How the Special Relativity Violates Fundamental Physics Concepts

Radwan M. Kassir ©2015

radwan.elkassir@dargroup.com

Abstract In this paper, it is shown that the classical addition of velocities is unavoidable, and follows naturally from an intrinsic physics concept. It is revealed that the relativistic addition of velocities and the Lorentz contraction simply lead to time transformations contradicting the Special Relativity predictions. Ironically, the Special Relativity time dilation prediction could be obtained from the classical addition of velocities and the Lorentz contraction, when the travel time of a two-way light trip is considered. A one-way (forward or backward) travel time leads to contradictions with the Special Relativity predictions. The special relativity time dilation factor could be obtained from the classical addition of velocities for a light trip in the transverse direction, but in contradiction with the speed of light postulate. Analyzed light travel time between relatively moving frame origins offers outcomes inconsistent with the Special Relativity.

Keywords: *Special Relativity, time dilation, Lorentz contraction, speed of light postulate, addition of velocities*

1. Introduction

The Special Relativity formulation is based on the relativity principle stating that the laws of nature must be the same in all inertial frames[a], and on the constancy of the speed of light principle postulating that the speed of light is invariant with respect to all inertial frames.[1,2] The latter principle is rather absurd, and it results in peculiar outcomes such as the dilation of time and the contraction of object lengths; i.e., in a relatively "moving" inertial frame, at-rest clocks runs slower, and at-rest measuring rods become shorter—in the relative motion direction—when observed from a "stationary" frame, relative to which the former frame is moving. The speed of light postulate and the ensuing Special Relativity have been widely criticized.[3-7] This study provides further rational evidence of the fallacy of the Special Relativity through demonstrating the unviability of the speed of light principle that results in several contradictions with intrinsic physics principles of space and time. The classical addition of velocities is revealed to be an unavoidable natural consequence of these principles, defying the artificial relativistic velocities addition resulting from the speed of light postulate.

2. Deduction of the Classical Addition of Velocities from the Intrinsic Relation between Space, Time, and Velocity

Consider two inertial reference frames with coordinate systems $K(x, y, z, t)$ and $K'(x', y', z', t')$ in relative motion of velocity v. Let's suppose the system axes are overlapping at the instant of time $t_o = t'_o = 0$. A rod of a rest length L' is fixed in K' on the X'-axis with one end at the K' system's origin and the other end at a fixed point A' on the X'-axis (Fig. 1). At the initial instant of time, a light ray is emitted from the origin of K' towards the point A'.

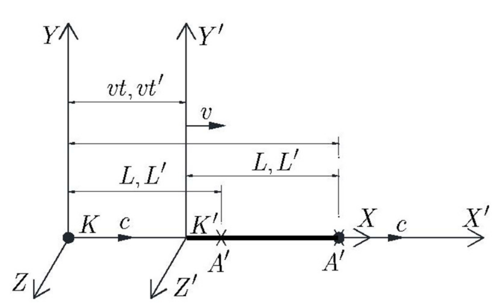

Fig. 1 Longitudinal light ray trip along the rod traveling with K'

[a] Frames in uniform rectilinear motion

Using the following basic physics concept,

$$\text{path travel time by a moving body} = \\ = \frac{\text{length of the traveled path}}{\text{speed of travel along the path}}, \tag{1}$$

the light ray travel time, with respect to K, in arriving to the rod end (point A'), becomes

$$t = \frac{vt + L}{c};$$
$$t = \frac{L}{c - v}. \tag{2}$$

where L is the "moving" length of the rod, and c is the speed of light with respect to K.

Equations (1) and (2) tell us that the "moving" rod length L is travelled by the light ray at a speed of $c - v$, indicating that the speed of light relative to the moving rod is $c - v$, which is nothing but the relative velocity according to the classical addition of velocities. Thus, the classical addition of velocities is a natural consequence of the intrinsic concept described by Eq. (1).

3. Special Relativity Inconsistencies

3.1. Longitudinal Travel Time

The Special Relativity instructs us that the light ray velocity relative to the "moving" rod should be obtained from the relativistic addition of velocities:[1]

$$u' = \frac{u - v}{1 - uv/c^2}, \tag{3}$$

where u is the velocity of a body in the "stationary" frame, and u' is its corresponding velocity relative to the "traveling" frame.

It follows that, according to Special Relativity, the velocity of light c_r relative to the moving rod is

$$c_r = \frac{c - v}{1 - cv/c^2} = c. \tag{4}$$

Therefore, using the Special Relativity prediction, an observer at the K origin would estimate the light ray travel time along the "moving" rod length to be,

$$t = \frac{L}{c}. \tag{5}$$

On the other hand, according to the Special Relativity constancy of the speed of light principle, the light ray travel time over the "rest" rod length L' in K' can be expressed as

$$t' = \frac{L'}{c}. \tag{6}$$

Using the Special Relativity length contraction (Lorentz contraction) prediction,[1] the "moving" rod length is related to the rod "rest" length by the formula

$$L = \frac{L'}{\gamma}. \tag{7}$$

where

$$\gamma = \left(1 - v^2/c^2\right)^{-1/2}$$

It follows from Eqs. (5)–(7) that

$$t = \frac{t'}{\gamma}, \tag{8}$$

which is in contradiction with the Special Relativity prediction of the time dilation[1] (i.e., $t = \gamma t'$).

Ironically, the Special Relativity time dilation prediction would follow, had we considered the light ray round trip travel time over the "moving" rod length, using the classical addition of velocities and the relativistic length contraction. In fact, the relative speed of light with respect to the "moving" rod in the reverse direction would be $c + v$. Therefore, the round trip travel time with respect to K becomes

$$t = \frac{L}{c - v} + \frac{L}{c + v}; \tag{9}$$

$$t = \frac{2L/c}{(1 - v^2/c^2)}. \tag{10}$$

On the other hand, according to the Special Relativity constancy of the speed of light principle,[1] the light ray round trip travel time over the "rest" rod length L' in K' can be expressed as

$$t' = \frac{2L'}{c}. \tag{11}$$

Using the relativistic length contraction formula given by Eq. (7), Eq. (10) yields

$$t = \frac{2L'/\gamma c}{\left(1 - v^2/c^2\right)} = \gamma t'. \tag{12}$$

Furthermore, if we consider one way trip in the forward direction over the "moving" rod length, using the classical addition of velocities, we obtain

$$\begin{aligned} t &= \frac{L}{c-v} = \frac{L'/\gamma}{c-v} = \frac{L'}{c\gamma(1 - v/c)} = \\ &= \frac{t'}{\gamma(1-v/c)} = \gamma t'(1 + v/c). \end{aligned} \tag{13}$$

Similarly, considering one way trip in the reverse direction, we obtain

$$t = \gamma t'(1 - v/c). \tag{14}$$

In summary, the Special Relativity results in the following contradictory outcomes:

- The relativistic addition of velocities, with the relativistic length contraction, considering 1- or 2-way light trip, leads to

$$t = \frac{t'}{\gamma}. \tag{15}$$

- The classical addition of velocities, with the relativistic length contraction, considering 2-way light trip, yields

$$t = \gamma t'. \tag{16}$$

- The classical addition of velocities, with the relativistic length contraction, considering 1-way light trip in the forward direction, results in

$$t = \gamma t'(1 + v/c). \tag{17}$$

- The classical addition of velocities, with the relativistic length contraction, considering 1-way light trip in the reverse direction, results in

$$t = \gamma t'(1 - v/c). \tag{18}$$

3.2. Transverse Travel Time

Considering the light ray trip along the rod fixed on the Y'- axis, with one end at the origin (Fig. 2), and using the classical addition of velocities, the relativistic time dilation would be obtained, but with contradiction to the Special Relativity. In fact, using Eq. (1), the transversal travel time with respect to K can be expressed as

$$t = \frac{\sqrt{L^2 + v^2 t^2}}{c}; \qquad t = \frac{L}{\sqrt{c^2 - v^2}}; \tag{19}$$

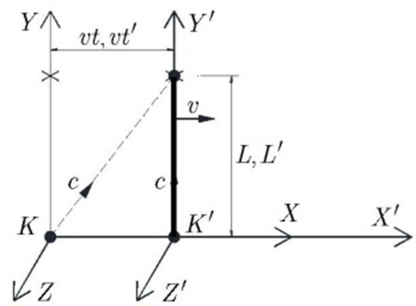

Fig. 2 Transversal light ray trip along the rod traveling with K'

Equations (1) and (19) tell us that the "moving" rod length L is travelled [transversally] by the light ray at a speed of $\sqrt{c^2 - v^2}$, indicating that the speed of light relative to the moving rod is $\sqrt{c^2 - v^2}$, which is nothing but the relative velocity c_r according to the classical addition of velocities. Indeed, the classical addition of velocities allows us to write

$$\vec{c}_r = \vec{c} - \vec{v}; \qquad c_r^2 = c^2 - v^2; \qquad c_r = \sqrt{c^2 - v^2}. \tag{20}$$

However, since, according to the Special Relativity, the "moving" and "rest" lengths are the same for the rod in transverse orientation,[1] the light ray travel time along the rod can be written as

$$t = \frac{L'}{\sqrt{c^2 - v^2}}, \tag{21}$$

which is the light ray travel time over the length L'. Therefore,

$$t' = \frac{L'}{\sqrt{c^2 - v^2}}, \tag{22}$$

which is in contradiction with the special relativity constancy of the speed of light principle requiring

$$t' = \frac{L'}{c}, \tag{23}$$

leading to the inconsistency

$$t' = \frac{L'/c}{\sqrt{1 - v^2/c^2}} = \gamma t', \text{ or } \gamma = 1. \tag{24}$$

3.3. Travel Time between the Frame Origins

Now, suppose at the instant of time t_o with respect to K, t'_o with respect to K', the frames are separated by the distance L relative to K, L' relative to K'. A light ray is emitted from the origin of K' at time t'_o towards the origin of K (Fig. 3). We are to determine the travel time between the origins from the perspective of each reference frame, with the Special Relativity assumption that the speed of light is the same from the perspective of both frames.

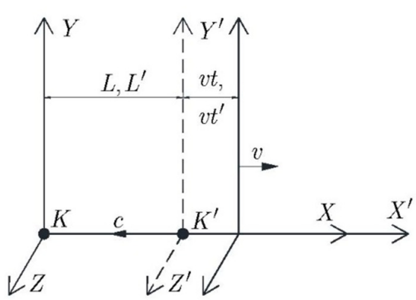

Fig. 3 Light ray trip from the origin of K' to that of K

With respect to K', according to Eq. (1) the travel time t' can be expressed as

$$t' = \frac{L' + vt'}{c}; \tag{25}$$

$$t' = \frac{L'}{c - v}. \tag{26}$$

Equations (1) and (26) tell us that the path L' is travelled by the light ray at a speed of $c - v$, indicating that the speed of light relative to this path is $c - v$, which is nothing but the relative velocity according to the classical addition of velocities.

Yet, the Special Relativity addition of velocities leads to the speed of light being c with respect to the path L'. Therefore, using the Special Relativity prediction, an observer at K' origin would estimate the light ray travel time across the length L' to be

$$t' = \frac{L'}{c}. \tag{27}$$

Comparing Eqs. (26) and (27), we obtain the inconsistency $v = 0$.

On the other hand, with respect to K, using the same principle, the light ray travel time is given by

$$t = \frac{L}{c}. \tag{28}$$

According to the Special Relativity spatial transformation equation[1]

$$x' = \gamma(x - vt), \tag{29}$$

we get the lengths

$$L = vt_o, \tag{30}$$

corresponding to $x' = 0$, and

$$L' = \gamma v t_o, \tag{31}$$

corresponding to $x = 0$.

Hence, using Eqs. (30) and (31), Eqs. (27) and (28) yield

$$t' = \gamma t, \tag{32}$$

which is in contradiction with the Special Relativity prediction of time dilation,[1] $t = \gamma t'$.

Whereas, Eqs. (26) and (28) lead to another contradiction, namely,

$$t' = \frac{\gamma t}{1 - v/c}. \tag{33}$$

4. Conclusion

The Special Relativity is inconsistent with the intrinsic physics concept relating space and time. Using the Special Relativity light speed postulate, and its prediction of the Lorentz contraction, fundamental contradictions in terms of the time transformation result.

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