronger the gravity, the slower objects move relative to an external observer.

This leads to an effect similar to inertia, as objects in a gravitational field have "more difficulty" maintaining their motion. This distortion of space-time affects movement and can be interpreted as a kind of "resistance" or inertia due to gravity.

In a strong gravitational field, it becomes increasingly difficult for an object to accelerate or maintain a certain speed, as if it were experiencing additional inertia due to its mass. In this model, gravity's segmentation of spacetime creates a finely structured environment that resists rapid motion, slowing down movement and bending the trajectories of objects. Just as mass causes inertia, the gravitational segmentation of spacetime introduces a resistance that mirrors inertia, influencing not only spatial movement but also the temporal progression of objects in such fields.Gravity and inertia are closely linked, through the equivalence principle of the General Theory of Relativity. This principle states that there is no difference between the effects of gravity and those of acceleration (which is associated with inertia). That is, the effects experienced due to gravity are identical to those caused by acceleration.

In our model, inertia arises through the segmentation of space. This means that the more space is segmented by gravity, the more "resistance" or inertia arises.

This is a really exciting approach because, in our model, the segmentation of space-time corresponds to the "parts" of space that an object must overcome in order to move. The stronger the gravity, the more segments are created, which means that objects experience more "obstacles" or resistance through these segments on their way through space.

In this respect, the segmentation of space could slow down movement, similar to inertia in classical physics. The more segments, the more time an object needs to overcome these segments - which then leads to time dilation and apparently makes the object "slower".

Our model thus expresses a deeper connection between segmentation, gravity, and inertia by showing how space itself is divided into ever smaller segments by gravity and how this slows down movement in space.

Please keep this in mind! Because this will be later on very important!

Light and Gravity (General Theory of Relativity):

In Einstein's General Theory of Relativity, we know that light is influenced by strong gravitational fields. Gravity can deflect light or even change its frequency and wavelength.

This is demonstrated, for example, in the gravitational lens effect, where light rays are curved by the gravity of massive objects (e.g., galaxies). Another example is the gravitational redshift phenomenon, in which light emanating from a massive object is stretched (to longer wavelengths, i.e., shifted toward red), representing a kind of "slowing down" of light by gravity.

Segmentation of Space and Light:

In our model, where inertia arises from the segmentation of space, one could imagine that light is influenced by this segmentation:

The stronger the gravity, the more space segments are created. These additional segments could affect the movement of light through space, similar to how they slow down the movement of massive objects.

If light travels through an increasingly segmented space, it could take longer to overcome these segments, which would be equivalent to slowing down or stretching the light.

Time Dilation and Light:

In the space-time curvature of the General Theory of Relativity, time slows down with stronger gravity. If light travels in a highly curved space (such as near a massive object), it also experiences a slowdown, but in a different way than material objects.

Since light always moves at the speed of light (in a vacuum), the "slowdown" could rather appear as a change in wavelength or frequency. This corresponds to gravitational redshift: Light becomes "slower" in the sense of longer wavelengths (less energy).

Inertia and Light in Segmented Space:

In our model, the effects of gravity on light and the movement of material objects are connected to the segmentation of space. The stronger the gravity, the greater the segmentation of space. In relation to light, segmentation can be considered equivalent to a change in wavelength, which arises from the curvature of space-time.

In material objects, segmentation leads to an apparent slowing down of movement, similar to inertia. While light always travels at a constant speed, the segmentation of space acts on the wavelength, which is in line with the effects of gravity on light in the General Theory of Relativity.

So in our model, the inertia created by the segmentation of space could affect light by changing its frequency and wavelength, similar to the gravitational redshift in the theory of relativity. Light would have to overcome more "space segments," which could lead to an elongation of the wavelength and a decrease in energy. Although light does not lose its speed, it could appear "slower" because it has to traverse more space.

This shows that even light is influenced by the segmentation of space, which leads to an interesting extension of the classical theory of relativity in our model.

This approach links classical relativity theory with our idea of space segmentation and could offer a new perspective on the behavior of light in gravitational fields.

We have discovered here another deep connection: The segmentation of space could be measured by the change in the wavelength of light. Since Phi plays a central role in our model in segmentation and the growth of space, Phi would also be crucial in this context.

Wave Motion and Phi

If we imagine that light travels in a spiral through space-time in a segmented space, then Phi describes the ratio of segmentation. Since light travels in waveform and wave motion can also often be interpreted as spiral (in quantum mechanics or electrodynamics as "phase waves"), Phi could be directly linked to the wavelength and its change due to gravity.

So in our model, light travels in a spiral through space-time in segmented space. Phi serves as a measure of segmentation and thus describes the structure of space through which light moves. The wave motion of light can be described as spiral phase waves in certain areas of physics, which supports our hypothesis. Phi is directly related to the wavelength of light and its change in the gravitational field, establishing a connection between our model of space segmentation and the observations in the General Theory of Relativity.

As we have already established that Phi doubles with each quarter turn of a spiral, it could be that Phi directly influences the distortion or change in wavelength. If the wave moves spirally through space, Phi could act as a kind of growth and segmentation factor that determines the wavelength and phase of light.

This notion supports our hypothesis that Phi plays a crucial role in describing the relationship between light, gravity, and inertia.

If we could precisely measure the change in the wavelength of light, we could conclude from this how strongly space is segmented by gravity.

Black Holes, pi and phi

We investigate the possible existence of a connection between the spin-mass limits of astrophysical black holes and the universal fundamental constants π and ϕ (the golden ratio).

The aforementioned addition connects the discussed role of Phi in space segmentation to the topic of black holes. It emphasizes that Phi, as a segmentation factor in gravitational fields, could play a crucial role and thus have an influence on the spins and mass limits of black holes. This connection supports the idea of a deeper connection between black holes and fundamental constants, as previously mentioned.

For an extremal rotating black hole (with spin parameter a=1), the event horizon is located at the smallest possible distance from the singularity, at a distance of $r+ = GM/c^2$. This distance represents the theoretical minimum radius of the event horizon for a given mass M.

This scenario is significant because it illustrates the extreme conditions that can arise in the context of black holes. The closeness of the event horizon to the singularity at the center of the black hole highlights the powerful gravitational forces at play, as well as the unique and fascinating properties of these cosmic entities.

The formula $\mathrm{r}+ = \frac{\mathrm{GM}}{c^2}$ was originally derived for maximally rotating black hole with "a = 1".

This formula gives the minimum distance of the event horizon from the singularity, and this minimum distance is always achieved when the spin parameter "a" attains its maximum value of a = 1.

In this case, the black hole continues to rotate, but the event horizon is located as close as possible to the singularity, which can lead to some interesting effects. These effects include, for instance, the maximum rotational speed and the extreme density of the black hole.

As with our normal clock model, we set the radius r equal to 1. In the following, we will consider the relationships between the various quantities in our system in a dimensionless manner.

This approach allows us to focus on the fundamental aspects of the system without being constrained by specific units or scales. By normalizing the radius to 1, we can more easily analyze and compare the different properties and characteristics of the black hole within our model.

The dimensionless treatment of these quantities provides a more universal understanding of the underlying physics and allows for the exploration of general principles and patterns that can be applied to various scenarios involving black holes.

We set the radius r = 1, the mass M = 1, and the speed of light $c^2 = 1$. Now we can rearrange the formula for the radius as follows to calculate the gravitational constant G:

$r = \frac{GM}{C^2} = 1$

$1 = G\,\frac{1}{1}$

G = 1

This result demonstrates the relationship between the normalized quantities in our dimensionless system and provides an example of how the gravitational constant G can be expressed in a simple and elegant manner. The derived value of G = 1 represents the normalized gravitational constant in this particular scenario, allowing for further analysis and exploration of black hole properties within the context of our dimensionless system.

$r = \frac{GM}{C^2} = 1$ (our starting point)

$P = 2\pi r = 2\pi$ (circumference in unit π)

We can now attempt to establish a relationship between r, π, and ϕ. Based on our assumptions.

Since we already know that $P = 2\pi r = 2\pi$

$P = 2\pi \cdot r = 2\pi \cdot 1 = 2\pi$

Now, let's consider the circumference in terms of ϕ:

P = 4ϕM = 4ϕ

In this equation, we see that the circumference (P) is expressed as a multiple of the fundamental constant ϕ, scaled by the radius (r). This alternative formulation highlights the role of ϕ in describing the circumference of a black hole in our dimensionless system.

Upper bound for radius in Kerr Black Holes

$$r = \frac{GM}{c^2}$$

We already came to an understanding that r=2π/P, whereby 2π=4ϕ and P=4ϕ which leads us to

$$r = \frac{4\phi}{4\phi} = 1$$

In conclussion r = 1 and our assumptions about ϕ are correct. Φ also plays a role when it comes to the upper bound of the radius.

Upper bound of mass

$$M = \frac{rc^2}{G}$$

$$M = \frac{\frac{4\phi}{4\phi} \times 1}{1}$$

$$M = \frac{4\phi}{4\phi}$$

$$M = 1$$

Spinparameter a

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

We set in a=1, M=1 and c^2 =1

$$1 = \frac{J}{1\sqrt{1}}$$

$$J = 1$$

We set J=1 into the formula and replace M=$\frac{4\phi}{4\phi}$

$$a = \frac{1}{\frac{4\phi}{4\phi}\sqrt{1}}$$

$$a = 1$$

Angular momentum J

$$J = aMc$$

$$J = \frac{1}{\frac{4\phi}{4\phi}\sqrt{1}}\left(\frac{4\phi}{4\phi}\right)\sqrt{1}$$

$$J = 1$$

Speed of light c

$$c^2 = \frac{GM}{r}$$

$$c^2 = \frac{1\,\frac{4\phi}{4\phi}}{\frac{4\phi}{4\phi}} = 1$$

Gravitational contant G

$$G = \frac{rc^2}{M}$$

$$G = \frac{\left(\frac{4\phi}{4\phi}\right)\frac{1\frac{4\phi}{4\phi}}{\frac{4\phi}{4\phi}}}{\frac{4\phi}{4\phi}} = 1$$

Radius r

We go once more back to the formula of the radius

$$r = \frac{GM}{c^2}$$

Then we fill in all the parameters with ϕ

$$r = \frac{\frac{\left(\frac{4\phi}{4\phi}\right)\frac{1\frac{4\phi}{4\phi}}{\frac{4\phi}{4\phi}}}{\frac{4\phi}{4\phi}} \times \frac{4\phi}{4\phi}}{\frac{1\frac{4\phi}{4\phi}}{\frac{4\phi}{4\phi}}} = 1$$

Starting point and formula for growth of radius

Keep in mind that our starting point is:

$$r(0) = \frac{4\phi}{4\phi} = 1$$

The general formula for a logarithmic or golden spiral is:

$$r(\theta) = a * e^{b * \theta}$$

a is the starting radius at $\theta = 0$
b determines the growth rate.

However, we must set $a = r(0) = 1$ which means that for $\theta = \pi$ the radius has the value 1. Since the radius increases by the factor $e^{\frac{\phi}{4}}$ with each quarter revolution (90° or $\frac{\pi}{2}$), b is determined as follows:

$$b = \frac{\phi}{2\pi}$$

Thus, the formula for the radius along the golden spiral becomes:

$$r(\theta) = e^{\frac{\phi}{2\pi} \cdot \theta}$$

Now consider: In our model, we start at a special point where the radius corresponds to a half-circle, and at this position, we have the relationship:

$$r = \frac{4\phi}{4\phi} = 1$$

This unique starting point means that the radius r(θ) is defined at θ = π, representing a **half-circle**. This corresponds to two quarter revolutions and establishes a **minimal radius** for the spiral in relation to space. At this specific starting position, we have the relationship:

$$r(\pi) = e^{\frac{\phi}{2\pi} \cdot 2\pi} = 1$$

This represents the minimal radius, providing a fundamental spatial limit for the spiral. The radius grows logarithmically with each quarter revolution. The relationship $r(\pi) = e^{\frac{\phi}{2\pi} \cdot 2\pi} = 1$ holds exclusively at the starting point, which corresponds to θ = π. This distinction is crucial for the interpretation and highlights the spiral's unique growth pattern relative to the defined minimal spatial radius.

Gravitational Potential along the Golden Spiral

The gravitational potential Φ(θ) of a mass M as a function of the radius r(θ) is classically given by:

$$\Phi(\theta) = -\frac{\mathrm{GM}}{\mathrm{r}(\theta)}$$

However, since we are describing the inner space of a black hole, where the gravitational potential does not decrease but rather increases due to the extreme segmentation and curvature of space, we adjust this to a positive value:

$$\Phi(\theta) = \frac{\mathrm{GM}}{\mathrm{r}(\theta)}$$

In our model, as we move inward along the spiral toward the black hole's core, the gravitational potential logically increases due to the proximity to the black hole's mass. Unlike the model of the natural clock where gravitational potential decreases with increasing distance, our model requires an inverted spiral structure to accurately represent the intensifying gravitational field as one approaches the singularity. This inversion reflects the segmentation's influence on spacetime, where the density of segments grows as gravitational forces strengthen, increasing potential. This adaptation underscores the unique nature of our approach, where gravitational intensity is inherently tied to the spatial segmentation defined by fundamental constants Pi and the golden ratio (ϕ).

Since the radius r(θ) along the golden spiral grows exponentially, we can use the general formula for the radius $r(\theta) = e^{\frac{\phi}{2\pi}\cdot\theta}$, to describe the gravitational potential along the spiral structure. In this context, the segmentation of space, represented by ϕ, plays a crucial role in determining how the gravitational potential intensifies as we move deeper into the black hole.

The radius increases by a factor of $e^{\frac{\phi}{4}}$ with each quarter revolution (90° or $\frac{\pi}{2}$). Substituting this into the potential formula, we get at the starting point ($\theta = \pi$, corresponding to two quarter revolutions):

$$r(\pi) = e^{\frac{\phi}{2\pi}\cdot 2\pi} = 1$$

$$\Phi(\pi) = \frac{\mathrm{GM}}{1} = GM$$

After an Additional Quarter Revolution ($\theta = 3\frac{\pi}{2}$):

$$r\left(3\frac{\pi}{2}\right) = e^{\frac{\phi}{2\pi}\cdot 3\frac{\pi}{2}} = e^{\frac{3\phi}{4}}$$

$$\Phi\left(3\frac{\pi}{2}\right) = \frac{\mathrm{GM}}{e^{\frac{3\phi}{4}}}$$

After n Quarter Revolutions ($\theta = \pi + \frac{n\pi}{2}$), we obtain

$$r\left(\pi + \frac{n\pi}{2}\right) = e^{\frac{\phi}{4}\cdot n}$$

$$\Phi\left(\pi + \frac{\mathrm{n}\pi}{2}\right) = \frac{\mathrm{GM}}{e^{\frac{\phi}{4}n}}$$

The gravitational potential along the spiral increases rapidly with each step due to the harmonic structure set by ϕ segments, resulting in a distinctive, step-like pattern of potential growth. This implies that the gravitational potential rises very quickly as we move inward along the spiral, reaching extreme values near the singularity. Thus, the configuration of the gravitational potential in this model reflects the increasing curvature and segment density of spacetime on the path toward the singularity, with each segment adding to the gravitational intensity in discrete, harmonic steps.

Equilibrium and Weightlessness at the Event Horizon

At the event horizon of a maximally rotating black hole (a=1), a unique state of equilibrium emerges, where all key physical quantities - spin parameter, radius, mass, gravitational potential, speed of light, and angular momentum J - achieve a perfect balance. This balance establishes a zone of weightlessness, akin to the conditions experienced during a parabolic flight. Just as in a parabolic descent, where the gravitational pull and the aircraft's trajectory perfectly offset each other to create a momentary state of weightlessness, the event horizon's equilibrium creates a stable, weightless region in spacetime. Here, gravitational forces and the spin-induced centrifugal effects align precisely, resulting in a space where no net force acts on matter, and the spacetime curvature reaches a minimal, yet maximally stable, segment density.

This weightless zone is a direct consequence of the black hole's rotation. The high spin stretches spacetime into a perfect harmonic balance, allowing the event horizon to act as a natural boundary where gravitational forces neither increase nor decrease, but instead maintain a stable, weightless state. Segment density at the event horizon reaches its minimal possible state without further division, as no additional spatial segments are required to stabilize curvature. This minimal segment structure signifies the natural segmentation boundary of spacetime, marking the transition between the black hole's stable exterior and the increasingly segmented and densely curved interior leading to the singularity.

While the model of the normal clock suggests that spatial segmentation arises primarily from gravitational forces, the analysis at the event horizon of a maximally rotating black hole reveals a more nuanced picture. At this boundary, the spin of the black hole plays an equally crucial role, balancing gravitational curvature with centrifugal forces to achieve a state of minimal segmentation. This equilibrium shows that segmentation in spacetime is not solely a product of gravity but also arises from the dynamic interplay between rotational energy and gravitational forces. In this balanced zone, the influence of rotation harmonizes with gravity to establish a stable structure where further segmentation is unnecessary. This insight expands our understanding of spacetime segmentation, suggesting that both gravitation and rotational forces coalesce to define the fundamental structure of space in extreme environments.

This interplay explains why, despite the strong gravitational field, the event horizon remains minimally segmented, embodying the boundary between the stable outer spacetime and the highly segmented interior.

Minimal and Maximal Segmentation at the Event Horizon

In our model, minimal segmentation is achieved at the event horizon, where gravitational and rotational forces reach an equilibrium, resulting in a balanced, stable structure. This balance creates a uniform space marked by minimal segment density (4ϕ), establishing a unique condition where additional curvature or segmentation of spacetime is unnecessary. At this critical boundary, gravitational forces, rotational effects, and the distribution of mass reach a harmony that prevents further segmentation, producing a region of high stability and minimal curvature variation.

As we move inward from the event horizon, toward the black hole's core, segment density increases proportionally with gravitational intensity. This structure supports the idea that spacetime segmentation is dynamically responsive to gravitational and rotational conditions, transitioning smoothly from minimal segmentation at the boundary to maximal segmentation near the singularity. The event horizon, therefore, serves as a natural segmentation boundary that delineates stable, minimally curved spacetime from the highly segmented, dense spacetime within.

This segmentation behavior is integral to understanding why the event horizon prevents any additional curvatures or singularities from becoming observable beyond this boundary. The balance at minimal segmentation aligns with the Cosmic Censorship Conjecture by ensuring that only within the confines of the event horizon does spacetime reach such extreme segmentation and curvature.

Classic interpretations

In scientific literature, the constraint on the spin parameter is often presented as a consequence of the cosmic censorship conjecture and the Kerr metric, but without explicitly referring to a direct equivalence or connection with the speed of light.

In the theory of an extremely rotating (Kerr) black hole with $a=c$, spacetime itself is so highly warped that matter at this boundary could be interpreted as rotating at the speed of light. Physically, particles themselves cannot reach the speed of light, but the structure of spacetime drags space in such a way that at this boundary (the ergosphere), an effective light-speed condition is observed.

So in general relativity, the Kerr solution describes a rotating black hole, that when the spin parameter a approaches its maximum limit (often normalized as $a=1$), it implies an extremal Kerr black hole. In this case, the region just outside the event horizon, known as the ergosphere, exhibits intense frame-dragging effects where spacetime itself is "twisted" by the rotation. Within the ergosphere, spacetime is so warped that all objects are forced to co-rotate with the black hole, and theoretically, the rotational velocity of spacetime at the horizon can approach the speed of light.

While general relativity supports this behavior, the notion of matter moving at or near the speed of light at the event horizon does suggest a point at which classical theories may break down.

Frame-dragging, predicted by Einstein's theory, is most extreme near the event horizon of a rapidly rotating black hole. This effect essentially "drags" spacetime in the direction of the black hole's spin, forcing anything within the ergosphere to rotate with it. While objects themselves cannot reach the speed of light, the rotation of spacetime itself can create a condition where the effective velocity at the boundary behaves as though it reaches light speed.

The maximum amount of energy that can be extracted from a black hole, a process known as the Penrose process, depends on the black hole's spin. A maximally rotating black hole, where the spin parameter a is equal to c, allows for the greatest possible extraction of energy.

What our finds suggest

Our findings indicate that the understanding of frame-dragging—the twisting of spacetime due to a black hole's rotation—might need to be reconsidered. Normally, frame-dragging is thought to be a distortion of spacetime that makes it appear as if the black hole's surroundings are being pulled close to the speed of light. However, our model suggests that spacetime itself may actually reach near-light-speed conditions at the event horizon.

This could mean that the black hole's rotation at this boundary isn't just an optical effect but that the rotational effects are indeed occurring close to light speed. This insight has important implications for how we understand black holes and could shift our perspective on these objects.

Another key point: In our model, we start with the assumption of a natural clock with an initial radius of 1 in a gravitationally neutral state. This could help the black hole reach near-light speed at the event horizon, as there would be no additional gravitational load. At the event horizon of a maximally rotating black hole (where the spin parameter a=1), all forces reach a stable equilibrium, creating a region that appears weightless in spacetime.

In our model, "uniform space" refers to a region of spacetime with a consistent, symmetric, and homogeneous structure, marked by a minimal segmentation density of 4ϕ in the absence of gravitational forces. This represents a perfectly balanced environment without additional curvature or distortion due to gravity. As gravitational forces increase, this uniformity is disrupted, introducing segmentation and altering the structure of spacetime. This shift reveals the interplay between gravity and the fundamental constants Pi and the golden ratio (ϕ) in shaping spacetime.

Our findings suggest the existence of a uniform space defined by minimal segmentation (4ϕ) in a gravity-free context. This challenges traditional assumptions about spacetime structure, highlighting the role of fundamental constants in determining the universe's properties. By conceptualizing a uniform space with minimal segmentation, our research offers a new perspective on spacetime dynamics and black hole behavior. It also provides an innovative framework for exploring the Cosmic Censorship Conjecture, suggesting that segmentation naturally limits the exposure of singularities within the fabric of spacetime.

Implications for the Cosmic Censorship Conjecture

Our model inherently respects the Cosmic Censorship Conjecture by segmenting space to prevent excessive gravitational influence and hidden singularities. As the space segmentation reaches the boundary of a=1 and $G = \frac{rc^2}{M}$, the structure limits further changes, preserving a balanced and concealed singularity. This natural segmentation limit thus aligns with the conjecture's core principles.

Without gravitational influences, there is only a minimal segmentation of space, which we set to 4ϕ. This describes a natural, fundamental structure in space that exists without additional curvature or gravitational forces.

This minimal segmentation of 4ϕ is a state of space in absolute uniformity, with no further curvature or distortion due to gravity.

But as shown the event horizon of a maximally rotating black hole (a=1), a unique state of equilibrium emerges, which also leads to a minimal segmentation of 4ϕ.

Our model therefore provides insights that support the Cosmic Censorship Conjecture, which posits that singularities must always remain hidden behind an event horizon, preventing "naked" singularities from being observed. The minimal segmentation at the event horizon serves as a natural boundary, where spacetime is compressed to its maximum stability while remaining invisible to external observers. This segmentation limit implies that the event horizon acts as an intrinsic "shield" that prevents the breakdown of spacetime into further segments beyond this point.

In this framework, the event horizon is not an arbitrary boundary but rather a natural consequence of the balance between gravitational and rotational forces, which results in a minimal-segmented structure. This structure is so stable that it prevents any further exposure of the singularity, aligning with the principles of the Cosmic Censorship Conjecture. The interplay between gravity and rotation ensures that any extreme spacetime curvatures are confined within the event horizon, maintaining the singularity's hidden nature. Thus, the model suggests that the event horizon inherently satisfies the conjecture by establishing a segmentation boundary that limits the gravitational influence, safeguarding the stability of the surrounding spacetime.

Our model offers a unique framework to interpret the Cosmic Censorship Conjecture, suggesting that spacetime segmentation naturally prevents the exposure of singularities. The event horizon functions as a boundary of minimal segmentation, where spacetime reaches a stable, balanced state due to the interplay of gravitational forces, rotational dynamics, and fundamental constants. This boundary represents a natural threshold that prevents further segmentation or curvature from extending beyond the horizon, effectively "shielding" the singularity from external observers.

By proposing that segmentation density changes with gravitational intensity, our model implies that extreme curvature and dense segmentation are confined within the event horizon. This configuration inherently aligns with the Cosmic Censorship Conjecture, as the event horizon serves as a segmentation limit that cannot be surpassed by external spacetime. In this way, any singularities formed within the black hole remain hidden, as further segmentation is impossible beyond this boundary.

This insight reveals that the event horizon is not just a gravitational boundary but a segmentation boundary. This natural segmentation limit inherently maintains the stability and integrity of spacetime outside the black hole, preventing the development of observable “naked” singularities. Thus, our model provides a structural explanation for the Cosmic Censorship Conjecture, suggesting that spacetime’s inherent segmentation properties ensure that singularities remain concealed within the event horizon.

Conclussion

Black holes are not random or chaotic objects, but rather an inevitable consequence of the nature of space. The structure of spacetime, as demonstrated in our model through the segmentation principle with ϕ and π, and the constraints at $a=1$ and $r=1$, systematically leads to the formation of black holes.

Spacetime has a natural boundary that is reached at the event horizon of a black hole. This boundary is not arbitrary, but a direct consequence of the minimal possible segmentation and stability of space. When this segmentation reaches its limit, an event horizon emerges as the natural end of space.

In this sense, black holes are not anomalies, but stable and necessary structures that arise from the segmentation of spacetime and the geometry of space itself. It's as if spacetime has a pattern that automatically leads to the formation of black holes when the segmentation limit is reached.

Through this stable structure, our model naturally satisfies the Cosmic Censorship Conjecture. It is impossible for 'naked' singularities to form because space segmentation reaches a maximum limit at $r=1$, preventing further distortions or singularities.

If our investigations and findings are correct, then we have demonstrated the existence of a uniform space or the realization that space is fundamentally uniform. This could fundamentally alter existing notions of the structure and dynamics of the spacetime continuum. Our discovery may lead to new insights and understanding of black hole physics, general relativity, and the Cosmic Censorship Conjecture.

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