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Invisible Spacetime Theory - An Approach to Generalize Subluminal and Superluminal Speeds

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Abstract Theory of Relativity and theories for superluminal speed cannot be given in same way even though both of them are created to explain the moving objects. In this paper a theoretical attempt is made to provide a general description for moving objects and time flow in moving objects, irrespective of their speed domain, is related with stationary objects. To do so, three assumptions are suggested such that they support Relativity at subluminal speeds and encourage 'Fifth dimension' concept at superluminal speeds.

Keywords: *Invisible Spacetime Theory, Faster Than Light (FTL), time travel, fifth dimension*

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1. Introduction

Subluminal velocity is a relative quantity. That is, frames can exist to explain relative object movement. But there was no any preferred frame from which superluminal speed can be explained. In this paper, a single frame is suggested from which both subluminal and superluminal speeds can be explained. This frame is considered to be placed in 'Invisible space (i-space)'. Unlike 3D space, it is assumed that i-space can bear objects with superluminal speeds. Both Special Relativity [1] and Faster Than Light concept are explained together from the view of i-space.

2. Assumptions

1. Subluminal objects move in 3D space and superluminal objects move in i-space.
   This is assumed because it is impossible to achieve superluminal movement in 3D space and so i-space is suggested for superluminal speeds.
2. 3D space occupies i-space.
   3D space and i-space exist together but the object carried by them differs in accordance with the first assumption.
3. From the view of i-space, 3D space exhibits a resultant recoil velocity for every movement of objects in it.
   Consider Figure 1. If object B, initiated from object A's place, moves towards our right with velocity v relative to object A then from the view of i-space, 3D space moves towards left with the same velocity *v* and so all the objects including A and B. As a result, from the view of i-space, object B is stationary and object A is moving towards left and hence relative velocity is conserved.

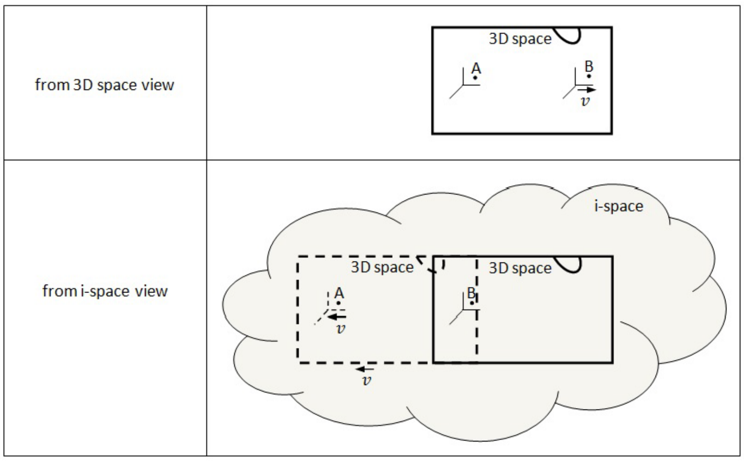

Figure 1. Illustrating third assumption

The only exception is that light is not subjected to above 3 postulates and can possess a constant velocity c in both 3D space and i-space irrespective of reference frames.

3. Time Flow Relation in Speed Interval [0, ∞)

Consider a bus moving with constant subluminal velocity v_s towards our right, relative to a stationary object. Then from postulate 3, with respect to i-space, stationary object moves with velocity v_s towards left, whereas bus is stationary. A light source is placed on bus floor. When the light source is switched on, light beam travels towards bus roof. When the light beam is heading towards the bus roof, bus shifts to superluminal velocity v_i at an instant. This is like there is no time gap for acceleration from v_s to v_i . This will not create any contradiction because in this paper, the effect due to velocity v_s is completely separated from that of v_i and vice versa. Light beam travels for time t_{m1} during which the bus takes velocity v_s and light beam travels for time t_{m2} during which the bus takes velocity v_i. Both t_{m1} and t_{m2} are measured by a clock placed inside the bus. Let $t_m = t_{m1} + t_{m2}$ be the time taken by the light beam to travel from bus floor to bus roof as shown in Figure 2.

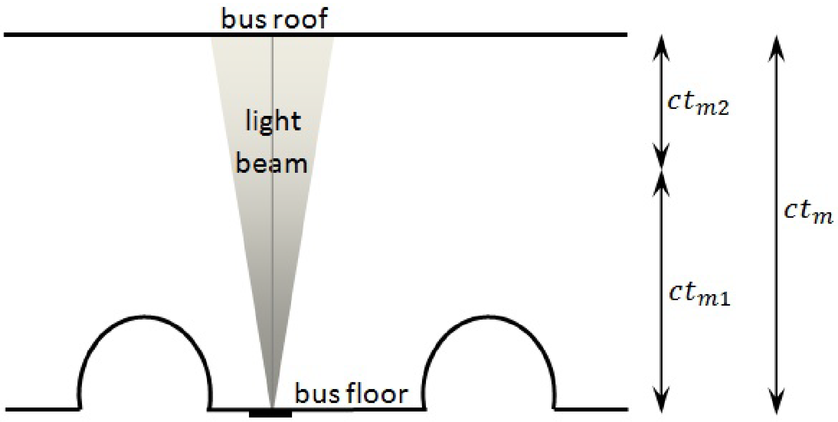

Figure 2. Light beam inside the bus

3.1. At Subluminal Speed

From Figure 3, let A be a point in 3D space, in which light source is placed at $t_{m1} = 0$. When light beam emerges from A, according to postulate 3, point A starts to travel towards left and let C be a new point in 3D space in which light source is placed when time t_{m1} is completed. Let CB be the distance traveled by light beam in reference frame of the bus when time t_{m1} is completed and is equal to $c \times t_{m1}$.

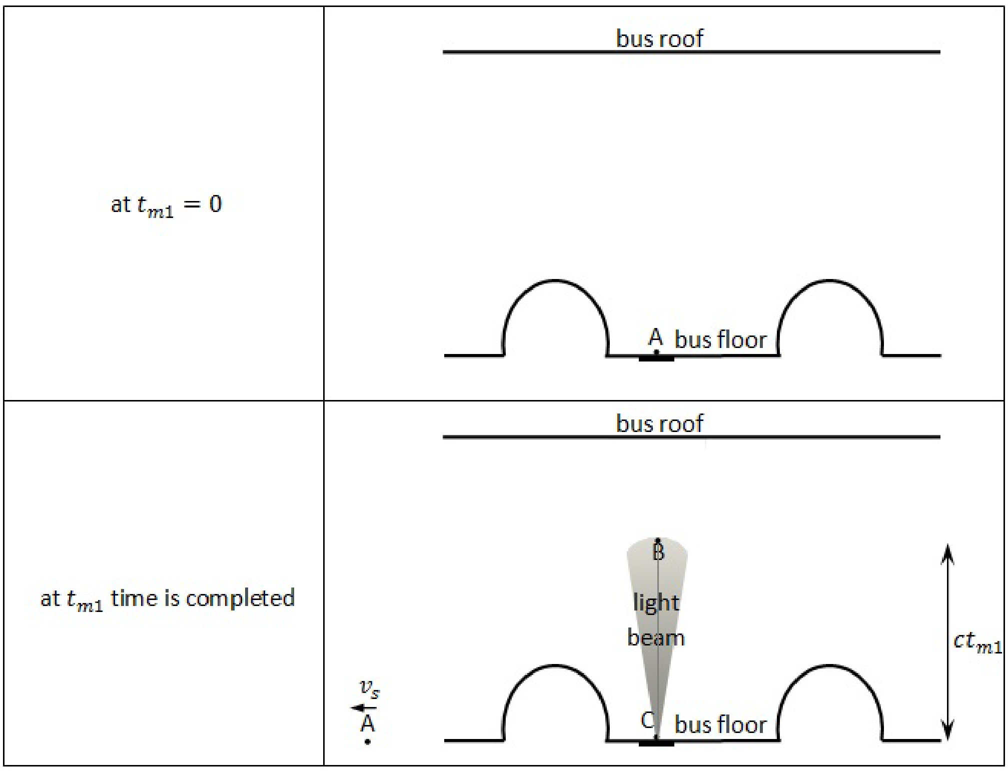

Figure 3. Illustration till the time t_{m1}

In time $c \times t_{m1}$, light beam also has to cover the distance AB in stationary frame of reference as shown in Figure 4. It is clear that AB > CB and light beam has to travel faster than c to cover the distance AB and to protect the originality of the event. But the observers in 3D space should not find the velocity of light beam greater than c and so the time moves faster in 3D space to maintain the speed of light beam as c itself. That is, stationary object moves faster than the clocks inside the bus. Let the stationary object covers t_s time when light travels from A to B. Since point A is moving with velocity v_s, it covers a distance $(v_s \times t_s)$ in time t_s.

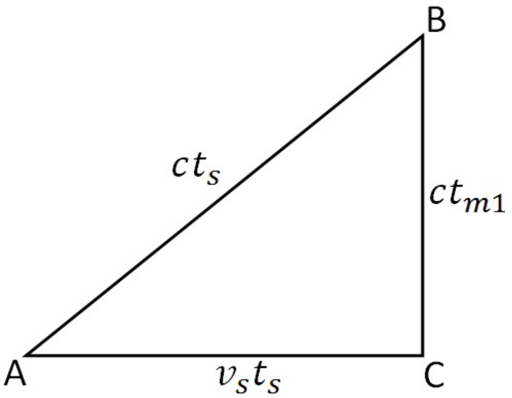

Figure 4. Geometrical view of light beam till the time t_{m1}

3.2. At Superluminal Speed

The instant light beam reaches point B, bus shifts its velocity to v_i. Since v_i is superluminal, bus moves in i-space, not in 3D space. Consider Figure 5. During the time t_{m2}, bus travels a distance $(v_i \times t_{m2})$ from point C to say point E and light beam travels from say B´ to a point in bus roof say D. Points B´ and D are mentioned from a reference frame inside the bus. In time t_{m2}, light is expected to cover the distance BD in 3D space. Since $v_i \geq c$, , the distance covered by light beam along the line BD will never be greater than CE and the covered distance is say BF whereas FD is uncovered. From Figure 5,

$$\text{CE} = v_i \times t_{m2}$$

$$\text{BF} = \text{B}'\text{D} = c \times t_{m2}$$

Since $v_i \geq c$, BF ≤ CE. That is, the distance covered by light in 3D space is equal to or lesser than the distance covered by bus in i-space. At constant v_i, if t_{m2} increases, CE increases and as a result FD increases. This implies when the bus proceeds from C to E, light appears to be traveling backward in 3D space. This is possible only if the events are occurring in reverse order. But observers in 3D space should not disobey the law of causality [2]. So their biological clock is reversed with respect to the clock inside the bus. In other words the bus is going past in time.

If t_p is the time that 3D space observers aged back, then FD= $-c \times t_p$ (negative sign indicates that t_p is ticking back in time).

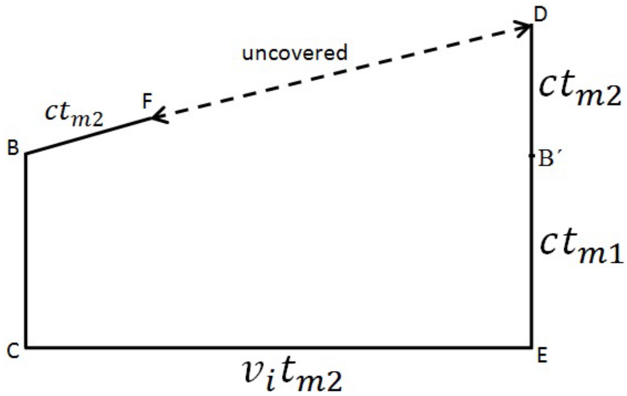

Figure 5. Geometrical view showing uncovered portion of light

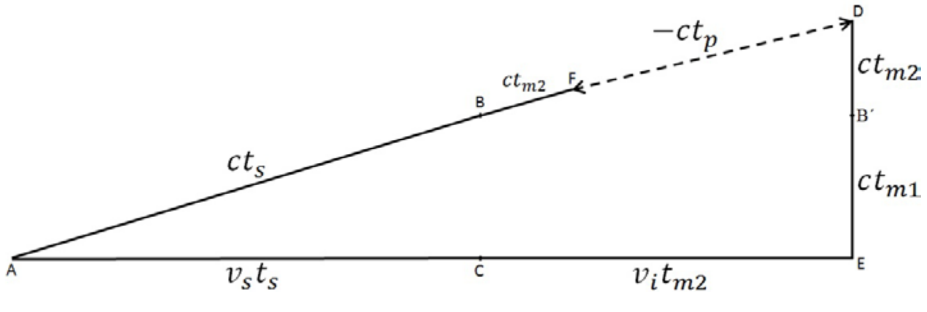

Figure 6. Geometrical view of the complete event

3.3. Time Flow Derivation

From Figure 6, in right angled triangle AED,

$$(v_s t_s + v_i t_{m2})^2 + (ct_m)^2 = \left[c\left(t_s + t_{m2} - t_p\right)\right]^2$$

$$\Rightarrow \left(\frac{v_s t_s + v_i t_{m2}}{c}\right)^2 + t_m{}^2 = \left(t_s + t_{m2} - t_p\right)^2 \qquad (1)$$

$$\left(\frac{v_s t_s + v_i t_{m2}}{c}\right)^2 + (t_{m1} + t_{m2})^2 = \left(t_s + t_{m2} - t_p\right)^2$$

$$since, t_m = t_{m1} + t_{m2}$$

Case 1: subluminal speed

Deriving the effect only at v_s

$$v_i = 0$$

$$t_p = t_{m2} = 0.$$

Eq. (1) becomes,

$$\left(\frac{v_s t_s}{c}\right)^2 + t_{m1}{}^2 = t_s{}^2$$

On manipulating the above equation,

$$t_{m1} = t_s\sqrt{1 - \frac{v_s^{\,2}}{c^2}}, v_s < c, t_{m1} < t_s \qquad (2)$$

Eq. (2) is the time dilation [3] equation in terms of ageing.

Case 2: superluminal speed

Deriving the effect only at v_i,

$$v_s = 0$$

$$t_s = t_{m1} = 0$$

Eq. (1) becomes,

$$\left(\frac{v_i t_{m2}}{c}\right)^2 + t_{m2}^{\,2} = \left(t_{m2} - t_p\right)^2$$

On manipulating the above equation,

$$t_p = t_{m2}\left(1 - \sqrt{1 + \frac{v_i^{\,2}}{c^2}}\right), v_i \geq c, t_p isnegative \qquad (3)$$

Eq. (3) is the past time travel equation.

Eq. (1) can provide relation between stationary and moving objects at any velocity. This equation is capable of explaining superluminal time flow and time dilation phenomenon together.

4. Invisible Time (i-time)

Superluminal movements cannot be defined by the objects in 3D space. When an object attains $v_i \geq c$, it disappears in 3D space and when its velocity becomes just below c, the object reappears in 3D space but back in time. In this time travel, the object has to undergo ageing and is also not explainable with respect to any object in 3D space. That is its ageing is invisible at $v_i \geq c$ to the objects in 3D space. This invisible ageing of time is called invisible time or simply i-time.

5. Invisible Spacetime (i-spacetime)

At $v_i \geq c$, the object moves both in i-space and i-time. These are together called as “i-spacetime”, in which superluminal objects are placed. The events occurring in or due to $v_i \geq c$ objects can be explained only by means of i-spacetime.

6. Conclusion

From this paper, we infer that Faster Than Light simply provides a way to travel past in time. Einstein-Rosen bridge [4] connects two distant points in space as well as time. If Faster Than Light speed leaves an object in i-spacetime, then Einstein-Rosen bridge must be constructed in i-spacetime, through which one can reach distant point before light, but past in time. At subluminal speeds, Invisible Spacetime Theory behaves like Special Relativity, the fundamental paper in Modern physics. Thus, this generalized paper, having dual nature of explaining objects at both subluminal and superluminal speeds, may give new perception to explore higher dimensions.

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