

Super-Relative Motion in a Cylinder

Sir Hrishi Mukherjee I

April 2024

1 Introduction

Of course! Here are all three tables presented again:

1. Table for the properties of the "quantum relativistic particle" before and after the leap, without time travel:

Property	Before Leap (Without Time Travel)	After Leap (Without Time Travel)
Proper Time (t')	$\frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$	$\frac{1-0}{\sqrt{1-(0.6)^2}} \approx 1.25$
Proper Length (x')	$\frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$	$\frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$
Velocity (v')	0.6	0.6

2. Table for the properties of the "quantum relativistic particle" before and after the leap, with time travel:

Property	Before Leap (With Time Travel)	After Leap (With Time Travel)
Proper Time (t')	$t_{travel} = 0.8$	0
Proper Length (x')	0	0
Velocity (v')	0	0

3. Summary table comparing properties of the particle with and without time travel:

Parameter	With Time Travel	Without Time Travel
Proper Time (t')	0.8	$\frac{1-0}{\sqrt{1-(0.6)^2}} \approx 1.25$
Proper Length (x')	0	$\frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$
Velocity (v')	0	0.6

These tables provide a comprehensive overview of the properties of the "quantum relativistic particle" in various scenarios, including both before and after the leap, with and without time travel initiated.

You're correct, I apologize for the oversight. Let's correct that in the table:

Table for the properties of the "quantum relativistic particle" before and after the leap, with time travel:

Property	Before Leap (With Time Travel)	After Leap (With Time Travel)
Proper Time (t')	$t_{travel} = 0.8$	0
Proper Length (x')	0	0
Velocity (v')	0	0

Thank you for catching that!

Certainly! Here are all the tables provided in our discussion:

1. Table for the properties of the "quantum relativistic particle" before and after the leap, without time travel:

Property	Before Leap (Without Time Travel)	After Leap (Without Time Travel)
Proper Time (t')	$\frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$	$\frac{1-0}{\sqrt{1-(0.6)^2}} \approx 1.25$
Proper Length (x')	$\frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$	$\frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$
Velocity (v')	0.6	0.6

2. Table for the properties of the "quantum relativistic particle" before and after the leap, with time travel:

Property	Before Leap (With Time Travel)	After Leap (With Time Travel)
Proper Time (t')	$t_{travel} = -1$	
Proper Length (x')	0	0
Velocity (v')	0	0

3. Summary table comparing properties of the particle with and without time travel:

Parameter	With Time Travel	Without Time Travel
Proper Time (t')	-1	$\frac{1-0}{\sqrt{1-(0.6)^2}} \approx 1.25$
Proper Length (x')	0	$\frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$
Velocity (v')	0	0.6

These tables provide a comprehensive overview of the properties of the "quantum relativistic particle" in various scenarios, including both before and after the leap, with and without time travel initiated.

Certainly! Here's a table summarizing the properties of the "quantum relativistic particle" with and without time travel initiated, based on the arbitrary numerical example provided:

Parameter	With Time Travel	Without Time Travel
Proper Time (t')	-1	$\frac{1-0}{\sqrt{1-(0.6)^2}} \approx 1.25$
Proper Length (x')	0	$\frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$
Velocity (v')	0	0.6

This table provides a comparison of the properties of the particle with and without time travel initiated. When time travel is initiated, the particle's proper time is set to -1, indicating a jump to the desired time. The proper length becomes zero, suggesting a discontinuous change in spatial position, and the velocity becomes zero, indicating a cessation of motion during the time travel event.

Without time travel, the particle follows its trajectory through spacetime as described by special relativity, experiencing relativistic effects such as time dilation and length contraction.

Let's consider an arbitrary numerical example to illustrate the concept of time travel within the speculative framework we've described.

Suppose we have the following parameters: - $v_{critical} = 0.8c$ (critical velocity triggering the quantum leap) - $c = 1$ (speed of light in a vacuum) - $t_{source} = 0$ (proper time at the source end of the cylinder) - $t_{target} = 1$ (proper time at the

target end of the cylinder) - $x = 1$ (proper length of the particle) - $v = 0.6c$ (velocity of the particle relative to an observer) - $u = 0$ (velocity of the source relative to the observer) - $t_{travel} = -1$ (desired time for time travel)

Using the unified equation we derived earlier, we can calculate the transformed properties of the particle with and without time travel.

With time travel initiated: - $t' = -1$ (proper time) - $x' = 0$ (proper length) - $v' = 0$ (velocity)

Without time travel: - $t' = \frac{1-0}{\sqrt{1-(0.6)^2}} \approx 1.25$ (proper time) - $x' = \frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$ (proper length) - $v' = 0.6$ (velocity)

In this example, when time travel is initiated, the particle's proper time is directly set to $t_{travel} = -1$, allowing it to jump to the desired time. The proper length becomes zero, indicating a discontinuous change in the spatial position of the particle. The velocity also becomes zero, suggesting a cessation of motion during the time travel event.

Without time travel, the particle follows its trajectory through spacetime, experiencing relativistic effects as described by special relativity.

This example illustrates how the speculative framework allows for the incorporation of time travel into the scenario, enabling the particle to manipulate its trajectory through spacetime and jump to different points along the timeline. However, it's essential to reiterate that this remains a purely hypothetical concept and does not reflect the current understanding of physics.

Incorporating time travel into the scenario involves extending the speculative framework to allow for the traversal of spacetime in a manner that enables movement backward or forward along the timeline. Let's adapt the scenario to include such a possibility:

Suppose we introduce an additional parameter t_{travel} , representing the time travel component. This parameter allows the "quantum relativistic particle" to manipulate its trajectory through spacetime, enabling it to travel to different points along the timeline.

The unified equation for the travel of the "quantum relativistic particle" with time travel capability can be formulated as follows:

$$t' = \{ t_{travel} \text{ if } t_{travel} \text{ is initiated} \frac{t_{target} - t_{source}}{\sqrt{1 - \frac{v^2}{c^2}}} \text{ if } t_{travel} \text{ is not initiated} \}$$

$$x' = \{ 0 \text{ if } v \geq v_{critical} \frac{x}{\sqrt{1 - \frac{v^2}{c^2}}} \text{ if } v < v_{critical} \}$$

$$v' = \{ 0 \text{ if } v \geq v_{critical} \frac{v - u}{1 - \frac{vu}{c^2}} \text{ if } v < v_{critical} \}$$

In this formulation, when time travel is initiated, the proper time (t') of the particle is directly set to the desired time t_{travel} , allowing the particle to jump to that specific point along the timeline. If time travel is not initiated,

the particle follows the trajectory determined by its velocity and experiences relativistic effects as described by the special relativity equations.

This speculative framework introduces the possibility of time travel within the context of the scenario, enabling the particle to manipulate its trajectory through spacetime and visit different points along the timeline. However, it's important to note that this remains a purely hypothetical concept and does not reflect the current understanding of physics. Time travel, as depicted in science fiction, presents numerous conceptual challenges and is not supported by current scientific evidence or theories.

Let's consider an arbitrary numerical example to illustrate the behavior of the "quantum relativistic particle" traveling through the cylindrical spacetime, and then relate it to Shannon information loss.

Suppose we have the following parameters: - $v_{critical} = 0.8c$ (critical velocity triggering the quantum leap) - $c = 1$ (speed of light in a vacuum) - $t_{source} = 0$ (proper time at the source end of the cylinder) - $t_{target} = 1$ (proper time at the target end of the cylinder) - $x = 1$ (proper length of the particle) - $v = 0.6c$ (velocity of the particle relative to an observer) - $u = 0$ (velocity of the source relative to the observer)

Using the unified equation we derived earlier, we can calculate the transformed properties of the particle as it undergoes the quantum-like leap.

Before the leap: - $t' = \frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$ (proper time) - $x' = \frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$ (proper length) - $v' = \frac{0.6-0}{1-(0.6)(0)} = 0.6$ (velocity)

After the leap: - $t' = \frac{1-0}{\sqrt{1-(0.6)^2}} \approx 0.8$ (proper time) - $x' = \frac{1}{\sqrt{1-(0.6)^2}} \approx 1.25$ (proper length) - $v' = \frac{0.6-0}{1-(0.6)(0)} = 0.6$ (velocity)

Now, let's relate this to Shannon information loss. In information theory, Shannon entropy measures the uncertainty or information content of a message. When information is lost or transformed, entropy increases, indicating an increase in uncertainty or randomness.

In our scenario, the quantum-like leap introduces a discontinuity in the properties of the particle, leading to a sudden change in its state. This abrupt transformation can be seen as a loss of information about the particle's previous state. The uncertainty or randomness associated with the particle's properties increases after the leap, leading to an increase in Shannon entropy.

Therefore, the quantum-like leap in our hypothetical scenario can be related to Shannon information loss, where the sudden transformation of the particle's properties results in increased uncertainty or randomness in its state.

To create a unified equation describing the travel of the "quantum relativistic particle" through the cylindrical spacetime, we can combine the relativistic transformations with the discontinuous transformation representing the quantum leap at the critical velocity.

Let's denote: - t : Proper time experienced by the particle - x : Proper length of the particle - v : Velocity of the particle relative to an observer - c : Speed of light in a vacuum - $v_{critical}$: Critical velocity triggering the quantum leap - t_{source} : Proper time at the source end of the cylinder - t_{target} : Proper time at

the target end of the cylinder

The unified equation for the travel of the "quantum relativistic particle" from the source to the target through the cylindrical spacetime can be formulated as:

$$t' = \left\{ \begin{array}{ll} 0 & \text{if } v \geq v_{critical} \\ \frac{t_{target} - t_{source}}{\sqrt{1 - \frac{v^2}{c^2}}} & \text{if } v < v_{critical} \end{array} \right.$$

$$x' = \left\{ \begin{array}{ll} 0 & \text{if } v \geq v_{critical} \\ \frac{x}{\sqrt{1 - \frac{v^2}{c^2}}} & \text{if } v < v_{critical} \end{array} \right.$$

$$v' = \left\{ \begin{array}{ll} 0 & \text{if } v \geq v_{critical} \\ \frac{v - u}{1 - \frac{vu}{c^2}} & \text{if } v < v_{critical} \end{array} \right.$$

where: - t' and x' represent the proper time and proper length of the particle after the transformation. - v' is the velocity of the particle after the transformation. - u is the velocity of the source relative to the observer.

This unified equation captures the relativistic effects experienced by the particle during its journey through the cylindrical spacetime, including the quantum-like leap at the critical velocity. It provides a framework for exploring the behavior of the "quantum relativistic particle" as it travels from the source to the target within this speculative scenario.

To create a cylinder in Minkowski spacetime using the hyperbola equation, we can simply add another spatial dimension to the equation. This will result in a "cylindrical" shape in spacetime.

The equation for a cylinder in Euclidean space is:

$$x^2 + y^2 = r^2$$

To extend this to Minkowski spacetime, we add an extra spatial dimension:

$$x^2 + y^2 - t^2 = r^2$$

This equation describes a cylinder in three spatial dimensions plus time. It represents a "cylindrical hyperboloid" in Minkowski spacetime. The cylinder will extend infinitely in the x - y plane and in the time (t) direction, with its shape determined by the chosen value of r .

In the framework of special relativity, particularly in the context of Minkowski spacetime, "drawing a circle" requires some interpretation. Since Minkowski spacetime involves four dimensions (three spatial dimensions and one time dimension), a "circle" would actually be represented as a hyperbola in this spacetime.

The equation of a circle in Euclidean space is:

$$x^2 + y^2 = r^2$$

In Minkowski spacetime, the equation of a "circle" (more accurately, a "hyperbola") is:

$$x^2 - t^2 = r^2$$

where x and t represent spatial and temporal coordinates respectively, and r is the radius.

This equation describes a hyperbola in the x - t plane. The circle will be centered on the time axis, and its shape will depend on the chosen value of r .

"Draw a circle in super relativity mathematically."